THE PracTEX Journal

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Editorial — LaTeX in the IT World

Francisco Reinaldo
Paul Blaga
Comment on this

In This Issue

Software systems for document preparation, project management, and requirements analysis are continually evolving. There is no limit to how much these systems can expand and become a more significant force in computerized automation. In this issue of the PracTeX Journal we present several articles by authors involved in these areas, with the hope that their experiences and techniques using LaTeX and other TeX tools will be useful to others.

Not too long ago there was a fairly small number of LaTeX and TeX users, and they concentrated mostly on math and scientific documents. As LaTeX and TeX matured over the years and became more accessible, it was natural that they would be used more in Information Technology. Today, there are countless universities, research organizations, and commercial enterprises using TeX in IT.

This issue grew beyond what we expected at the outset. Although it's a very specific area, it generated a lot of interest --- we had over 1,800 hits on the pre-release web site.

I hope you enjoy reading the articles, and be sure to give us feedback by clicking the links next to each article.

- Articles

The first article, Formatting Sweave and LaTeX Documents in APA Style, by Brian D. Beitzel, explains the use of the class **aps6.cls** for preparing manuscripts to be submitted to American Psychological Association's journals, according to its 6th edition *Publication Manual*.

The second paper, The Vocal Tract LaTeX Package, by Dimitrios Ververidis, Daniel Schneider, and Joachim Köhler, is dealing with the package **VocalTract.sty**, devoted to the visualisation of the vocal tract.

The next paper, Writing Posters with Beamerposter Package in LaTeX, by Han Lin Shang, discusses the use of the package **beamerposter**, a LaTeX tool for creating conference posters as well as some connected packages.

In Seeing stars, James S. Hefferon shows how to create star symbols with MetaPost for rating a web page.

In TeX in the eBook Era, Luca Merciadri emphasizes the advantages of using eBooks, in connection with LaTeX-composed documents.

The following paper, Easy-to-use Chinese MTEX Suite, Hongbin Ma describes, to use his own words, "an easy-to-use and easy-to-learn Chinese MTeX Suite". It was developed by Hongbin Ma and friends in order to provide Chinese LaTeX users with a compact TeX distribution.

In Bashful Writing and Active Documents, Joseph Gil discusses a new paradigm in computer science, *active documents*. These offer ways of presenting users with documents that change in response to exterior events. The author proposes a new package, **bashful**, and documents created with this package, in the author's own words, "extend the user interaction offered by active documents to the time of the document creation".

Finally, the article by Rayans Carvalho and Francisco Reinaldo, Documenting ITIL processes with LaTeX (Portuguese), presents a LaTeX-based processes and services documentation tool, as suggested by the Information Technology Infrastructure Library .

- Columns

Ask Nelly answers some questions about the customization of lists in LaTeX and about creating logos with LaTeX.

The Distraction demonstrates a package writing guitar chords, and offers some entertaining font quizzes.

Thanks

The PracTeX Journal thanks the production editors - Lance Carnes and Yogeshwarsing Calleecharan - who worked hard with us to create this issue. Dave Witte Morris carefully copy edited several articles. Thanks to all for helping out. It takes many hours to edit the articles and put together the web site, and working with this team makes it a pleasure to do.

Colin Shanafelt of Gatsbylight.com provided a free license of "Easy Grader" publishing software for each production editor. This software is a a useful tool for teachers, reviewers, and others who evaluate written material. This donation is much appreciated.

Francisco Reinaldo

Paul Blaga

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News from Around

News From Around

Editors
Comment on this article

LaTeX Blogs

See the LaTeX Community blog for LaTeX articles, blogs, and contests. It is edited by Stefan Kottwitz, author of *LaTeX Beginner's Guide*.

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Feedback from readers

Editors

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1 Feedback from readers
1.1 Math italic d vs roman d
1.2 Displayed equations
1.3 Redefining LaTeX math commands
1.4 Missing chess piece

Math italic d vs roman d

While preparing the article LaTeX teaching techniques, Lenore Horner for the 2011-1 issue the proofreader and author disagreed over the use of an italic d vs an upright or roman d.

Proofreader Calleecharan

> [Horner] writes $ \frac{ds}{dt} $ on page 3. The differential operator "d" should be upright and not in italic.

Author Horner

> I made the changes in the derivative notation because the argument that the derivative is an operation and so shouldn't look like a variable made sense to me. I later checked every single math and physics book on my shelves at home (I have another shelf-full at school that I keep forgetting to check) and not a single one of them - including the one by an author who had his wife write a font for the TRS-80 to properly typeset his book - writes the derivative in any way differently from the variable d. I guess LaTeX is out to change the way we write math in this case.

We asked a well-known math book publisher and TeX expert, Michael Spivak.

> Should dx/dy have an italic d or a roman d? For centuries, of course, mathematicians have used an italic d. Then some standards committee or other decided it should be roman d, since italic letters are reserved for variables. As far as I know, $e^{i\pi}=-1$ is still written with an italic e and an italic i, but perhaps they were worried about Emerson's hobgoblin of small minds.
>
> I believe the roman d flag is now carried by physicists and engineers, but don't know that many mathematicians who use it. I haven't yet seen a Calculus book that uses a roman d, though there's almost certainly an enthusiast somewhere who has written one.

Claudio Beccari cites the ISO standard for this (and also published an article on it in *TUGBoat* ten years ago):

> The roman d (differential), the roman i or j (imaginary unit), the roman e (base of natural logarithms) must be typed in upright type by an ISO regulation, but it deals only with typesetting mathematics in Science and Technology. See the paper sp811.pdf http://physics.nist.gov/cuu/pdf/sp811.pdf issued by the NIST (National Institute for Science and Technology, the successor of the US National Bureau of Standards).
>
> The ISO regulations, I must underline, deal only with Science and Technology, not with *pure* mathematics, and mathematicians are not bound to such regulations. It applies to physicists, engineers, chemists, and others dealing with measurable sciences. (Of course, mathematics is a science, but the term *science* used by the regulation implies sciences that deal with measurable physical quantities). The underlying *ratio legis* is that physical quantity symbols should not be confused with symbols that do not represent quantities; furthermore, physical quantities have similar symbols, where d, i and e are used very frequently for diameters, distances, diffraction indices, electric current, electron charge, and the like. The italic physical quantities should not be confused either with the units of measurement that, again, must be in upright type, and not italic, slanted, or oblique forms.
>
> As a university engineer and professor I published using mathematics during the whole length of my research career, and I find these regulations very wise and very convenient to use in practical situations, as well as the obligation to use roman type in subscripts and superscripts that do not represent physical quantities or

> mathematical entities, so that the *i*-th element of a succession of voltages should be V_i while the input voltage should be V_{i}.
>
> I underline that the ISO regulations apply to Science and Technology, so the use of, say, upright or italic d for the differential depends on the field where that symbol is used; roman type is compulsory in Science and Technology, optional in pure mathematics.

Since the proofreader is an engineer he recommended the roman d. Mathematicians apparently almost always use the italic d. The author is a physicist and chose to use the italic d. Now this all makes sense ... or does it?

Displayed equations

After the article LaTeX teaching techniques, Lenore Horner was published we received the following comment:

Ross Moore 2011-09-20

> One extra thing that I do is use \tfrac{1}{2} so that the fraction looks nice, even in displays, where otherwise it can dominate an expression (as in one of your early examples).

Horner 2011-10-11

> I have to disagree with Ross. See attached examples and pedagogical discussion of why using universal small halves in displayed equations doesn't make sense. What it comes down to is that I agree with LaTeX default choices on appropriate sizing within expressions and disagree with Ross's suggestion to override those defaults.

Redefining LaTeX math commands

Juan Luis Varona 2011-09-20

Comment on Speedy LaTeX on the Mac, Lenore Horner

In general, it is not a good idea to redefine TeX commands. But sometimes it is a very bad idea. For instance, redefining

```
\renewcommand{\[]{\left[}
\renewcommand{\]}{\right]}
```

because in this way you cannot use

```
\[
formula
\]
```

Note that

```
\[
formula
\]
```

Is *not* the same as

```
$$
formula
$$
```

although it seems similar (for instance, you can not to use \qedhere with $$...$$).

Horner 2011-10-21

> Juan Luis makes a good point that redefining has dangers. In this case I think the advantages outweigh the dangers, although I do see that I should not have recommended $$ $$ as the replacement for \[\] but rather either \begin{equation*} \end{equation*} or \begin{align*} \end{align*} since $$ $$ (I think) triggers TeX on which displaymath, equation, and align are built but is different from all of them. Personally, I prefer the align environments over the equation environments since I don't have to change the environment if I need to add extra lines of math later. Because I can insert any of the options with the same number of key-strokes and it makes sense to put the opening and closing statements of the displayed math on their own lines, there is no disadvantage in editing to using the longer forms. However, the longer \left(\right) or \left[\right] necessary for most sets of parenthesis in an equation make editing and proofreading the equations themselves much harder for me. Sample of math redefinitions

Missing chess piece

Luis A. Dissett 2011-10-21

In Distractions — Some chess problems created in LaTeX the solution to "Additional chess problem 2" reads: "If it is white's turn, then white plays 1. 0-0 and, irrespective of what black does, mates with 2. Rd4d1."

However, black can escape by 1. 0-0 Kd4-d5 2. Re1-d1 Ke6.

A black pawn is missing on e6.

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Formatting Sweave and LATEX Documents in APA Style

Brian D. Beitzel

Article PDF
Article source
Comment on this article

Abstract: Journals in the social sciences typically require manuscripts to be formatted according to the American Psychological Association's Publication Manual, which is now in its 6th Edition. The apa6 class is an update of the popular apa class (often referred to as “apa.cls”), bringing it into compliance with 6th Edition requirements and adding a few new features. This article describes the major features of apa6 and presents results from testing apa6 with four bibliographic package scenarios; the output of these bibliographic packages is compared with 6th Edition requirements. The article concludes with information regarding how to easily convert a document from LaTeX to Microsoft Word for the purpose of submitting manuscripts to journals that require APA style.

Brian Beitzel. I am an Associate Professor in the Department of Educational Psychology, Counseling and Special Education at SUNY Oneonta in Oneonta, NY. I started learning and using LaTeX because of the potential of the apa class for formatting manuscripts (including Sweave for reproducible research) and because of the capabilities of the beamer package for presentations. You can contact Brian at `brian at beitzel dot com`.

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Article revision 2012/03/08

Formatting LaTeX Documents in APA Style (6th Edition) Using the apa6 Class

Brian D. Beitzel

Email brian@beitzel.com

Abstract Journals in the social sciences typically require manuscripts to be formatted according to the American Psychological Association's *Publication Manual*, which is now in its 6th Edition. The apa6 class is an update of the popular apa class (often referred to as "apa.cls"), bringing it into compliance with 6th Edition requirements and adding a few new features. This article describes the major features of apa6 and presents results from testing apa6 with four bibliographic package scenarios; the output of these bibliographic packages is compared with 6th Edition requirements. The article concludes with information regarding how to easily convert a document from LaTeX to Microsoft Word® for the purpose of submitting manuscripts to journals that require APA style.

1 Background

Journals in psychology and other social sciences typically require authors to format their manuscripts in compliance with the guidelines published by the American Psychological Association (APA) in its *Publication Manual*, which APA updates periodically. The 6th Edition of the *Manual* (American Psychological Association, 2009) significantly altered the formatting guidelines for section headings and other aspects of manuscripts. These changes rendered existing formatting systems (e.g., the apa LaTeX class) inadequate for publication venues that require strict compliance with the 6th Edition.

The apa6 LaTeX class is an update of the apa class (frequently referred to as "apa.cls"), bringing the printed output into compliance with 6th Edition requirements. Because the author of the apa class is no longer maintaining it, I updated the code and released it under a new name, apa6.

In addition to the formatting updates (described in Section 2) required by the changes introduced in the 6th Edition, I added a few new features that were not available in the `apa` class. I describe these briefly in Section 3 of this article; for more detail, please consult the `apa6` documentation.

Central to the requirements of APA style is the citing of sources. Several LaTeX bibliography packages are available for this. I tested the most common ones and have included my results in Section 4 of this article.

One additional aspect of preparing manuscripts for publication is the frequent stipulation that manuscripts be submitted in Microsoft Word® format. Microsoft Windows® users need look no further than Section 5 of this article for a relatively easy solution for accurately converting LaTeX documents into Word documents.

Although I refer exclusively to LaTeX documents throughout this article, all the information applies equally to Sweave documents (cf. Zahn, 2008). Sweave is a function in the open-source statistical software R (R Development Core Team, 2011). An Sweave document contains both directives for statistical analysis (conceptually similar to SPSS commands) and prose (abstract, introduction, etc.). The Sweave function processes the statistical analyses and "weaves" the statistical output with the prose to produce a complete manuscript. Thus, the researcher no longer must re-type, copy, or paste statistical results into a word-processing file. And if the data to be analyzed should change for any reason (e.g., one decides to exclude a few outlier cases), one only needs to re-run the Sweave command in order to produce an updated manuscript with the latest statistical results. The details of Sweaving are beyond the scope of this article, but a quick web search will turn up many useful results.

2 Compliance with 6th Edition Requirements

This section describes the updates made necessary by requirements appearing for the first time in the 6th Edition.

Like `apa`, `apa6` has three modes that generate a different visual result when the document is compiled: `jou` mode (the default), which has a two-column, printed-journal appearance; `man` mode, which follows APA's requirements for formatting manuscripts for publication; and `doc` mode, which has a standard LaTeX-document appearance. Although some of the 6th-Edition changes (e.g., format of section headings) apply equally to `jou` and `doc` modes, in this article I will be

discussing the much-more-detailed specifications from the *Manual* pertaining to `man` mode.

2.1 Section Headings

Perhaps the biggest change introduced in the 6th Edition is the way section headings are formatted. Prior to the 6th Edition, headings were formatted based on how many levels of heading (think of levels in a hierarchical, Roman-numeral outline) were present in the document. In the 6th Edition, regardless of the number of heading levels in the manuscript, the top heading level is always centered, boldfaced, and set in upper- and lower-case. Other heading levels have similarly specific requirements. (In APA style, headings are not numbered.) The `apa6` class complies with all of the 6th Edition heading requirements.

2.2 Float Placement

According to the 6th Edition, tables and figures (in that order) must appear after the references but before the appendices. This creates something of an enigma regarding what should happen with floats (i.e., tables or figures) that are ultimately typeset within an appendix. The choices we are left with are to place appendix floats (a) along with the floats from the main part of the manuscript, which would mean that appendix floats appear prior to the point at which they are mentioned; (b) within the appendices themselves, which is not consistent with how floats in the main part of the manuscript are handled; or (c) in a separate float section that follows the appendices, which results in two sections of floats. Obviously none of these choices is satisfactory, so I posed the question to APA's Style Expert. He responded that at least for APA's journals, "it doesn't matter whether appendix tables are submitted with text tables or separately, as long as they are numbered correctly (e.g., Table A1, Table B1, etc.)." (J. Hume-Pratuch, personal communication, June 15, 2011). Therefore, `apa6` takes the most straightforward approach and includes all appendix floats within the body of the relevant appendix. This also has the advantage of making the appendices more readable.

Because the 6th Edition requires figure captions to be printed on the same page as their respective figures, `apa6` does not produce any Figure Captions pages.

2.3 Author Note

According to the 6th Edition, the Author Note must appear on the title page rather than on a separate page of the manuscript. The `apa6` class typesets the Author Note at the bottom of the title page, per 6th Edition specifications.

3 New features

In addition to providing compatibility with the 6th Edition of the *Manual*, I have implemented several new features beyond those available in the `apa` class.

3.1 Repositioned Floats

When revising and proofreading a manuscript, it is most helpful to have the tables and figures readily available (rather than turning most of the way to the end of the manuscript to access them). If the user invokes the `floatsintext` option (in the `\documentclass` line), tables and figures will be integrated in the text approximately at the point where they are mentioned.

3.2 Masked References

Most often when authors submit manuscripts for peer review, the manuscripts must have all identifying information stripped so that reviewers do not know who the author of the manuscript is. If the user specifies the `mask` option, `apa6` will suppress the author's name and affiliation, the Author Note, and any references that are marked as being the author's own.

The `apa6` class replaces masked citations with the text, *(2 citations removed for masked review)* (in the case of two masked citations) and removes the corresponding entries from the reference list.

For final production of the manuscript there is no need to revise how the previously masked references are cited. Removing the `mask` option from the `\documentclass` line will unmask all in-text citations and display all sources in the reference list.

3.3 Flexible Bibliographies

The apa6 class supports three bibliography packages: apacite, natbib, and biblatex. Section 4 describes how well each of these packages complies with 6th Edition requirements.

3.4 Smaller Changes

I also added several new features for convenience, and will give them only passing attention here. First, the user can specify the desired font size (within the standard set of 10pt, 11pt, and 12pt that LaTeX provides). Second, with the `draftfirst` or `draftall` options, a "DRAFT" watermark (which the user can further customize with different text or font size) will be placed on either the first page or on all pages. Finally, the user can specify keywords to facilitate electronic indexing of the article after publication; many journals (including APA journals) request authors to provide these. If specified, keywords are displayed on a line beneath the abstract.

4 Compliance of Bibliography Packages with 6th Edition Requirements

Although apa6 supports the apacite, natbib, and biblatex bibliography packages, not all of them are equally precise with regard to 6th Edition requirements. This section compares the output of these packages, highlighting inaccuracies that authors should be aware of when using them. For details on how to use each of these packages with the apa6 class, please refer to the apa6 documentation.

4.1 Citation Tests

The test cases for looking at formatting come from the file `bibliography.bib`, which is located in the "samples" subfolder of the apa6 installation. There are several situations that we will need to examine in order to be satisfied that we are complying with APA requirements. Please note that the following tests are not intended to be comprehensive tests of APA citation style; rather, they cover some of the more rigorous APA-style challenges for bibliographic citation software.

1. *Joining Multiple Author Names Outside Parentheses.* With a multiple-author source and when all authors must be listed (as opposed to the situations in Tests #4 and #5 below), write out the word "and" prior to the last author's name if the authors are named outside parentheses.
2. *Joining Multiple Author Names Within Parentheses.* In the same situation as above, but when the authors' names are cited *inside* parentheses, use the symbol "&" in place of the word "and."
3. *Order Citations Alphabetically.* When multiple sources are cited within parentheses, sort them in the same order in which they appear in the reference list at the end of the manuscript. For this test, I purposely entered the citations in reverse alphabetical order.
4. *Truncating 3-5 Author Names.* When there are 3-5 authors, list all authors' names for the first citation; for subsequent citations, list only the first author's name followed by "et al."
5. *Truncating Six or More Author Names.* When there are more than six authors, list only the first author's name, followed by "et al."
6. *Same Author(s), Same Year.* When different articles have the identical author(s) in the same year, give the year followed by "a," "b," etc.
7. *Same Author(s), In Press.* When different in-press articles have identical author(s), use "in press-a", "in press-b", etc., instead of the year.
8. *Same Author(s), Different Articles.* When citing two or more articles by the same author(s) within parentheses, do not repeat the author name(s).
9. *Different First Authors, Same Last Name.* When two first authors have the same last name, include their initials to clarify which one is being cited.
10. *Multiple Authors, Same Year.* When two or more articles have a subset of the same authors in the same order, all citations must include as many author names as necessary to make the citation unique. Note that the "al." in "et al." is plural and therefore must replace at least two names.
11. *Suppress Name Suffixes.* Do not include the suffix of author names (e.g., "Jr.") when citing their work in the body of the text.
12. *Capitalizing Initial Lower-Case Names.* If the first word in a sentence is an author name that begins with a lower-case letter (e.g., "de Waal"), capitalize

that name.

4.2 Results of Citation Tests

Table 1 presents the results of these citation tests. First it should be noted that most of these packages handle basic citations very well. Only one of them passed all 12 tests, but two others did very well. Additionally, not all failures in Table 1 are equally egregious; for example, the single biblatex-biber failure (Test #9b) will never cause confusion as to which source is being cited.

Before we look at the results, I wish to applaud the developers of `apacite` and `biblatex-apa` for responding to my initial citation results and modifying their packages to better comply with 6th Edition requirements. There are now many fewer failed tests in this series than there were when I first ran these tests with then-current versions of these packages just a few months ago.

I summarize the results for each package next. No reviewer or journal editor will comment on "the amazing accuracy of your citations"; but comments to the opposite effect may end up in your Inbox. So unfortunately, we need to focus on the non-compliance here rather than what each package does right.

4.2.1 apacite

I loaded the apacite package using the `apacite` option of the apa6 class, as follows: `\documentclass[jou,apacite]{apa6}`

There were two apacite errors: (a) in Test #3, the references were not sorted alphabetically within the parentheses; and (b) in Test #12, the prefix "De" was not capitalized (because there is no capitalization command in apacite).

To overcome the failures of Test #3, one must manually sequence the parenthetical citations; this is entirely feasible but does require a certain level of alertness on the part of the author. There is no cure for the failure of Test #12 without adding on the natbib package (see next section).

4.2.2 apacite-natbib

I loaded both the apacite package and the natbib package implicitly using the `natbib` option when calling the apa6 class: `\documentclass[jou,natbib]{apa6}`

Table 1: Citation test results

Test	Expected	Results			
		apacite[a]	apacite-natbib[b]	biblatex[c]	biblatex-biber[d]
1	Herbst-Damm and Kulik (2005)	Passed	Passed	Passed	Passed
2	(Herbst-Damm & Kulik, 2005)	Passed	Passed	Passed	Passed
3	(Haybron, 2008; Mayer, 2008a)	Failed	Passed	Passed	Passed
4a	Lassen, Steele, and Sailor (2006)	Passed	Passed	Passed	Passed
4b	Lassen et al. (2006)	Passed	Passed	Passed	Passed
5	Gilbert et al. (2004)	Passed	Passed	Passed	Passed
6a	Mayer (2008a)	Passed	Passed	Passed	Passed
6b	Mayer (2008b)	Passed	Passed	Passed	Passed
7	Mayer (in press-a, in press-b)	Passed	Passed	Passed	Passed
8	(Mayer, 2008a, 2008b)	Passed	Passed	Passed	Passed
9a	J. R. Levin and O'Donnell (2000)	Passed	Passed	Failed	Passed
9b	M. E. Levin and Levin (1990)	Passed	Passed	Failed	Failed
10a	(Borst, Kosslyn, et al., 2011)	Passed	Passed	Failed	Passed
10b	(Borst, Kievit, et al., 2011)	Passed	Passed	Failed	Passed
10c	(Borst, Thompson, & Kosslyn, 2011)	Passed	Passed	Failed	Passed
11	Franklin and Adams (2010)	Passed	Passed	Passed	Passed
12	De Waal and Grosser (2009)	Failed	Passed	Passed	Passed

[a] apacite version 6.01 (2012/02/25) [b] natbib version 8.31b (2010/09/13) [c] biblatex version 1.7 (2011/11/13), biblatex-apa version 4.6 (2012/02/08), BibTeX version 0.99d [d] biblatex version 1.7 (2011/11/13), biblatex-apa version 4.6 (2012/02/08), biber version 0.9 (2012/02/17)

There were no apacite-natbib errors, thanks to some clever programming by the apacite developer. The `natbib` package does not contain a bibliographic style; therefore, apacite is required when using natbib with apa6. The apa6 user simply needs to specify the `natbib` option to load both of these packages properly.

4.2.3 biblatex with BibTEX

I loaded the biblatex package with the following options specified:

```
\usepackage[style=apa,sortcites=true,sorting=nyt]{biblatex}
```

There were five biblatex (with BibTEX) errors: (a) in Test #9a,the first author's initials were not given; this is a serious error, explicitly violating APA requirements because another author has the same surname; (b) in Test #9b, the same problem occurred; (c–e) in Tests #10a, #10b, and #10c, the references were identified as "(Borst et al., 2011a)," "(Borst et al., 2011b)," and "(Borst et al., 2011c)." Although the Test #10 results do not cause confusion in identifying the intended source, this format does not conform to APA requirements.

4.2.4 biblatex with biber

I loaded the biblatex package and biber with the following options specified:

```
\usepackage[style=apa,sortcites=true,
            sorting=nyt,backend=biber]{biblatex}
```

There was only one minor biblatex (with biber) error: In Test #9b, the second author's initials were given when they should have been omitted.

4.3 Conclusions from Citation Tests

For APA-style citations, the apacite-natbib and biblatex-biber solutions are clearly the most competent; the only error was relatively minor and would never cause confusion as to which source is being cited (unlike the biblatex-BibTEX errors).

Time for a personal admission: For several months after learning about biber I was daunted by using it because for some reason I thought that once I converted to biber I was more or less committing myself to it for life. However, that is not so; to use biber, there are no changes required in the `.bib` file (although some advantages can be gained from a few label changes). All it takes is including

the `backend=biber` option when loading the biblatex package. It could hardly be simpler!

4.4 Reference Tests

The in-text citations are only part of the battle; formatting the reference list correctly is the other critical test for a bibliography package. I checked the reference list output from each package against 6th Edition requirements and found no errors that could not have been predicted by the results of the citation tests already described.

4.4.1 apacite

The apacite package produced a perfect reference list for my sample sources.

4.4.2 apacite-natbib

The apacite-natbib solution also had no errors in the reference list.

4.4.3 biblatex with BibTEX

Strangely, biblatex (with BibTEX) erred in sorting two of the references: Borst, Kosslyn, et al., 2011 was listed prior to Borst, Kievit, et al., 2011. I don't have a clue as to why this would be; I even tried switching the BibTEX keys but the sorting remained unchanged.

Additionally there is the problem of the three Borst references having "a," "b," and "c" (respectively) appended to their publication dates. This violates APA guidelines because the author lists for these three references are unique.

4.4.4 biblatex with biber

The biblatex-biber package also produced a perfect reference list.

4.4.5 Attention to the Details

To conclude, let's show off a 6th Edition formatting requirement that all four of these bibliography solutions are now capable of producing. D. Gilbert and eight

other individuals published an article in 2004. Check out the reference below and you will see that the first six authors are listed, followed by an ellipsis, followed by the final author. This way of handling more than six authors in the reference list is a new stipulation in the 6th Edition.

> Gilbert, D., McClernon, J., Rabinovich, N., Sugai, C., Plath, L., Asgaard, G., ... Botros, N. (2004). Effects of quitting smoking on EEG activation and attention last for more than 31 days and are more severe with stress, dependence, DRD2 A1 allele, and depressive traits. *Nicotine & Tobacco Research, 6*(2), 249–267. doi:10.1080/14622200410001676305

4.5 EndNote® Results

For comparison with a leading commercial bibliographic manager, I also subjected the latest version of EndNote® (X5.0.1) to each of these tests. EndNote failed citation tests #10c (substituting "et al." in place of only one author name, the same error as biblatex) and #12 (with no capitalization available for a lowercase name, the same flaw as apacite). There were no errors on the reference list.

5 Converting Documents from LaTeX to Word®

There are many recommendations online regarding how to solve the problem of submitting a LaTeX document to a journal that requires submissions to be in Word® format. The most common recommendation is to convert from LaTeX to HTML and then open the HTML file in Word. Various open-source converters are available, such as `htlatex`, `tth`, and others; see http://www.tug.org/utilities/texconv/textopc.html for a good listing of available programs.

An HTML-converter solution is quite unsatisfactory for APA style, however, because such converters cannot precisely maintain page formatting (e.g., title page, abstract page, etc.).

After much searching and experimenting, I found the TeX2Word™ software (http://www.chikrii.com/products/tex2word/) from Chikrii Softlab to be an excellent conversion utility. It is commercial software but has a free 30-day trial period available. TeX2Word allows customized conversion of documents from LaTeX to Word format (Microsoft Windows® only). Although TeX2Word does

not utilize a TEX distribution in its conversion (and thus cannot access the apa6 class directly), it has extensive customization capabilities that allow one to specify the formatting of section headings and other aspects of the resulting Word document. These customizations are contained in files with a .ptex extension. I have written the apa6.ptex file that facilitates conversion of apa6 documents and have included it with the apa6 class, available from CTAN. Conversion from LATEX to Word with the apa6.ptex file properly formats section headings, the title page, abstract page, double-spacing, any boldfaced and italicized text (e.g., statistical results), and table and figure captions. Some editing must be done by hand, such as inserting figures and moving tables from their in-text positions to separate pages at the end of the document. After the conversion is complete, the user will see some final editing directions on the title page of the Word document. My biggest disappointment with TeX2Word is its current inability to competently handle bibliographic information. See the apa6 documentation for more details.

Overall, TeX2Word is relatively painless to use, and in my opinion it should be the first choice for anyone wishing to convert an apa6 document to Word.

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Table of Contents **Issue 2012, Number 1 [Published 2012-10-22]**

The Vocal Tract LaTeX Package

Dimitrios Ververidis, Daniel Schneider, and Joachim Köhler

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Abstract: VocalTract.sty is a package to visualize the vocal tract. Vocal tract is manipulated by a vector of articulation parameters according to S. Maeda model. Animation can be achieved by providing a sequence of vectors over time, e.g. from Matlab©. An embedded sequence of vectors in the VocalTract.sty for certain German phonemes allows for a sequence of phonemes animation when no vector is available.

Dimitrios Ververidis graduated from the Department of Mathematics of the Aristotle University of Thessaloniki in Greece in 2001. He continued his studies at the School of Medicine of the same University until 2003, where he obtained the M.Sc. in Medical Informatics. In 2008, he earned a Ph.D. in Informatics with a thesis entitled *Digital Processing Techniques in Speech Emotion Recognition*, also at the Computer Science faculty of the same University. In 2009, he was with VTT Technical Research Center of Finland. In 2010–2011, he was with IAIS Fraunhofer Institute in Bonn, Germany. He has been a LaTex and PSTricks user since 2003. He has used LaTeX for writing his publications, PSTricks for drawing figures and plotting mathematics, and `beamer` for presenting publications. The Vocal Tract LaTeX package can be fully downloaded from CTAN at [1] . You can reach Dimitrios at [2] or `jimver04 at gmail dot com`.

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The vocal tract LaTeX package

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Abstract `VocalTract.sty` is a package to visualize the vocal tract. Vocal tract is manipulated by a vector of articulation parameters according to S. Maeda model. Animation can be achieved by providing a sequence of vectors over time, e.g. from Matlab®. An embedded sequence of vectors in the `VocalTract.sty` for certain German phonemes allows for a sequence of phonemes animation when no vector is available.

1 Introduction

The package provided is a vocal tract visualization tool to be used in speech research. The LaTeX/PSTricks engine used provides non-aliazed vocal tract images in postscript or portable document format (PDF) suitable for manuscripts. The package is also loaded through the VTCalcs software, a software for simulating vocal tract in Matlab® [4].

The vocal tract is manipulated with a vector of variables that vary over time. These are denoted as articulatory model (AM) parameters. The certain 10 AM parameters used here were proposed in [8, 9], where the number of variables related to the tongue was minimized by using factor analysis on vocal tract x-ray animations. The first simulation of the vocal tract was written in Fortran and could solve the differential equations for the voice to vocal tract and the inverse problem [8]. Faster implementations in C++ and Matlab® appeared [4]. Later, the model was augmented to provide control for the vocal chords tension [5]. In our work, the breathing is also simulated by an additional parameter. We consider that the provided package will enhance the vocal tract drawings to appear in manuscripts and help to understand the origins of speech production.

D. Ververidis work was carried out during the tenure of an ERCIM fellowship;

The outline of this manuscript is as follows. A study about the phonemes of the German language and their respective vocal tract set up using our package is shown in Section 2. Details about how to use the the vocal tract package are described in Section 3. Future work is discussed in Section 4.

2 German phonemes categorization

German language phonemes are categorized into vowels, unvoiced consonants, and voiced consonants according to the oscillation source, that is glottal, contrived or both types, respectively. Vowels are presented in Figure 1(a) and are produced with glottis oscillation. The alphabet used is the speech assessment methods phonetic alphabet (SAMPA) that is widely used in computer science [15]. Unvoiced consonants are shown in Figure 1(b) and are generated from the oscillation (due to turbulence) of a constriction formed by a part of the oral cavity with the tongue. Voiced consonants depicted in Figure 1(c) are generated by both sources of oscillation. Apart from the 26 German phonemes shown here, the phoneticians recognize 18 to 20 other phonemes [3]. In our work we assumed that the additional phonemes combine the 26 basic phonemes, i.e. the affricative 'ts' for the word 'Zahl' (tsa:l) can be considered as a sequence of the plosive 't' and the fricative 's'.

Vowels are separated into front, central and back depending on the position of the tongue; Rounded and unrounded depending on the shape of the lips; Close to open depending on the distance between the tongue and the ceiling. Unvoiced consonants are classified depending on which part of the oral cavity is coupled with the tongue to provide an oscillation source into 4 categories, namely: bilabial, labio-dental, alveolar, and velar. They can be also categorized into plosives and frivatives depending on the amount of pressure accumulated before pronunciation, i.e. high pressure for plosives and low for fricatives. The voiced consonants are classified according to the tongue position and the lips aperture into bilabial, labiodental, alveolar, palatal, velar and uvular. Special cases are the 'r' that is pronounced with a movement of the tongue from palatal to alveolar position and 'l' that is generated with air escape from the sides of the tongue when the latter is raised [3, 9].

The sequence of the certain 26 vectors of 10 parameters each is embedded in the style file, so that visualization is possible when no vectors are available. The

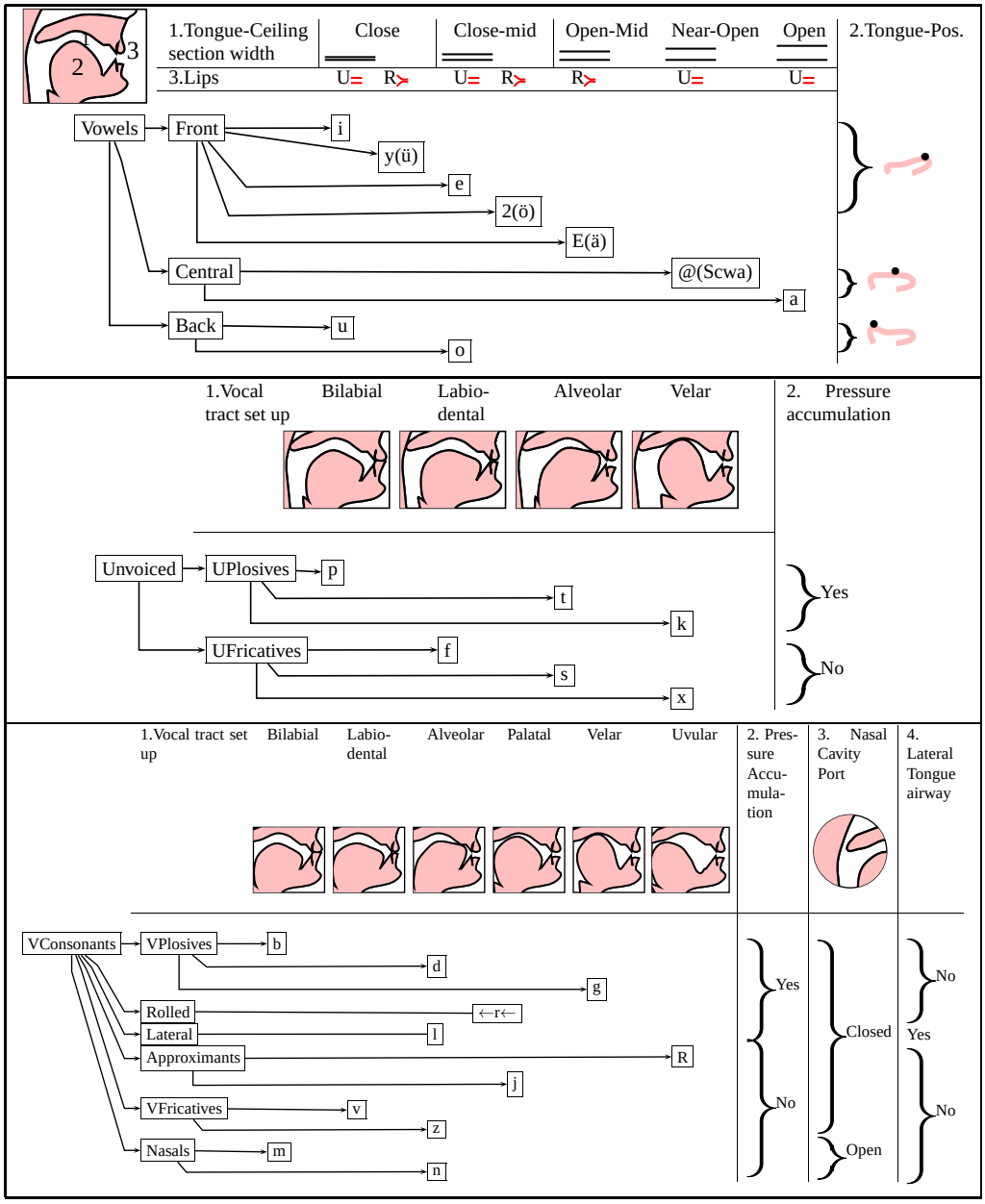

Figure 1: German phonemes categorization into (a) Vowels (b) Unvoiced consonants. (c) Voiced consonants. Legend: U=Unrounded; R=Rounded; Pos.=Position.

breathing parameter is set as 0.5 for normal breathing (0.1 for short and slow breath to 0.9 for deep and fast breath). The output is the animation of Figure 2. The red space corresponds to the pressure accumulated for generating plosive phonemes.

3 Installation and examples

`VocalTract.sty` can be downloaded from [13]. In order to be compiled, a LaTeX2e package [7], such as Miktex for Windows [10] and TexLive for Linux [12] must be already installed. The following PSTricks packages have been included in the preample of the style file: `pstricks`, `pst-coil` for drawing lines and patches; `arrayjob`, `ifthen`, `fp`, `fltpoint` for algebraic operations among variables; and `multimedia`, `multido`, `animate` for rendering animations [14].

In Figure 3, a logic diagram of scripts to call the package either from LaTeX or Matlab® is depicted. 'vtLatex_FigureDemo.tex' produces a visualization of the vocal tract in DVI, PS, or PDF format. 'vtLatex_AnimationDemo.tex' produces a

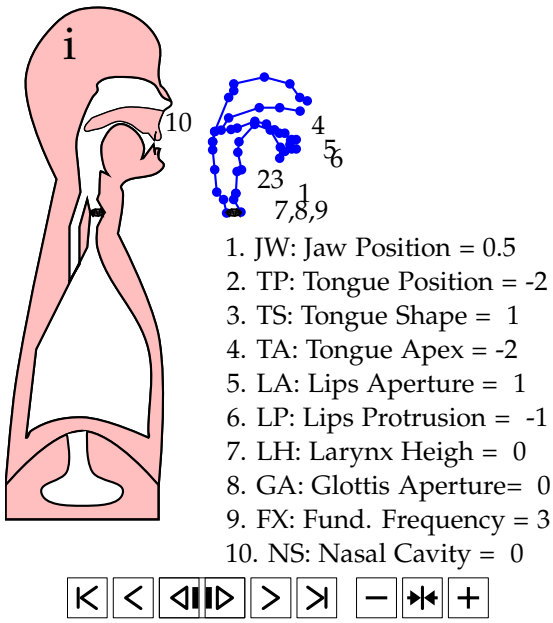

Figure 2: Vocal tract system for the vowel 'i'. Left: using sp-lines; Right: using lines only.

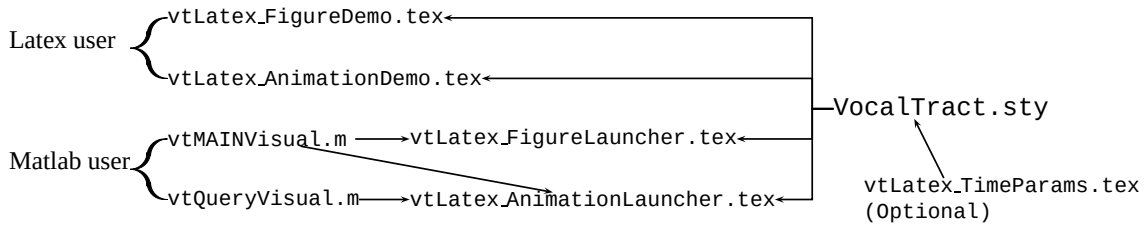

Figure 3: Functions that generate figures or animation. Two functions named as Launchers are responsible for connecting Matlab® functions with LaTeX engine.

sequence of ordered visualizations of the vocal tract in a PDF animation object. Figure 2 presents the compilation result of 'vtLatex_AnimationDemo.tex' as it follows:

```
%======= Vocal Tract Animation Demo =======
\documentclass{article}\pagestyle{empty}
\usepackage{VocalTract}
%\input{vtLatex_TimeParams} % AM Parameters (if commented, use the embedded
%                                       vectors in the Style file)
\begin{document}
\def\BreathType{0.5}  % Normal Breathing [slow:0.1 to fast:0.9]
\begin{animateinline}[poster=first,loop,controls]{1}%
\multiframe{\Nframes}{IndexStepVocalTract=0+1}{% Nframes defined in
%                                                vtLatexTimeParams.tex
\begin{pspicture}(0,-0.5)(6,8)
\SetOscAmp{\IndexStepVocalTract}{\BreathType} % Sinusoid generator for breathing
\UpdateVocalTract{\IndexStepVocalTract}  % in the respective time
\VocalChords              % Show VCords
\StomachCompartment       % Show Stomach Compartment
\rput(1.75,7){\ShowPhonemesGerman{\IndexStepVocalTract}} % Transcriptions
\ShowPressure{\IndexStepVocalTract}  % Show Pressure as Red Space
\rput(2,0){\ShowLinearTubes{\IndexStepVocalTract}\VocalChords} % The linear
%                                                     model next to the human
\rput(2.5,0){\ShowParameters}  % Explain the parameters
\end{pspicture}}% Multiframe
\end{animateinline}
\end{document}
```

In order to produce an animation for a certain word, e.g. 'satz', the 'vtLatex_AnimationDemo.tex' should be compiled and the third line should be uncommented. In the end, the 'VocalTract_TimeParams.tex' should be:

```
%============= VocalTract_TimeParams.tex ==================
\newarray\SpeakVec
\readarray{SpeakVec}{%
%%=========================================================================================
%% 1. Jaw Position     4. Tongue Apex     7. Larynx Height       10. Nasal Cavity
%%  2. Tongue Position  5. Lip Aperture    8. Glottal Aperture    11. Phoneme Label
%%   3. Tongue Shape     6. Lip Protrusion  9. Glottal Frequency
%%=========================================================================================
%%  1       2     3       4      5      6     7    8     9    10      11
%% JW      TP    TS      TA     LA     LP    LH   GA    FX    NS
%%  3       3     3       3      3      3     3    3     3     3                Max
%%  0       0     0       0      0      0     0    0     0     0                Relax
%% -3       3    -3      -3     -3     -3    -3   -3    -3    -3               Min
%%=========================================================================================
    2.5  &  0   & 0    &  0.4  & 0  &  0    & 0  & -1 &  0  &  0 &z& % 24
 -1.5    & 2.5  & 0    &-0.5   & 0.5& -0.5  & 0  & 0  &  0  & 0  &a& % 7
    0    & -0.5 &-1    &  2.3  & 0  &  0    & 0  &-3  & -3  & -3 &t& % 11
    2.5  &  0   & 0    &  0.4  & 0  &  0    & 0  &-3  & -3  & -3 &s& % 14
\dataheight=11
}
\dataheight=11
\def\Nframes{5}
```

'vtMAINVisual.m' is a Matlab® function designed as a plug-in function for the VTCalcs package [4]. It can be fed with Maeda's articulatory parameters to visualize the vocal tract in DVI, PS or PDF. The 'vtQueryVisual.m' provides a PDF animation from Matlab® command line when a sequence of phonemes from the set of the phonemes described in Section 2 is given, e.g. » `vtQueryVisual("zats")` stands for the visualzation of word 'satz'.

4 Future work

A method to depict the vocal tract using the LaTeX and the PSTricks engine was presented. Although the functionality of the method is high, several issues should be addressed in the future, namely:

- The shape of the curves generated by sp-lines in PSTricks to connect nodes are erroneously estimated among several postscript zoom levels. That is a curve is not the same at 100% zoom level compared with 200% zoom level.

It might happen due to the different step size in sp-line estimation through zoom levels.

- Audio should be included in PDF animations. Phonemes can be synthesized with VTCalcs [4];
- The floating point operations should be faster in order to improve compilation speed which is now 1 second per frame;
- The 2D model should become 3D model as in [1, 2] and [6];
- The set of 26 German phonemes should be augmented to include phonemes from other languages;
- Functions to call the package from Python language [11] or C should be written.

Acknowledgment

We would like to thank Prof. Mark Huckvale for his offer to provide code and to explain the S. Maeda model. We would like to thank also Prof. Francisco Reinaldo for the useful comments on the paper.

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Writing Posters with Beamerposter Package in LaTeX

Han Lin Shang

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Abstract: The beamerposter package in LaTeX is an excellent tool for the creation of posters. There are several options available using the beamerposter package, when writing a poster in LaTeX. Here, I would like to present some of these options associated with the beamerposter package. I shall introduce the basics and some useful companion packages that make a poster look neat and nice.

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Writing posters with *beamerposter* package in LaTeX

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Abstract The *beamerposter* package in LaTeX is an excellent tool for the creation of posters. There are several options available using the *beamerposter* package, when writing a poster in LaTeX. Here, I would like to present some of these options associated with the *beamerposter* package. I shall introduce the basics and some useful companion packages that make a poster look neat and nice.

1 The *beamerposter* package

1.1 Learning the basics

The *beamerposter* package [3] has been developed by Philippe Dreuw and Thomas Deselaers, which allows to write poster presentations in various font sizes in a straightforward manner. As shown in Table 1, the package on CTAN is composed of the following files:

beamerposter.sty	Define the font sizes
beamerposter.tex	Manual in English
beamerposter.pdf	Compiled manual in English
example.tex	Example of a poster created by the package

Table 1: Content in the *beamerposter* package.

The *beamerposter* package allows you to define a poster of sizes from A0 to A4. In particular, it also allows you to benefit from the nice color box handling and alignment in the *beamer* class to create nice posters.

The *beamerposter* package is an extension of the LaTeX *beamer* [2] and *a0poster* [1] classes. It has the advantages of both classes. On the one hand, the *beamer* class is considered as the standard class for presentation and offers a great variety of *beamer*

themes; on the other hand, *a0poster* class allows a poster in either landscape or portrait orientation and offers great flexibility in font size and font style.

Beamerposter is a package used within the class of *beamer*. Therefore, the beginning of a LaTeX file would be something like

```
\documentclass{beamer}
\usepackage[orientation=portrait, size=a0, scale=1.4]{beamerposter}
\begin{document}
Write something here
\end{document}
```

Within the document, you can write the content of your poster, as you would write for any other documents in LaTeX. If you prefer your poster to be in the landscape orientation, then simply replace the option portrait with landscape.

All that remains to be done is to compile your document in the usual way using LaTeX's PDFTeXify, dvips and dvipdf, as described in Table 2.

PDFTeXify	your_doc.tex
dvips	your_doc.tex
dvipdf	your_doc.tex

Table 2: Various ways of compiling a LaTeX file.

1.2 Structuring the poster

With the help of *textpos* package [4], you can easily divide a poster into different columns and sections. The package *textpos* facilitates placing boxes at relative or absolute position at the LaTeX page. As pointed out by Norman Gray (the creator of the *textpos* package), the main reason for creating *textpos* package is to help produce a large format conference poster. We can load this package as usual with `\usepackage[absolute,overlay]{textpos}` in the preamble.

The *textpos* package works in two modes, namely relative and absolute. In the relative mode, the block positioning coordinates in the `textblock` environment are taken to be relative to an 'anchor point', which is the current position. It follows by other blocks that may locate above or below. However, if the entire environment is to be laid out individually, then the absolute mode should be used, where the anchor point is the fixed top left corner of the page. When using the absolute position mode, the `textblocks` are placed under any other text on the page (imagine purple color background). The option `overlay` allows the positioned blocks of text overlay any other page content.

As a main function of the *textpos* package, the syntax of the `textblock` environment is described as follows

```
\begin{textblock}{<hsize>}{<hpos>,<vpos>}
Write something here
\end{textblock}
```

The `<hsize>` and `<hpos>` are arguments given in units of a module `\TPHorizModule`,and `<vpos>` is given in units of a module `\TPVertModule`.These parameters can be set by `\setlength{\TPHorizModule}{<dimen>}` and for `\TPVertModule` as well. Customarily, `<dimen>` is set to be 1cm. `<hsize>` is a whole or fraction number that controls the size of `textblock`, `<hpos>` and `<vpos>` are two whole or fraction numbers that jointly determine the horizontal and vertical positions.

Within the `textblock`, you may divide the page into several columns and create different sections with

```
\begin{block}{Title of section}
Write something here
\end{block}
```

Although this could be done using package *multicol* or `minipage` environment, I prefer to use the `block` environment instead, as this is more versatile. The `block` environment allows to include a `block` inside your poster. Unlike the `minipage` environment, the `block` environment does not require to specify a given length and width of `block`, since these information are specified through the `textblock` environment. So, to write two blocks in the same column, the following code

```
  \begin{block}{Title of block 1}
    First block
  \end{block}
  \begin{block}{Title of block 2}
    Second block
  \end{block}
```

produces Figure 1.

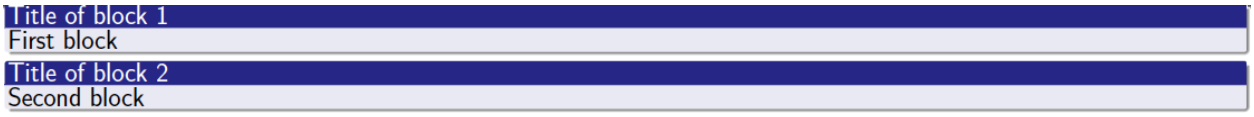

Figure 1: An illustration of writing two blocks with full page width.

Of course, you can also define the `block` environment within the `textblock` environment. For instance, one would like to produce two column posters; and within each column, there are a number of blocks. The following code

```
\begin{textblock}{30}(0.1,1.6)
  \begin{block}{Title of block 1}
    First block
  \end{block}
  \begin{block}{Title of block 2}
    Second block
  \end{block}
\end{textblock}

\begin{textblock}{30}(30.1,1.6)
  \begin{block}{Title of block 3}
    Third block
  \end{block}
  \begin{block}{Title of block 4}
    Fourth block
  \end{block}
\end{textblock}
```

produces Figure 2.

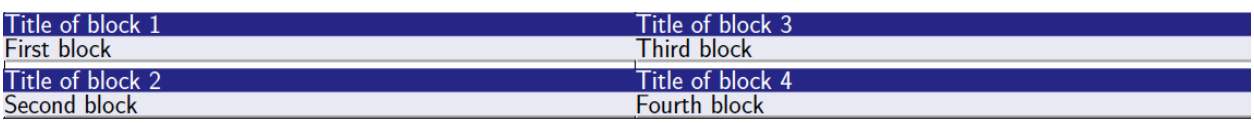

Figure 2: An illustration of writing two blocks with two columns.

For instance, you can include a `textblock` environment with another `textblock` environment, so that the possibilities are enormous. For example, the following code

```
\begin{textblock}{60}(0.1,1.65)
\begin{block}{Title of block 1}
Let $\mathbf{y}$ and $\mathbf{x}$ be the response and predictor
vectors, whose observations are denoted as $y_i$ and
$\mathbf{x}_i$. The nonparametric regression model is $\dots$
\end{block}
\end{textblock}

\begin{textblock}{30}(0.1,9.25)
```

```
\begin{block}{Title of block 1}
Let $\mathbf{y}$ and $\mathbf{x}$ be the response and predictor
vectors, whose observations are denoted as $y_i$ and
$\mathbf{x}_i$. The nonparametric regression model is $\dots$
\end{block}
\end{textblock}

\begin{textblock}{16}(0.1,20.2)
\begin{block}{Title of block 1}
Let $\mathbf{y}$ and $\mathbf{x}$ be the response and predictor
vectors, whose observations are denoted as $y_i$ and
$\mathbf{x}_i$. The nonparametric regression model is $\dots$
\end{block}
\end{textblock}
```

produces Figure 3.

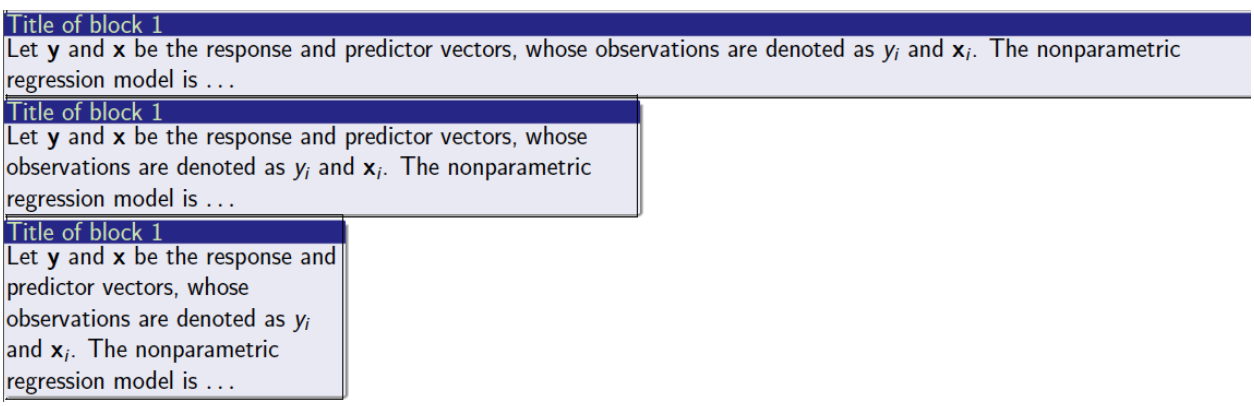

Figure 3: An illustration of one `textblock` environment within another `textblock` environment using the *beamer* theme of Frankfurt.

With the tools of `textblock` and `block`, we are now in position to create a poster using the *beamerposter* package. Figure 4 provides a simple illustration. The source code for producing Figure 4 can be obtained upon requested from the author.

Bayesian bandwidth estimation for nonparametric regression model with an unknown error density

Author A, Author B, Author C*

Nonparametric regression setting

Let $\mathbf{y}$ and $\mathbf{x}$ be the response and predictor vectors, whose observations are denoted as y_i and $\mathbf{x}_i$. The nonparametric regression model is

$$y_i = m(\mathbf{x}_i) + \epsilon_i, \quad i = 1, 2, \ldots, n$$

where ϵ_i is assumed to be i.i.d. with an unknown density denoted by $f(\epsilon)$. It is assumed that $cor(\epsilon_i, \mathbf{x}_i) = 0$.

Nadaraya-Watson kernel estimator

The unknown $m(\mathbf{x}_i)$ is estimated by the Nadaraya-Watson (NW) kernel estimator

$$\hat{m}(\mathbf{x}_i; \mathbf{h}) = \sum_{i=1}^{n} w_i(x) y_i, \quad w_i(x) = \frac{\frac{1}{\mathbf{h}} K(\frac{\mathbf{x}-\mathbf{x}_i}{\mathbf{h}})}{\sum_{i=1}^{n} \frac{1}{\mathbf{h}} K(\frac{\mathbf{x}-\mathbf{x}_i}{\mathbf{h}})}.$$

where $K(\cdot)$ is a kernel function, and the bandwidth vector $\mathbf{h}$ is treated as a parameter. The NW estimator $\hat{m}(\mathbf{x}_i; \mathbf{h})$ includes an undesirable term, $K(0)/\mathbf{h}$. Therefore, we use the leave-one-out NW kernel estimator,

$$\hat{m}_i(\mathbf{x}_i; \mathbf{h}) = \frac{(n-1)^{-1} \sum_{j=1; j \neq i}^{n} \frac{1}{h} K(\frac{\mathbf{x}_i - \mathbf{x}_j}{\mathbf{h}}) y_j}{(n-1)^{-1} \sum_{j=1; j \neq i}^{n} \frac{1}{h} K(\frac{\mathbf{x}_i - \mathbf{x}_j}{\mathbf{h}})},$$

Estimation of an unknown error density

We propose to approximate $f(\epsilon_i)$ by a kernel density given by

$$\hat{f}(\epsilon_i; b) = \frac{1}{n-1} \sum_{j=1; j \neq i}^{n} \frac{1}{b} K(\frac{\hat{\epsilon}_i - \hat{\epsilon}_j}{b}),$$

where b is the bandwidth. Efromovich (2005) justified that residuals are proxies of errors.

Likelihood

The likelihood of $\mathbf{y}$ given $(\mathbf{h}, b)'$ is approximated by

$$L(\mathbf{y}|\mathbf{h}, b) = \prod_{i=1}^{n} \left\{ \frac{1}{n-1} \sum_{j=1; j \neq i}^{n} \frac{1}{b} K(\frac{\hat{\epsilon}_i - \hat{\epsilon}_j}{b}) \right\}$$

Prior

Let $\pi(\mathbf{h})$ and $\pi(b)$ denote the priors of $\mathbf{h}$ and b, which are assumed to follow a Cauchy distribution

$$\pi(h_i) = \frac{1}{\pi(1 + h_i^2)}, \quad \pi(b) = \frac{1}{\pi(1 + b^2)}.$$

Posterior

The posterior of $(\mathbf{h}', b)'$ is approximated as (up to a normalising constant)

$$\pi(\mathbf{h}, b|\mathbf{y}) \propto \pi(\mathbf{h}) \pi(b) L(\mathbf{y}|\mathbf{h}, b).$$

Sampling algorithm

A MCMC algorithm, such as random-walk Metropolis, is used to sample $\mathbf{h}$ and b. The ergodic averages of the sample values of $\{(\mathbf{h}^{(i)}, b^{i}), i = 1, \ldots, 10,000\}$ are used as the estimates of $\mathbf{h}$ and b.

Simulation

Consider the relationship between $\mathbf{y}$ and $\mathbf{x} = (\mathbf{x}_1, \mathbf{x}_2, \mathbf{x}_3)'$ given by

$$y_i = \sin(2\pi x_{1,i}) + 4(1 - x_{2,i})(1 + x_{2,i}) + \frac{2x_{3,i}}{1 + 0.8x_{3,i}^2} + \epsilon_i,$$

for $i = 1, 2, \ldots, 1000$. A sample was generated by drawing x_{1i}, x_{2i}, x_{3i} independently from $U(0, 1)$, and ϵ_i from the mixture of two Gaussian densities defined as $0.7N(0, 0.7^2) + 0.3N(0, 1.5^2)$.

The following table presents the parameters estimated by the Bayesian algorithms with the assumptions of unknown, Student t and Gaussian error densities.

Error density	Parameter	Estimate	95% Bayesian credible intervals	SIF
Unknown	b	0.2387	(0.1691, 0.3187)	5.64
	h_1	0.0874	(0.0693, 0.1070)	21.41
	h_2	0.0594	(0.0339, 0.0879)	30.54
	h_3	0.2008	(0.1611, 0.2481)	13.24
	LML	-1444.19		
Student t	ν	10.0169	(7.1201, 14.0821)	6.66
	h_1	0.0827	(0.0622, 0.1048)	8.86
	h_2	0.0701	(0.0401, 0.0989)	12.69
	h_3	0.1908	(0.1448, 0.2459)	9.81
	LML	-1457.07		
Gaussian	σ	1.0523	(1.0109, 1.0983)	1.16
	h_1	0.0773	(0.0544, 0.0924)	14.49
	h_2	0.0797	(0.0572, 0.1121)	17.36
	h_3	0.1879	(0.1438, 0.2333)	16.21
	LML	-1485.72		

Note: LML refers to log marginal likelihood, and SIF refers to simulation inefficient factor.

Conclusion

Based on Bayes factors, the Bayesian algorithm with an unknown error density performs better than the wrongly specified error distributions, although it performs slightly worse than the correctly specified error distributions in other simulations.

Reference

Efromovich, S. (2005), 'Estimation of the density of regression errors', *The Annals of Statistics*, **33**(5), 2194-2227.

*Contact Author C@edu for the draft

Figure 4: An illustration of a poster produced by the *beamerposter* package using the *beamer* theme of Frankfurt.

1.3 Adding color

Previous section should allow you to obtain a structure of your poster, but you may like to add some color to the poster. This can be achieved in *beamerposter* package, because you can define any color using the rgb scale, just put `\definecolor{colorname}{rgb}{r,g,b}` in the preamble. The r,g,b are numbers within 0 and 1, they express the amount of red, green and blue you add to create each color. For example, `\definecolor{lightpurple}{rgb}{0.8,0.3,0.7}`. You can now obtain any word in color by typing any word. Colors can also be defined by other scales, such as gray scale.

You may also want to consider packages *color* and *xcolor* which provide access to several kinds of colors, tints, shades, tones of arbitrary colors.

1.4 Obtaining smaller or larger size posters

The option `scale=number` for making posters from A0 to A4 is easily accessible in the *beamerposter* package. Thus, you can always rescale the poster to smaller or larger page size. For completeness, Table 3 lists different page sizes from A0 to A4. For different page sizes, you may have to re-position the `textblock` coordinates accordingly.

	w(in)	h(in)	w(mm)	h(mm)	w(ft)	h(ft)
A0	33.07	46.77	840	1188	2.76	3.90
A1	23.39	33.07	594	840	1.95	2.76
A2	16.54	23.39	420	594	1.38	1.95
A3	11.69	16.53	297	420	0.97	1.38
A4	8.26	11.69	210	297	0.69	0.97

Table 3: Width and height of different page sizes.

2 *Beamer* themes

Beamer class supports the concept of a theme, with which you can alter the appearance of your poster, such as the color of `block`. It is this feature that truly separates the *beamerposter* package from the *a0poster* class. Possible *beamer* themes are listed in alphabetical order: AnnArbor, Antibes, Bergen, Berkeley, Berlin, Boadilla, CambridgeUS, Copenhagen, Darmstadt, default, Dresden, Frankfurt, Goettingen, Hannover, Ilmenau, JuanLesPins, Luebeck, Madrid, Malmoe, Marburg, Montpellier, PaloAlto, Pittsburgh, Rochester, Singapore, Szeged, Warsaw.

While the code for producing Figure 3 uses the *beamer* theme of Frankfurt, an example of blocks created by `\usetheme{Singapore}` is exhibited in Figure 5.

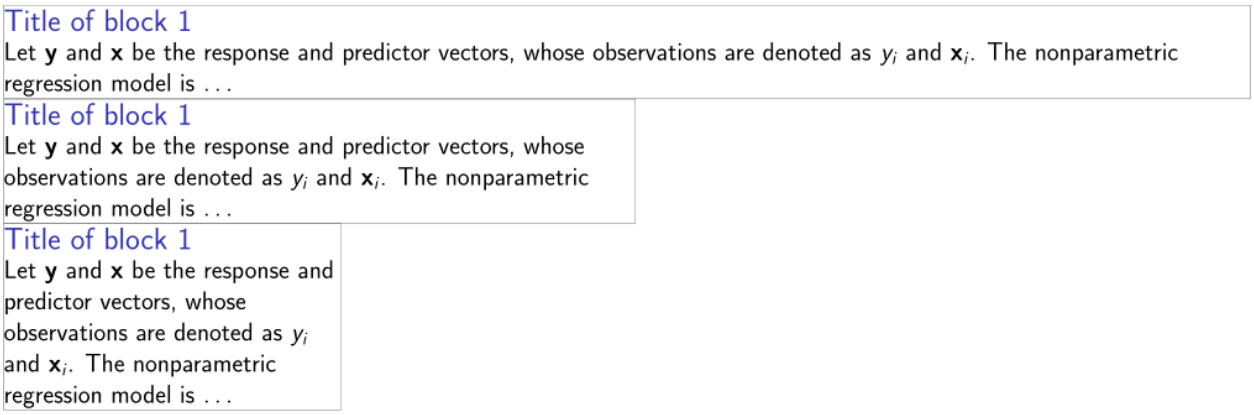

Figure 5: An illustration of one `textblock` environment within another `textblock` environment using the *beamer* theme of Singapore.

3 Conclusion

We have now seen some of the options offered by the *beamerposter* package for writing a poster presentation in LaTeX. It is an extension of the *beamer* class and *a0poster* class. An introduction of *a0poster* class can be found in [5]. However, it is highly recommended to use the *beamerposter* package with the *textpos* package as a way of locating different blocks of texts. The orientation of a poster can be portrait or landscape, font size can easily be scaled up or down, and best of all, the *beamer* themes can easily be adopted into a poster created by the *beamerposter* package.

References

[1] The *a0poster* class and manual.
http://www.ctan.org/tex-archive/macros/latex/contrib/a0poster/

[2] The *beamer* class.
http://www.ctan.org/tex-archive/macros/latex/contrib/beamer/

[3] The *beamerposter* package.
http://www.ctan.org/tex-archive/macros/latex/contrib/beamerposter

[4] The *textpos* package.
http://www.ctan.org/tex-archive/macros/latex/contrib/textpos/

[5] T. Morales de Luna (2008) Writing posters in LaTeX, The PracTex Journal, No. 3.
http://www.tug.org/pracjourn/2008-3/morales/

THE PracTEX Journal

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Seeing Stars

Jim Hefferon

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Abstract: MetaPost is a great tool for line art. We walk through creating a rate one-to-five graphic with it, highlighting some of its advantages over a mouse-driven graphics tool..

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Seeing Stars

Jim Hefferon

Many web sites let users rate content. On a site of mine, visitors can rate things on a scale of 0 to 5 stars and then the page shows the overall rating.

This is probably not an integer. (It is not quite an average of all user ratings, since averages are a problem when there are only a few votes, but it is close to an average.) For instance, I may need to display 2.5 stars out of 5.

Rating: ★★½☆☆ 2.5 on a scale from zero to five

Cascading Style Sheets can do this. The idea is that I write a box with a repeating background of stars in some muted color, with the width of the box set to exactly the width of five stars. Over that I draw repeating stars in a more distinctive color, with the width of this overlay box set to show the correct number of stars. Here is the HTML.

```
<span class="rating_bar"><span style="width:{{rating}}%"></span></span>
```

Muted stars are drawn in the `<span>` with class `rating_bar`. Distinctively-colored stars are drawn in the inside `<span>`. I use the Django web framework,[1] and to produce the above screenshot the `{{rating}}` is replaced by the number 50.0, leaving `style="width:50.0%"`.

Here is the CSS.

```
.rating_bar {
  display: inline-block;
  width: 100px;
  background: url(/graph/star-grey.png) 0 0 repeat-x;
}
.rating_bar span {
  display: inline-block;
  height: 20px;
  background: url(/graph/star-rust.png) 0 0 repeat-x;
}
```

1. www.djangoproject.org

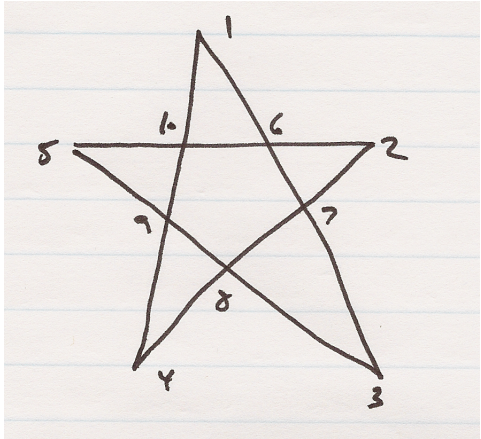
The stars are the graphics `/graph/star-grey.png` and `/graph/star-grey.png`. This is the problem. I cannot do art. I tried opening a drawing program and making a muted star for a half hour before giving up, no closer than when I began.

But there is a happy ending. METAPOST drew my stars.

A star is made

METAPOST is a programming language for drawing graphics, especially two-dimensional line art. It is closely related to METAFONT, the language in which TEX's original fonts were specified. METAPOST is not interactive, that is, it does not entail drawing with the mouse and menus (good thing, because I cannot do interactive). Instead, you make up an input file and run it through a compiler.

I started by sketching a star.



I told you that I cannot do art.

I started by labeling the points of interest. In the METAPOST source file below they are called `z1`, `z2`, etc.

The stars, like rust

Here is the input file `star.mp`. I'll go through part-by-part at the bottom.

```
% star.mp
%
%  2011-Oct-29 Jim Hefferon jhefferon@smcvt.edu  Written
outputtemplate := "%j-%c.mps";

numeric line_width_light;
line_width_light:=0.4pt; % TeX's rule width

color rust;
  rust=(171/255,50/255,41/255);

def draw_star(expr c) =
  save width, height;
  numeric width, height;
  width=20pt; height=width;
  z0=(.5width,.5height);   % center
  z1=(x0,height);    % top corner; 12 oclock
  z2=((z1-z0) rotated (360/5))+z0;  % mid right corner
  z3=((z1-z0) rotated (2*360/5))+z0;  % bot right corner
  z4=((z1-z0) rotated (3*360/5))+z0;  % bot left corner
  z5=((z1-z0) rotated (4*360/5))+z0;  % mid left corner
  z6=whatever[z1,z3]=whatever[z2,z5]; % mid right of internal pentagon
  z7=whatever[z1,z3]=whatever[z2,z4]; % bot right of internal pentagon
  z8=whatever[z2,z4]=whatever[z3,z5]; % bot of internal pentagon
  z9=whatever[z1,z4]=whatever[z3,z5]; % bot left of internal pentagon
  z10=whatever[z1,z4]=whatever[z2,z5]; % mid left of internal pentagon
  % Outline
  path p;
  p=z1--z6--z2--z7--z3--z8--z4--z9--z5--z10--cycle;
  fill p withcolor c;
  pickup pencircle scaled line_width_light;
  draw p;
  enddef;

beginfig(0) % muted star
  draw_star(.9[black,white]);
endfig;

beginfig(4) % exciting star
  draw_star(rust);
endfig;
end
```

A percent sign marks the rest of the line as a comment. The `outputtemplate` line determines the name of the files that METAPOST outputs. Here, `stars.mp` will output two files, named `stars-0.mps` and `stars-4.mps` because further down in the file there are sections for `beginfig(0)` and `beginfig(4)` (I have other colors in my file but I've cut them out for this discussion).

Next I give a width for lines, and I define a color. One of the colors for my site I named *rust*. Its RGB specification is $(171, 50, 41)$. It is what I used for the

distinctively-colored stars in the screenshot from the start of this article.

Then comes the main work. As I described above, I will draw two same-sized stars in different colors, so I defined a single section of code to draw a star and I'll call that code once with a gray color and once with rust.

That `draw_star` code starts by defining the five points `z1` through `z5`, by making the first at the top and then rotating for the other four. No artistic eye required.

Making the interior points `z6` through `z10` is where we get a peek at METAPOST's powers. It will find intersections. For instance, to find `z6` it intersects the line from `z1` to `z3` with the line from `z2` to `z5`. (Because METAPOST is finding the intersection, I don't have to. This is particularly useful when I fiddle with a drawing somewhat, trying to get it right. I don't have to recompute the intersection each time with METAPOST.)

Here is the construct to intersect the lines.

```
z6=whatever[z1,z3]=whatever[z2,z5];
```

The square brackets find "of-the-way" points. Thus `.25[z1,z3]` is the point one quarter of the way from `z1` to `z3`. To intersect the lines we want a point that is an unknown part of the way from `z1` to `z3`, and also is an unknown part of the way from `z2` to `z5`. METAPOST's `whatever` is a throwaway variable, so with the above code the system knows that `z6` is on both lines. There is only one such point and METAPOST is smart enough to find it.

At the end of the definition, I give the star's outline path `p`, fill it with the color, set the line width with the `pickup` command, and draw the path around the now colored-in star.

To output the files with the star graphics I now run the two routines with different colors. I had to decide how gray to make the muted star. After a couple of tries I decided that a good choice was the color 0.9 of the way from black to white.

Done.

When you wish you had a star

To get the graphic files, I followed these steps.[2] I first ran METAPOST.

```
$ mpost stars
```

I next made a proof sheet to see how it looked.

```
$ tex mproof stars-0.mps stars-4.mps
$ dvips -Ppdf -omproof.ps mproof
```

Now I can view the output with Ghostview.[3]

```
$ gv mproof.ps
```

Browsers want the graphic in PNG format so I used the swiss-army knife graphics conversion program.[4]

```
$ convert star-4.mps star-rust.png
```

I copied the two files to the directory where my web server could find them.

My stars!

Here are the completed images, post processing.[5]

Now they are the right colors, they *look* like stars, and they are in a format that browsers can understand. Success.

2. I run Ubuntu Linux with TEX Live. Your setup may require variations on these steps.
3. See http://pages.cs.wisc.edu/~ghost/.
4. See http://www.imagemagick.org/script/index.php.
5. The graphics conversion program made each graphics 20 pixels wide. I believe this is because I defined them to be 20 pt wide in the METAPOST file and a point is close to a PostScript big point.

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TeX in the eBook Era

Luca Merciadri

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Abstract: There are many advantages to reading eBooks, and their usage is ever increasing. There are those who prefer traditional printed books, but there is also a growing audience whose lifestyle and taste is suited to eBooks. We discuss some advantages of using eBooks, and creating them with LaTeX. We continue by explaining technical aspects that might improve and help you with your LaTeX eBook. We end with a short discussion about the PDF file format and its use with eBook documents.

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TEX in the eBook era: a simple –yet fully working– approach

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Abstract There are many advantages to reading eBooks, and their usage is ever increasing. There are those who prefer traditional printed books, but there is also a growing audience whose lifestyle and taste is suited to eBooks. We discuss some advantages of using eBooks, and creating them with LATEX. We continue by explaining technical aspects that might improve and help you with your LATEX eBook. We end with a short discussion about the PDF file format and its use with eBook documents.

1 eBooks: Why?

We are concerned here with LATEX eBooks. Some (traditional) books are written using LATEX, and then printed. In some situations, reading an eBook is more effective than reading hard copy.

Most LATEX books are scientific or technical texts. As a result, many LATEX documents are long, and thus

- heavy (to carry with you),
- bad for the environment if you print them,
- difficult to handle.

Moreover, you do not necessarily need to read an entire book in many cases.

Using eBooks gives you numerous advantages. For example, with an eBook you can

1. quickly search and find some keywords in a text;
2. close and open it again easily;

3. do many other well-known things.

Our aim here is not to discuss the interests of using eBooks, which are already well-known, but to explain why eBook versions could be useful for LaTeX documents, and how they could be created.

2 LaTeX and eBooks

LaTeX offers many advantages over traditional typesetting, and its merits do not need to be explained again.

2.1 Why?

Many scientific books, proceedings, papers, and some novels are already printed as 'hard copy' but composed using LaTeX. As a result, electronic versions of the documents are generally available.

However, these documents are rarely adapted to eBook readers. Why wouldn't we try to write LaTeX eBooks, or at least eBook versions of our LaTeX documents?

1. LaTeX provides the reader with many useful features: hyperlinks, glossaries, indexes, etc., that are easier to use with an electronic version of a document. Consider, for example, going to page x. Is it not simpler to click on the page number than to move a pack of sheets until you find the correct number?

2. You will see in this article that writing an eBook using LaTeX is an easy task for a person who is familiar with LaTeX;

3. There is no reason to make LaTeX-composed documents unavailable to eBook readers, especially since these readers are quickly becoming more widespread.

It is useful to know how to write LaTeX documents that can be read on eBooks.

2.2 How?

However, making an eBook-compatible LaTeX document is not easy, especially if you have never tried it. We all know that, at the beginning, LaTeX was not designed with eBooks in mind! That does not mean that making LaTeX documents

available to eBook readers is an impossible task, but that it will not be straightforward if you are not accustomed to it (just as with many other things in LaTeX, but we all appreciate it when the excellent results appear in our documents.)

To get an idea of the possibilities, I used a web engine and typed related keywords. Needless to say I did not encounter many related results. But on-topic results were interesting. Among them, I found three topics on a forum: [4, 5, 6].

What are the biggest problems one needs to solve when considering an eBook audience, where formerly there was a hard-copy audience only?

1. Dimensions of eBooks are smaller;

2. eBooks are electronic.

The biggest difference is that the dimensions of an eBook are smaller. An eBook reader does not scale down your document proportionally. *You* need to scale your document to the appropriate size. The dimensions 90 mm× 120 mm are generally used, because the majority of eBook readers have a 6″ diagonal, with 3 : 4 aspect ratio.

Now, what might improve the document's readability and effectiveness? You want

1. to put 'as much text as possible' on each page of the document. However, 'as much text as possible' needs to be understood clearly: that does not mean you can forget every typographic rule! Use different margins if you feel the need to do it;

2. characters to be easy to read. This means that you might choose a new font;

3. text to be easy to read. Do not use long sentences: break them up into bulleted lists or divide separate thoughts into different paragraphs. Large blocks of text are difficult to read and do not have enough white space to give the reader's eye a break [3];

4. things to be clickable: glossary entries, indexes, and any other `hyperref`-linked element.

A first minimal example was submitted at [6] by 'frabjous':

```
\documentclass[12pt,oneside]{book}

\usepackage[papersize={90mm,120mm},%
margin=2mm]{geometry}

\usepackage[T1]{fontenc}
\usepackage[charter]{mathdesign}

\usepackage[normalmargins]{savetrees}
\sloppy
\pagestyle{empty}

\usepackage{titling}
\title{The title}
\author{The author}
\date{\today}

\usepackage{hyperref}
\hypersetup{pdftitle={\thetitle},%
pdfauthor={\theauthor}}

% ...

\begin{document}
\maketitle
\tableofcontents

% ...

\end{document}
```

The important thing to notice is that this minimal example is extremely straightforward, and it produces a simple yet functional output.

It uses minimal margins and displays no page numbering, thus allowing each page to contain as much material as possible.

Some examples to consider: an online contributor named 'ahi' posted at [6] a

translation of 'The Art of War,' a book originally written by Sun Tzŭ. The same person posted at [5] 'The Complete Memoirs of Casanova,' which I personally find LaTeX-ly readable.

Let us consider the code of 'The Art of War,' that was provided with the output. The document body is simple. As is typical, though, the preamble is somewhat tricky, and some of its aspects need to be discussed:

- The class of the document is `memoir`, with `10pt` and `openany` options. The `openany` option allows chapters to begin on the next page available, and not just on odd-numbered pages.
  This helps create a short document containing as much material as possible on the fewest number of pages.
  The advantage of the `memoir` class is that it automatically writes the name of the current chapter on each page, separated from the text by a rule. This helps the reader to remember the subject of what (s)he is currently reading (in case (s)he would have forgotten it!). As we will see on the next page, the `memoir` class also lets you use different styles for titles.
- Fonts are also different:

  ```
  \usepackage{kerkis}
  \usepackage{yfonts}
  ```

- The `microtype` package is used.
- Margins are different too:

  ```
  hmargin={0.17in, 0.17in}
  ```

  and

  ```
  vmargin={0.50in, 0.17in}
  ```

  are used in the `geometry` package's parameters, with the same `papersize` as in the minimal example provided above.
- The following penalties are imposed:

  ```
  \widowpenalty 3999
  \clubpenalty 3999
  ```

I find that these settings make a pleasant page appearance. Note that `\clubpenalty` is the penalty for a broken page, with a single line of a paragraph remaining on the bottom of the preceding page.

– The title of the book is written on each page:

```
\makeevenhead{ruled}{\small%
\emph{\rightmark}}{}{\small%
\scshape The Art of War, Sun Tz\u{u}}
\makeatletter
\makeoddhead{ruled}{\small%
\emph{\rightmark}}{}{\small%
\scshape The Art of War, Sun Tz\u{u}}
```

– The following lengths are redefined:

```
\setlength\beforechapskip{0pt}
\setlength\midchapskip{5pt}
\setlength\afterchapskip{30pt}
```

– A chapter style is defined:

```
\makechapterstyle{plroman}{
\renewcommand\chapternamenum{}

\renewcommand\printchaptername{}

\renewcommand\printchapternum{%
\color{gray}\centering\MakeUppercase%
{\fontsize{1in}{2in}\selectfont%
\romannumeral\thechapter}}

\renewcommand\chapnumfont{\HUGE%
\rmfamily\centering\romannumeral}

\renewcommand\chaptitlefont{\Huge%
\centering\color{black}\vskip%
\midchapskip\vskip\midchapskip}
```

```
\renewcommand\afterchapternum{%
\par\nobreak\vskip\midchapskip%
\vskip%\midchapskip}

\renewcommand\printchapternonum{%
\vphantom{\chapnumfont \thechapter}
\par\nobreak\vskip\midchapskip%
\hrule\vskip\midchapskip}
}
```

This style is not necessary: the document stills looks great without it. This simply adds a personal touch to it, which does no harm. Another advantage of the `memoir` class is that you can use many different styles; see e.g. [2].

The document can be compiled using `PDFLaTeX` only.

Note that there are different ways to specify the global dimensions and the margins. The advantage of using the `geometry` package is that it automatically deals with your input in relation to the PDF output. That is, if you had specified

```
\textheight=120mm
\textwidth=90mm
```

at the place of using

```
papersize={90mm,120mm}
```

in `geometry`'s arguments, you would have ended up with a PDF document with large margins and standard dimensions, but with a printed area of 120 mm × 90 mm.

Some authors use the `\sloppy` command, pretending this is the miracle solution for preventing overfull boxes (because of overfull lines). (You might have noticed that `\sloppy` was used in the minimal example given at the beginning of this article.)

Without it, LaTeX will truncate words that it cannot fit in a line due to its standards. [4] As said in [4], 'it is certainly less annoying to have extra whitespace in lines than having parts of words missing due to not fitting on the page.'

The problem with this command is that you get ugly justification and instead of using hyphenation, it will add white spaces most of the time. The best solution here is to make small changes to the advanced settings for hyphenation. [4]

But how can you change these settings, and which settings would you change? We saw above that penalties could be adapted to your needs. With larger values for these penalties LaTeX will work harder to avoid widows and orphans. However,

1. setting them to the maximum value of 10000 is evidently not the solution;
2. keep in mind that mid-range values do not have a large influence on the result.

The role of the `microtype` package is to deal with these problems too. (But either modify the penalties manually or let it try.)

Sample output of 'The Art of War' is given at p. 11 and 12.

2.3 Is PDF the right format?

Many eBook readers are not capable of reflowing text, hyphenating, or allowing for font size changes. Either they do not support this, or the PDF file they are dealing with might not be 'reflowable.' The reflowable attribute is a recent PDF capability, and is not supported in some PDF creators.

For this reason, PDF is sometimes considered a poor choice of format for eBooks, because its purpose is to give a static representation of a document in a dimensional point of view. That is, the PDF specification was built with the 'reproducing image' capability in mind. For some [7], it is inherently not suited to eBooks, and thus not an eBook format.

One of the problems is that the screen dimensions of the readers are not standard. As a result, if you provide an eBook whose size does not match the reader's size, the reader will need to adapt the PDF output to its screen. If the eBook reader and the PDF file are compatible, there should be no problem, but having a compatible (i.e. reflowable) PDF file is not typical. By default, neither the `ps2pdf` nor the `pdfLaTeX` routes give a reflowable PDF.

Ideally, one would need a reader with a TeX engine that re-typesets the document every time the user changes the font size or orientation, which has obviously not been implemented. [1]

Many people find that 'EPubs' are better than PDFs on eBook readers, both in appearance and also in efficiency. With EPubs, if you have a separate html file for each chapter, only the current chapter needs to be loaded rather than the entire book. This provides many advantages. The EPub format is actually XHTML and the `tex4ht` package can genenerate XHTML. With a little post-processing, the output from `tex4ht` can be made into a `.epub` file. Since an EPub is XHTML, it is not bound to 'pages' at all and is implicitly reflowed, depending on the e-reader screen size. EPubs can be generated using `latex` + `tex4ht`. [1]

3 Conclusion

Despite shortcomings of the PDF format, producing a PDF file for a predefined screen dimension is sufficient to give a correct eBook composed using LaTeX.

Several other solutions do exist, and can be implemented if necessary. Meanwhile, it is possible to produce an eBook using LaTeX by writing a simple LaTeX document as was shown above. LaTeX can thus be used to produce eBooks, but with some restrictions. These restrictions might be overcome, if needed, by implementing other solutions such as the `.epub` format.

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Sun Tzŭ's

The Art of War

translated by Lionel Giles, M.A.

Pax Librorum
Publishing House
2009

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Introduction

Sun Tzŭ Wu was a native of the Ch'i State. His *Art of War* brought him to the notice of Ho Lu, King of Wu. Ho Lu said to him: "I have carefully perused your 13 chapters. May I submit your theory of managing soldiers to a slight test?"

Sun Tzŭ replied: "You may."

Ho Lu asked: "May the test be applied to women?"

The answer was again in the affirmative, so arrangements were made to bring 180 ladies out of the Palace. Sun Tzŭ divided them into two companies, and placed one of the King's favourite concubines at the head of each. He then bade them all take spears in their hands, and addressed them thus: "I presume you know the difference between front and back, right hand and left hand?"

The girls replied: "Yes."

Sun Tzŭ went on: "When I say 'Eyes front,' you

must look straight ahead. When I say 'Left turn,' you must face towards your left hand. When I say 'Right turn,' you must face towards your right hand. When I say 'About turn,' you must face right round towards your back."

Again the girls assented. The words of command having been thus explained, he set up the halberds and battle-axes in order to begin the drill. Then, to the sound of drums, he gave the order "Right turn." But the girls only burst out laughing. Sun Tzŭ said: "If words of command are not clear and distinct, if orders are not thoroughly understood, then the general is to blame."

So he started drilling them again, and this time gave the order "Left turn," whereupon the girls once more burst into fits of laughter. Sun Tzŭ: "If words of command are not clear and distinct, if orders are not thoroughly understood, the general is to blame. But if his orders *are* clear, and the soldiers nevertheless disobey, then it is the fault of their officers."

So saying, he ordered the leaders of the two companies to be beheaded. Now the King of Wu was watching the scene from the top of a raised pavilion; and when he saw that his favourite concubines were

about to be executed, he was greatly alarmed and hurriedly sent down the following message: "We are now quite satisfied as to our general's ability to handle troops. If We are bereft of these two concubines, our meat and drink will lose their savour. It is our wish that they shall not be beheaded."

SUN TZŬ replied: "Having once received His Majesty's commission to be the general of his forces, there are certain commands of His Majesty which, acting in that capacity, I am unable to accept."

Accordingly, he had the two leaders beheaded, and straightway installed the pair next in order as leaders in their place. When this had been done, the drum was sounded for the drill once more; and the girls went through all the evolutions, turning to the right or to the left, marching ahead or wheeling back, kneeling or standing, with perfect accuracy and precision, not venturing to utter a sound. Then SUN TZŬ sent a messenger to the King saying: "Your soldiers, Sire, are now properly drilled and disciplined, and ready for your majesty's inspection. They can be put to any use that their sovereign may desire; bid them go through fire and water, and they will not disobey."

But the King replied: "Let our general cease drilling

and return to camp. As for us, We have no wish to come down and inspect the troops."

Thereupon SUN TZŬ said: "The King is only fond of words, and cannot translate them into deeds."

After that, HO LU saw that SUN TZŬ was one who knew how to handle an army, and finally appointed him general. In the west, he defeated the CH'U State and forced his way into YING, the capital; to the north he put fear into the States of CH'I and CHIN, and spread his fame abroad amongst the feudal princes. And SUN TZŬ shared in the might of the King.

— SSŬ-MA CH'IEN (c. 145 BC – 86 BC)

I

Laying Plans

1. SUN TZŬ said: The art of war is of vital importance to the State.
2. It is a matter of life and death, a road either to safety or to ruin. Hence it is a subject of inquiry which can on no account be neglected.
3. The art of war, then, is governed by five constant factors, to be taken into account in one's deliberations, when seeking to determine the conditions obtaining in the field.
4. These are: (1) the Moral Law; (2) Heaven; (3) Earth; (4) the Commander; (5) method and discipline.

5, 6. *The Moral Law* causes the people to be in complete accord with their ruler, so that they will follow him regardless of their lives, undismayed by any danger.

7. *Heaven* signifies night and day, cold and heat, times and seasons.

8. *Earth* comprises distances, great and small; danger and security; open ground and narrow passes; the chances of life and death.

9. *The Commander* stands for the virtues of wisdom, sincerity, benevolence, courage and strictness.

10. By *method and discipline* are to be understood the marshaling of the army in its proper subdivisions, the graduations of rank among the officers, the maintenance of roads by which supplies may reach the army, and the control of military expenditure.

11. These five heads should be familiar to every general: he who knows them will be victorious; he who knows them not will fail.

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Easy-to-use Chinese MTEX Suite

Hongbin Ma

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Abstract: Although there are many free and commercial TeX collections and distributions, Chinese TeXers still have many difficulties in TeXing Chinese documents. Some of the problems Chinese TeX users confront with TeX distributions are: the huge size, complex structure, nontrivial installation and configuration, lack of a full-featured Chinese editor, and lack of other needed add-ons. These difficulties may prevent many people from becoming TeXers or TeX experts. Motivated by these issues and many other practical demands, the author and several friends developed an easy-to-use and easy-to-learn Chinese MTeX Suite, which is a green*, compact, free, convenient, pragmatic and powerful TeX distribution with many add-ons and unique features which are seldom available in other TeX distributions. The developers of MTeX have made continuous efforts to make this software more powerful and suitable for TeXers, programmers, teachers, and scientists. This article gives a brief introduction to the MTeX suite, including its motivation, main features, installation, usage instructions, kernel, default editor (Sc1IDE), and other add-ons.

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* Green software helps reduce the impact on the environment, usually indirectly by reducing the demand for new computing equipment. See
http://wiki.cs.vu.nl/green_software/index.php/Green_software_%28definition%29

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Easy-to-use Chinese $\mathcal{M}$TEX Suite

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1 Motivation of Developing $\mathcal{M}$TEX

As the main developer of Chinese $\mathcal{M}$TEX Suite , or simply $\mathcal{M}$TEX [1], I started to fall in love with TEX[2] and LATEX[3] in 2002 when I was still a graduate student majoring in mathematics and cybernetics at the Academy of Mathematics and Systems Science, Chinese Academy of Sciences. At that time, recommended by some senior students, I started to use Chinese CTEX Suite , or simply CTEX[4], which was maintained by Dr. Lingyun Wu[5], a researcher in our academy, and is roughly a collection of pre-configured MiKTEX system[6] packaged with other tools such as customized WinEdt[7] for Chinese TEXers. CTEX brings significant benefits to China TEX users and it helps much to popularize the use of LATEX in China, especially in the educational and academic areas with large requirement on mathematics typesetting. Furthermore, at that time, CTEX provides one way to typeset Chinese documents easily with LATEX and CCT [8] (Chinese-Typesetting-System), which was initially developed by another researcher Prof. Linbo Zhang[9] in our academy since 1998 for the purpose of typesetting Chinese with LATEX. Besides CCT system, another system called TY (Tian-Yuan) system [10] was invented by a group in Eastern China Normal University so as to overcome the difficulties of typesetting Chinese with LATEX using different idea. These work make considerable efforts to address the nature of Chinese itself, for example, using certain widely used Chinese fonts, adopting proper Chinese font sizes, carefully coping with the spacing of characters, breaking the lines according to Chinese culture, and so on. Due to the complexities involved in Chinese typesetting, in the last decade, Chinese TEX users are mainly using CTEX so as to avoid the nontrivial

configuration procedure of Chinese typesetting for the Chinese fonts and tools used.

As a user of CTEX suite, gradually I found some disadvantages of CTEX suite despite that it has many benefits.

- First, it is a huge software collection which takes hundreds of megabytes, which makes it time-consuming to download and install. Either the installation or uninstallation process needs to take a long time.
- Second, it is not portable not only because it is very big but also because an installation process is necessary. We often need to work on different computers, hence a green and portable TEX system without configuration is desirable.
- Third, it lacks many features and tools I want. Here are some examples:
  - TY system is not included and configured in CTEX .
  - I hope to make LATEX can include graphics files of any commonly used format (e.g., `.gif` , `.tif` , `.bmp` , `.png` , `png` , `.eps` , `.pdf` graphics files).
  - I hope the compilation process can be smarter than before so that proper TEX engine (TEX, eTEX, LATEX, LATEX209, pdfLATEX, XeTEX, XeLATEX, LuaTEX[11], etc.) can be invoked with necessary options and proper tools (such as bibtex [12], makeindex , cct , patchdvi , ty , gbk2uni [13], fixbbl [14], ppower4 [15], etc.) can be invoked automatically to correctly process Chinese typesetting, generate references, make index list, and so on.
  - I hope to be able to insert LATEX symbols or commands or any code snippets or any document template in any text file editor (even notepad in windows) with a simple individual tool.
  - I hope to be able to conveniently use formulas generated by LATEX in any Windows © applications like PowerPoint ©, WinWord ©, WPS ©, and so on.
  - I hope to be able to support TEX engines, `.dvi` viewers, `.ps` viewers, `.pdf` viewers, editors, spell checkers in unified ways and the users can have the right to choose from a list of available choices. For example, besides the commercial Adobe Acrobat Reader © or Adobe Acrobat ©, we have other possible choices like SumatraPDF , PdfXCView , Foxit PDF Reader , or even GsView .

- I hope to be able to switch to proper place in `.tex` files when viewing `.pdf` files, just like the inverse search feature of some `.dvi` viewers like YAP or DviWin .

– Furthermore, I hope to do all text editing jobs (such as TEXing, programming, designing web, and so on) with a powerful,customizable yet small editor which does not fit the purpose of TEXing only. WinEdt [7] is simply too large and not quite powerful for general-purpose text editing and customization. For example, I hope the editor can automatically complete proper right bracket when I type left bracket, e.g. completing $\backslash right]$ automatically for $\backslash left[$.

– I hope to integrate more utilities in the editor, for example, various compilers, code formatting tool, subversion version control, and so on.

– Finally, the MiKTEX shipped with CTEX looks very complex with thousands of files (many files are outdated and many files may never be used), difficult to configure Chinese fonts, highly dependent of Windows registry, very complicated for directory structure.

Motivated by the above issues and my own long learning experience for LATEX, I hope to make an easy-to-learn and easy-to-use unique TEX distribution with clean directory structure, very necessary files, small size, valuable extra features, selected documents, and so on. To this end, I started to investigate various kinds of TEX distributions, including fpTEX [16], MiKTEX [6], DosTP [17], EmTeX [18], BakomaTEX [19], and so on. From these existing TEX distributions, by studying the whole directory structure, the file searching mechanism, the complex font processing mechanism, the main command-line tools, the configuration files, and even the monitored registry changes, it became clearer and clearer to me on how the existing TEX systems work. Based on these continuously-growing understanding, I started to build my own initial $\mathcal{M}$TEX system on the basis of EmTeX with reorganized directory structure plus a bundle of home-made batch scripts running with 4DOS ©, as well as some unique tools and wrappers which are mainly developed with Delphi ©, Tiny C Compiler , and MASM32 . The rar-packed archive of the initial $\mathcal{M}$TEX occupies less than 20 Megabytes disk space, integrating carefully customized 4DOS [20]©(*JP Soft*), EmTeX , EditPlus [21]©, Acrobat Reader 4 ©, Ghost Script [22], CCT , TY , my own batch scripts and small tools developed to fit my needs. Upon the requests of some friends, the early version of $\mathcal{M}$TEX was re-

leased in CTEX forum in 2005. From then on, according to my growing needs and the users' bug reports as well as feature requests, I made continuous efforts to improve $\mathcal{M}$TEX to make it as modern as other TEX distributions, especially since 2007, great changes were introduced into $\mathcal{M}$TEX to make it cutting edge with the latest TEX engines/utilities/macros/fonts/documents and extendable with a unified mechanism, implemented with Take Commander Console [23] batch scripts, to manage all the components of $\mathcal{M}$TEX. Currently, the TEX engines (executable files) of $\mathcal{M}$TEX are mainly taken from W32TEX directly, while the fonts and the macros are updated from CTAN with the batch scripts. Note that due to the open extendable framework of $\mathcal{M}$TEX, any other TEX engines (e.g. MiKTEX,DosTP) can be used by making minor changes to $\mathcal{M}$TEX configuration files, where command aliases, environment variables, searching paths, and other settings are defined by text files. Now $\mathcal{M}$TEX has been used by many Chinese users and some friends in other countries including Singapore, U.S., U.K., and so on.

2 Main Features of $\mathcal{M}$TEX

2.1 $\mathcal{M}$TEX Is Free

Roughly speaking, $\mathcal{M}$TEX (kernel itself) is released as a freeware for non-commercial use and users can use it *as is* without any fee in their personal studies or work. The source codes of $\mathcal{M}$TEX kernel files can be found in `http://mtex-kernel.googlecode.com/`. We do not plan to make money from this software, however, we would like to accept donations so as to provide certain financial support to our great efforts in maintaining and enhancing this software. As to the detailed licensing description of $\mathcal{M}$TEX, the users may refer to files *LICENSE.** in the folder of $\mathcal{M}$TEX.

The licensing of the components of $\mathcal{M}$TEX should not be affected by the license of $\mathcal{M}$TEX kernel, and we do not provide registration or crack for the sharewares or commercial softwares which are included in $\mathcal{M}$TEX. Although theoretically speaking, any software can be made as one component of $\mathcal{M}$TEX according to the unified packaging rule, normally we mainly select and put free, small and useful softwares in the repository of $\mathcal{M}$TEX servers.

We need also remark that $\mathcal{M}$TEX is *virus-less* and it does not contain any viruses or malwares. However, some anti-virus softwares may issue wrong alerts

for some tiny or packed .exe files in $\mathcal{M}$TEX due to their (imperfect or stupid) virus detection mechanism. Note that we may use upx [24] to pack some big .exe files to save disk space and we also use optimized compilers or libraries to generate very small .exe files, for example, several useful tools in $\mathcal{M}$TEX are compiled with Delphi © compiler DCC32 and KOL [25], which can generate very small .exe file. In such cases, the users need to add the folder of $\mathcal{M}$TEX to the white list or safe area of the anti-virus software so that the anti-virus software can trust the files in $\mathcal{M}$TEX directly.

2.2 $\mathcal{M}$TEX Is Integrated

$\mathcal{M}$TEX is a self-contained *integrated* TEX distribution, hence, by using $\mathcal{M}$TEX, the users need not install any other TEX distributions like MiKTEX, and the users need not install other related softwares such as Adobe Acrobat Reader ©, Ghost Script [22], GsView [26], WinEdt ©, Perl , etc. since $\mathcal{M}$TEX has provided such utilities or replacements.

2.3 $\mathcal{M}$TEX Is Powerful

Exactly speaking, $\mathcal{M}$TEX is not only a TEX distribution since it has many unique features and many useful addons organized in unified elegant ways. In fact, $\mathcal{M}$TEX is a *powerful* software platform, which contains a suite of home-made and third-party selected utilities/documentations/engines/fonts/macros, aiming at providing *an integrated software solution* for almost all the jobs in the authors' studies and work, vast from scientific typesetting, scientific computation, scientific drawing, to programming design, website design, spelling checking, file conversion, and so on.

2.4 $\mathcal{M}$TEX Is Small

Comparing with most other TEX distributions, $\mathcal{M}$TEX is very *small* which is mainly due to careful design, selection, reduction and refinement of its components. A typical $\mathcal{M}$TEX installation occupying less than 200 Megabytes disk space, whose packed self-extractor is only about 50 Megabytes, can fit most needs of the users.

Noting of the famous 80-20 rule, we have made the following efforts to make $\mathcal{M}$TEX very compact yet functional:

- Reducing unnecessary files which are seldom-used in daily work.
- Placing infrequently used components in the $\mathcal{M}$TEX servers.
- Optimizing and customizing important components.
- Stripping comments of macro packages to save space.
- Designing the $\mathcal{M}$TEX kernel elaborately to make it flexible and extendable.
- Selecting many small command-line tools and combining them efficiently by using batch scripts.
- Developing our own $\mathcal{M}$TEX tools via outstanding compilers and libraries.

2.5 $\mathcal{M}$TEX Is Extendable

$\mathcal{M}$TEX provides one unique *download-and-install-on-the-fly* mechanism for the TEX engines, editors, utilities, fonts, macros, and documentations, which means that the users need not install many seldom-used components yet the users are able to invoke full functions provided in the $\mathcal{M}$TEX servers when necessary. On $\mathcal{M}$TEX servers, currently dozens of editors, hundreds of utilities, over five hundred fonts, near one thousand documentations, and about two thousand macro packages have been provided to cover various needs of the users. With this mechanism, we are able to provide $\mathcal{M}$TEX users more ready-to-use components than existing TEX distributions, and this mechanism greatly extends the practical usages of $\mathcal{M}$TEX so that $\mathcal{M}$TEX does not restrict in serving as a TEX distribution only. Note that, according to this mechanism, almost any software can be packed as $\mathcal{M}$TEX components with minor efforts, hence the number of $\mathcal{M}$TEX components is gradually growing upon the the requirement of ourselves and the users.

2.6 $\mathcal{M}$TEX Is Green and Portable

$\mathcal{M}$TEX is *green* and *portable*. This means that the users can put the $\mathcal{M}$TEX folder into thumb drive or removable disk or even compact disk and use it anywhere anytime without a specific installation process like most Windows applications.

Many efforts are conducted to make $\mathcal{M}$TEX easy-to-use without special configuration, especially, it does not need to modify Windows registry unless certain third-party utility requires to do so, in which case we use the *auto-configuration* mechanism of $\mathcal{M}$TEX designed for all utilities to make every utility portable and re-configurable without concerning the actual path of $\mathcal{M}$TEX folder. Furthermore, the portability of $\mathcal{M}$TEX makes $\mathcal{M}$TEX co-existable with other TEX distributions in the same computer, although installation of other TEX distributions is completely not necessary or recommended if the users use $\mathcal{M}$TEX for TEXing.

2.7 $\mathcal{M}$TEX Is Cutting Edge

Some well known TEX distributions, e.g. emTeX and fpTeX , have stopped maintaince and updating. However, we know that although the most fundamental TEX engine invented by D. E. Knuth[27] have been frozed, the techniques related with TEX have been changing always in recent years, and some new TEX engines, macros, tools, and fonts have emerged. As far as I know, many people are still using the out-dated MiKTEX 2.4. To enable the users to try the latest TEX techniques, $\mathcal{M}$TEX is very cutting edge in sense that it is often updated with the latest TEX engines, macros, tools, and fonts which are downloaded and processed by our own batch scripts. As a small yet featureful TEX distribution, $\mathcal{M}$TEX allows the users to update to the latest version easily by clicking the button *[Update MTeX Components]* in the *$\mathcal{M}$TEX Main Menu*. All installed components can be updated automatically or manually.

2.8 $\mathcal{M}$TEX Has Multi-language Interface

$\mathcal{M}$TEX supports *multiple-language* user interface and has been configured well for Chinese users to typeset *Chinese*. With $\mathcal{M}$TEX, users can easily switch among user interfaces for different code pages provided that corresponding configuration files (language files) of the requested code page exist in $\mathcal{M}$TEX. Currently, since the users of $\mathcal{M}$TEX are mainly Chinese students or teachers or researchers, besides the default *English* (codepage:437) user interface for non-Chinese code pages, we have mainly provided language files for *Simplified Chinese* (codepage:936) and *Traditional Chinese* (codepage:950) user interfaces. So if the users have interests to translate the language files, please contact the author so as to make $\mathcal{M}$TEX more

international.

2.9 $\mathcal{M}$TEX Has Special Design for Chinese

As mentioned before, typesetting Chinese documents may be more complex than typesetting English documents, and hence Chinese TEX community has made many efforts and invented number of tools and macro packages to make the Chinese typesetting happier. However, unfortunately, most of them are only released in Chinese forums and hence most of them are not available in CTAN[28] or western world. As a TEX system mainly for Chinese users, $\mathcal{M}$TEX integrates most existing tools and macro packages for Chinese typesetting, and provides corresponding compilation options in the settings dialog for the main compilation command *clatex*, which is in charge of almost all the *smart compilation* procedure for various TEX source files.

2.10 $\mathcal{M}$TEX Has Special Design for Beginners

As a LATEX user, I know that many people feel that LATEX is very difficult to learn. To help $\mathcal{M}$TEX users to learn and practice, $\mathcal{M}$TEX provides many demo examples, templates, selected documents, as well as some tips for beginners. From my own learning experience and teaching experience, I think LATEX can be easy to learn in the right way:

- Use existing examples to demonstrate the basic compilation procedure and the great power of LATEX;
- Use one simple example to illustrate the key philosophy of LATEX — focusing on the structure and contents rather than typesetting details, i.e. *What You Think Is What You Get* rather than *What You See Is What You Get*;
- Add more elements to the simple example to illustrate more elements of LATEX such as mathematics, tables, figures, references, and so on;
- Read the selected documents (such as *lshort.pdf* [29]) to gain comprehensive understanding to LATEX;
- Learn from continuous practice, gradually practice will make perfect. In this process, users are suggested to learn to search the local macro files and read the documents provided in the $\mathcal{M}$TEX servers.

With $\mathcal{M}$TEX, following the above ideas, in my graduate courses, for those students who never know LATEX before, I usually just use 20 to 30 minutes to introduce the installation of $\mathcal{M}$TEX and basic usage of LATEX by examples, then almost all the students can use LATEX to complete their assignments and projects in my courses, which shows that TEXing with $\mathcal{M}$TEX is not difficult for most students.

3 Installation of $\mathcal{M}$TEX

3.1 Fresh Installation

We provide two ways to "install" a fresh $\mathcal{M}$TEX suite: one way is to download an self-extraction archive which contains a pre-configured typical installation, and the other way is to download a tiny installer which allows the user to customize, download and install chosen components. Both ways essentially unpack some archives to the specified installation folder. Note that $\mathcal{M}$TEX is green hence the users may also copy an existing $\mathcal{M}$TEX folder to removable disks or other computers.

Existing $\mathcal{M}$TEX Servers With the help of some friends and users of $\mathcal{M}$TEX, we have set up several $\mathcal{M}$TEX servers, and a list of them can be found in the official website of $\mathcal{M}$TEX: `http://mtex.sf.net`. Among these servers, we mainly recommend two servers:

- `ftp://ftp.ctex.org/pub/tex/systems/mtex/`
- `ftp://mtex:mtex@10.106.2.170/mtex/`

where the last one is only accessible in the campus of Beijing Institute of Technology and it is the recommended server for the students and the researchers of Beijing Institute of Technology due to its fastest download speed of intra-net. More servers can be added if users would like to provide mirrors; in this case, please contact the author directly.

Typical Installation This approach is recommended for most users. The following steps are needed with this approach:

1. Download self-extractor *mtex20??.exe* (about 50 Megabytes) from any server.

2. Run the downloaded self-extractor and input the destination of $\mathcal{M}$TEX folder when prompted.
3. Wait one minute until the self-extractor finishes extraction and quits.

In the second step, the users are suggested to type "c:\" or "d:\" as destination, i.e. the $\mathcal{M}$TEX suite will be installed to folder *c:\mtex* or *d:\mtex*. Note that the destination path should not contain space or Chinese characters so as to avoid unnecessary troubles of path parsing in the batch scripts.

Customized Installation This approach is suitable for experts who want to customize the components upon installation. Note that this approach is not recommended since the users can always add new components after a typical installation. The following steps are needed with this approach:

1. Download the tiny installer *m-setup.exe* (about 80 Kilobytes) and all configuration files *m-setup.*.** from the "*current*" folder of any server and save them to a temporary folder, say e.g. *e:\m-setup*;
2. Run the installer and input the destination path of $\mathcal{M}$TEX folder (the default path is *c:\mtex*).
3. Click the button *[Setup network]* to configure and test the internet connection: first click the button *[1. Test Internet connection]*, the installer will test the network and prompt the users the network status, then if the network is okay, the users can click the button *[2 .Download and load config files]* to download files needed by the installer.
4. Close the dialog of *[Setup network]*, and then the users are able to customize the components needed. Description of each component will be shown on the right side if the mouse is put over that component.
5. Once the user has chosen the components to install, the user can click the button *[Install now]* to start the installation. The installer will download the components from $\mathcal{M}$TEX servers, and then it will extract them to proper sub-folders of the destination path.
6. Wait until the installer finishes downloading and extraction, then the installer will automatically launch the configuration dialog (see §3.3).

In the second step, the users are suggested to type "c:\" or "d:\" as destination, i.e. the $\mathcal{M}$TEX suite will be installed to folder *c:\mtex* or *d:\mtex*. Note that the destination path should not contain space or Chinese characters so as to avoid unnecessary troubles of path parsing in the batch scripts.

3.2 Software Updating

$\mathcal{M}$TEX users can update $\mathcal{M}$TEX suite to latest version directly from "$\mathcal{M}$TEX Main Menu " by running *mtex\MainMenu.cmd*. Then just click button *[Update MTeX Component]* and follow the instructions step by step.

3.3 Configuration

Basic Settings Most basic settings of $\mathcal{M}$TEX can be customized, for example, the language interface, the default $\mathcal{M}$TEX server, the proxy server, the default editor, the default `.dvi` / `.ps` / `.pdf` viewer, and so on. Usually all these settings are not necessary to change since $\mathcal{M}$TEX will detect and provide proper defaults. For example, if the user is running on Simplified Chinese Windows, then it will automatically use Simplified Chinese interface; if the user is running a non-Chinese Windows, it will use the default English interface.

1. Invoke "$\mathcal{M}$TEX Main Menu" by running *mtex\MainMenu.cmd*.
2. Click button *[Basic Settings]* and a dialog of *MTeX Basic Settings* will appear.
3. Make necessary customization in the dialog.
4. Click button *[Save]* if some settings were changed; otherwise, just click button *[Cancel]* or button *[Reset Defaults]* and then quit.

To save space, here we do not introduce the details of basic settings. In current typical installation of $\mathcal{M}$TEX, the default TEX editor is Sc1IDE [30], the default `.dvi` viewer is DviWin [31], the default `.ps` viewer is automatically chosen as GsView [26], and the default `.pdf` viewer is SumatraPDF [32].

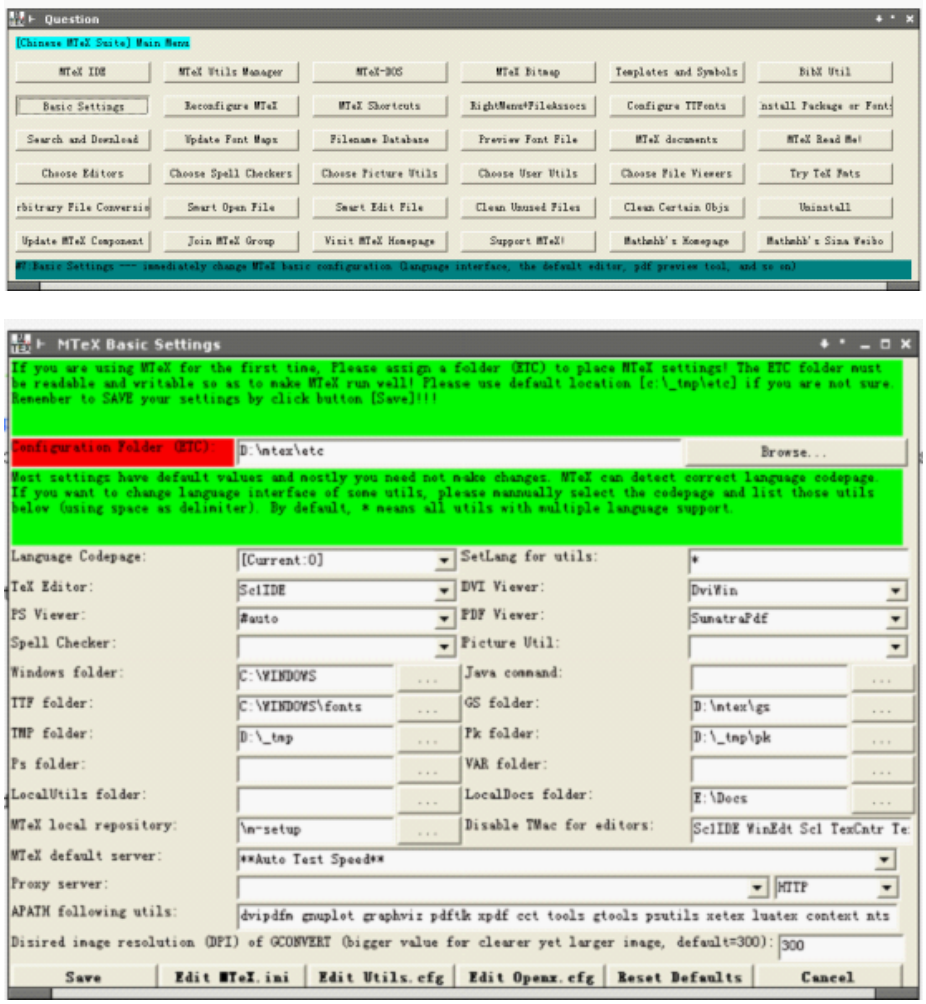

Figure 1: Basic Settings for $\mathcal{M}$TEX

Create Shortcuts The users are suggested to create shortcuts for $\mathcal{M}$TEX for convenience. To do this, the users just need to do the following steps:

1. Invoke "$\mathcal{M}$TEX Main Menu" by running *mtex\MainMenu.cmd*.
2. Click button *[MTeX Shortcuts]* and a message box will appear.
3. Click button *[Create Shortcuts]* to create some shortcuts.

The users can also remove the shortcuts at any time by similar operations except that the users need to click button *[Delete Shortcuts]* in the last step.

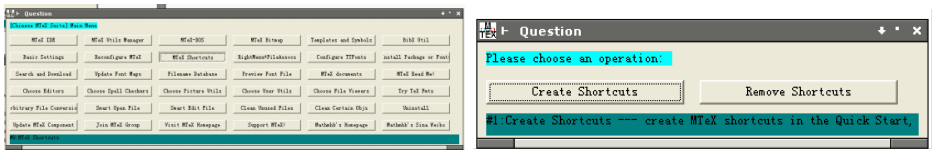

Figure 2: Create Shortcuts for $\mathcal{M}$TEX

Once shortcuts are created, the users can invoke $\mathcal{M}$TEX editor, $\mathcal{M}$TEX-DOS, $\mathcal{M}$TEX Main Menu directly from the desktop, and user can access some unique *Send To ...* shortcuts for selected file in the explorer:

- *Smart Open with MTeX*: Smartly uses proper utility to open/view the selected file according to its file type.
- *Smart Edit with MTeX*: Smartly uses proper utility to edit the selected file according to its file type.
- *Smart Convert with MTeX*: Smartly uses proper utility to convert the selected file according to its file type.
- *MTeX Dos Prompt*: Provides a unique DOS prompt window which is much more powerful than Microsoft Command Prompt.
- *MTeX IDE*: Edits the file with the default TEX editor.

Note that the first three shortcuts are very powerful since they support arbitrary file types, and the actions they will do for different file types are completely defined in the configuration file `openx.cfg` , which in fact provides one elegant and "green" way to replace the complex file association mechanism of Windows via the registry. For example, for a selected file *hello.idle* written in *Idle* scripting language, *Smart Open with MTeX* will prompt several choices (shown in Figure 3) like *Idle*,*IdleW*,*Idle2Exe* and *Idle2Exe-GUI*, then clicking *[Idle2Exe]* will result in download-and-install-on-the-fly (shown in Figure 4) of the utility `ldle` , which is a component on the $\mathcal{M}$TEX servers and is not packed into the typical installation, and converting this idle script to an `.exe` file by calling command *idlec* in utitity `idle` with proper options. Related configurations in file `openx.cfg` are shown in Listing 1, which defines the possible actions for `.idle` files and the commands to launch them.

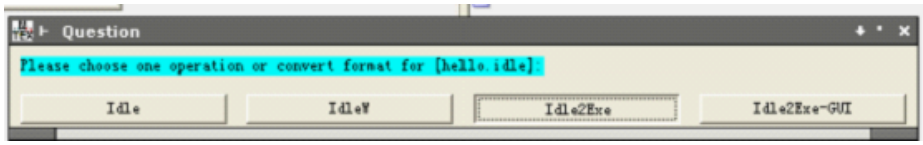

Figure 3: An example of *Smart Open with MTeX* for a file with `.idle` extension

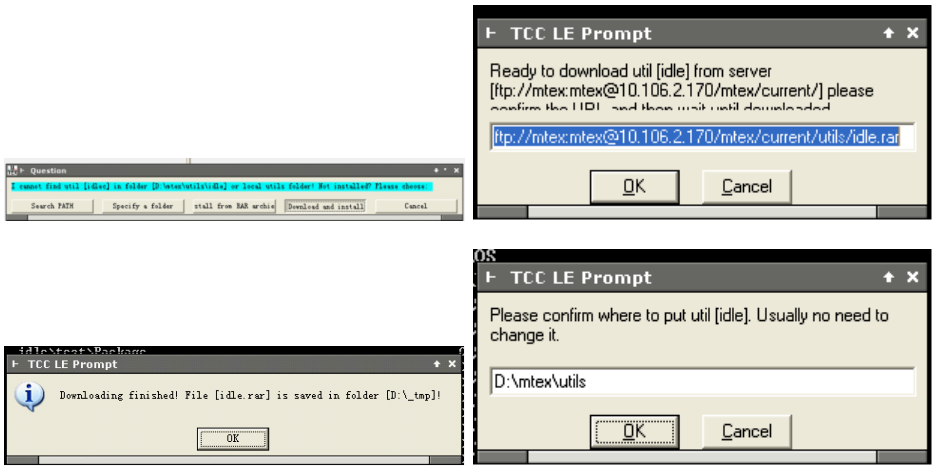

Figure 4: Snapshot of Download-and-Install-on-the-Fly of utility in $\mathcal{M}$TEX

Listing 1: Configuration example of `openx.cfg`

```
.idle=Idle/IdleW/Idle2Exe/Idle2Exe-GUI
!Idle=util idle
!IdleW=util :idle idlew
!Idle2Exe=util :idle idlec -x $N.exe $F
!Idle2Exe-GUI=util :idle idlec -w -c -x $N.exe $F
```

File Associations For convenience, the users are also suggested to associate certain files with $\mathcal{M}$TEX so that users can edit `.tex` files by double-clicking, view `.dvi` / `.ps` / `.pdf` / `.eps` files by double clicking, and so on. To this end, the users just need to do the following steps:

1. Invoke "$\mathcal{M}$TEX Main Menu" by running *mtex\MainMenu.cmd*.

2. Click button *[RightMenu+FileAssocs]* and a message box will appear.
3. Click button *[Associate MTeX Files]* and a dialog *MTeX Files Association* will appear.
4. Customize file association and click *[OK]* to associate files related with $\mathcal{M}$TEX.

Note that the users can also restore the file associations at any time by similar operations except that the users need to click button *[Clear file associations]* in the third step.

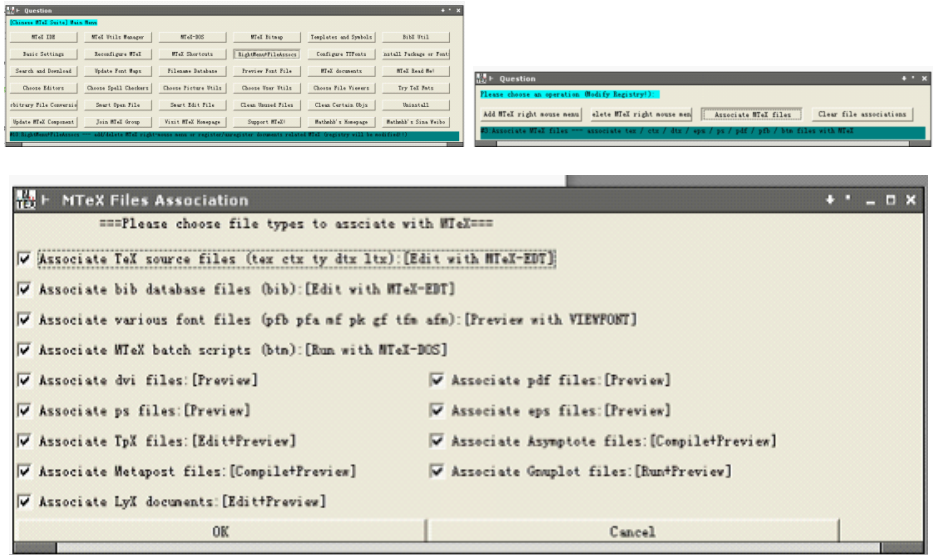

Figure 5: Snapshot of Associating Files in $\mathcal{M}$TEX

Other Possible Configurations Besides the above suggested configurations, users can also reconfigure any utilities shipped with $\mathcal{M}$TEX in a unified way when necessary. We take one example to explain this configuration. $\mathcal{M}$TEX provides one component RedMon [33], which can be used to create virtual `.pdf` *Printer* and `.eps` *Printer*, tiny replacements of Adobe Distiller ©. Of course, such an utility needs to modify the Windows registry, hence if the users want to use such virtual printers, the users need to configure it once. To this end, the users just need to do the following steps:

1. Invoke "$\mathcal{M}$TEX Main Menu" by running *mtex\MainMenu.cmd*.
2. Click button *[Reconfigure MTeX]* and a dialog on License for MTeX will appear.
3. Click button *[I agree]* to accept the license agreement and choose *[Custom Configuration]*.
4. In the dialog the users can customize some features and utilities in $\mathcal{M}$TEX, for example, select only RedMon in the right panel, and then click button *[Configure Utils Only]* to configure RedMon , which will install virtual `.pdf` *Printer* and `.eps` *Printer* step by step.

Note that the users can also let $\mathcal{M}$TEX to make *[Default Configuration]* in the third step, which will automatically make full configuration for $\mathcal{M}$TEX including creating shortcuts, associating files, font configurations, and so on.

Figure 6: Snapshot of Reconfiguring of $\mathcal{M}$TEX

4 Teaching TEXing with $\mathcal{M}$TEX

Since $\mathcal{M}$TEX is easy-to-install and easy-to-learn, with proper teaching skills, usually the teacher only needs to spend about half an hour to introduce the installation of $\mathcal{M}$TEX and basic usage of LATEX.

4.1 One Demo

Here is one simple demo to use $\mathcal{M}$TEX:

1. Invoke the default editor Sc1IDE by running *mtex\MTeX-IDE.cmd* or from desktop shortcut.
2. Open any demo file, e.g. *mtex\demo\e-sample.tex*, then the users will see LATEX codes are syntax highlighted with code folding.
3. Click toolbar button (or hot key *Ctrl+Alt+3*) to smartly compile the TeX file with engine *pdflatex*.
4. Click toolbar button (or hot key *Ctrl+7*) to view the generated `.pdf` file. Note that by double-clicking anywhere in the `.pdf` view, the editor will locate the cursor at corresponding line of the source file.

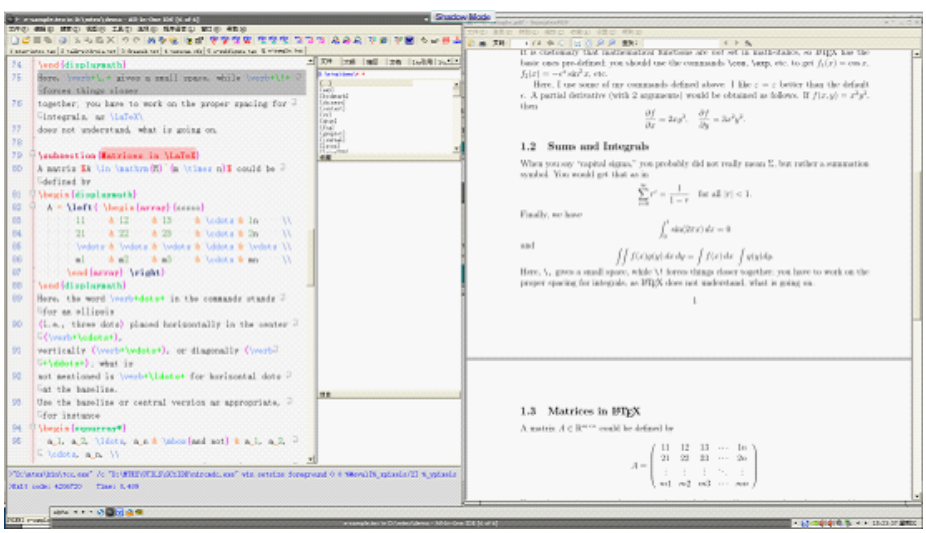

Figure 7: TEXing in $\mathcal{M}$TEX: source view and `.pdf` view

In this step, it would be much attracting for students if the teacher can compile more interesting examples in the *demo* folder such as *e-chess.tex*, *e-carom.tex*, and so on. These fancy examples on Chess, Chemistry, etc. can inspire the students to discover the great power of TEX and LATEX, which will motivate them to study LATEX by reading documents and learning by practice.

4.2 One Example

To edit a new TeX file, the teacher can do the following steps:

1. Press *Ctrl+N* to open a new buffer and press *Ctrl+S* to save it as a TeX file with `.tex` extension.
2. Type *doc* followed by *Ctrl+B* to generate one simple LaTeX template.
3. Edit the file by adding some basic commands and arbitrary text.
4. Compile the file like the above to see the effects.
5. Change the document class to *ieeetran* (or other) and recompile the file like the above.

In this step, the teacher should highlight the following important points to students:

- Firstly, LaTeX is to represent *what you think* rather than *what it looks like*, so we need not focus on the typesetting details of a document; instead, we need to think over the structure and contents of the document. This point is the most critical philosophy which distinguishes LaTeX from WinWord ©.
- Secondly, learning to use LaTeX is not difficult at all if starting with a simple easy-to-understand LaTeX template. This point is of significance for LaTeX beginners so that they are not lost at the starting point.
- Thirdly, MTeX provides many convenient ways (abbreviation expanding, sidebar panels, templates and macros pad, etc.) to allow the user quickly typeset LaTeX commands, environment, or even a somewhat complex document template. This point will help students to gain confidence in "writing" LaTeX codes efficiently.
- Lastly, *learning LaTeX by practice and searching* is the most important key to help a LaTeX beginner become an expert gradually. This point is the most important thing for the students, hence the teacher should give enough chances for students to learn by practice. In my graduate courses, I always ask the students to finish their assignments with LaTeX by using MTeX. Note that the teacher need not introduce many LaTeX commands to students since the students are suggested to read the classic document shipped with MTeX

such as *lshort.pdf* and all the students will grasp LaTeX in continuous exercises of using LaTeX.

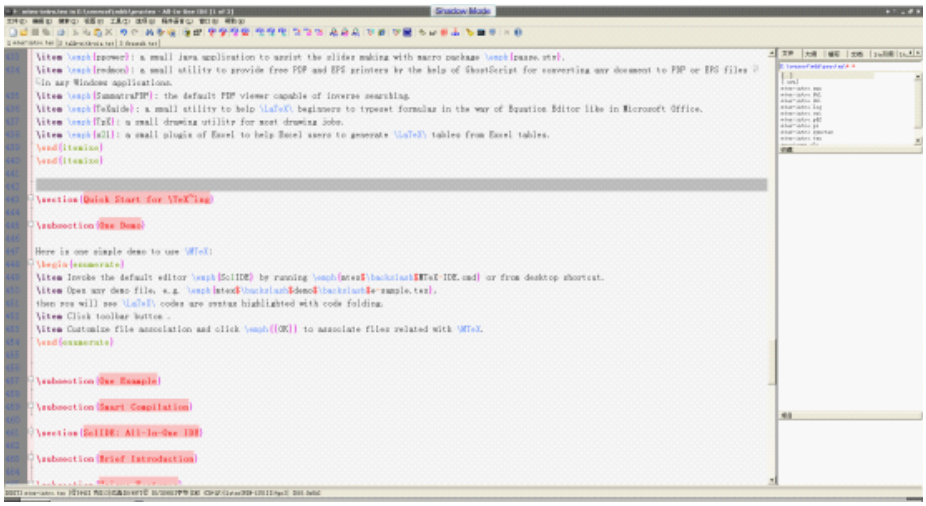

Figure 8: Snapshot of Sc1IDE: a fully functional all-in-one editor

Some editing tips will be briefly introduced in Section 6.

During the editing, users can also click the toolbar button to launch a template and symbol pad for easy inserting of LaTeX commands or symbols.

Figure 9: Snapshot of $\mathcal{M}$TEX TMac: a template and symbol pad

4.3 Smart Compilation

$\mathcal{M}$TEX provides one unique smart compilation script, *clatex.btm*, for `.tex` files and other files. Roughly speaking, this script can do some clever jobs to handle files with different extensions and different formats. For non-TEX files, it invokes command *openx -compile* to compile files via the compiler settings given in file `openx.cfg`. For TEX files, this script can do the following jobs:

- For `.ctx` file, make necessary pre-processing and post-processing needed by CCT system.
- For `.ty` file, make necessary pre-processing and post-processing needed by TY system.
- Do proper actions for all kinds of TEX files so as to make it inverse searchable for both `.dvi` and `.pdf` output.
- Generate missing pixel fonts before previewing the `.dvi` file.

- Invoke bibtex or bibtex8 automatically to support use of .bib reference database.
- Invoke makeindex or cctmkind to support index generating when necessary, even for Chinese documents.
- According to file contents, automatically determine and invoke proper TEX engine (*tex*, *latex*, *pdftex*, *pdflatex*, *xetex*, *xelatex*, etc.) to compile .tex file.
- Automatically determine whether to compile the .tex file twice, three times or four times.
- Support graphics inclusion of arbitrary image format by automatic image format conversion to required format (.eps , .pdf , or .jpg) provided that users do not explicitly give the extension of the graphics file.
- Automatically invoke metapost for the inclusion of metapost figures (*.1, *.2, and so on).
- Automatically invoke dvipdfm , dvips , ps2pdf , ppower when necessary.
- Support specific pre-processing and post-processing for Chinese typesetting, for example, use fixbbl and gbk2uni to fix possible errors of .bbl and .out generated.
- Pass proper options to invoked programs so as to be able to embed Type 1 fonts.
- Automatically preview generated .dvi or .pdf file if the compilation is successful.
- Make necessary processing to support special packages such as psfrag , pdftricks , mfpic , asymptote and so on.
- Pass proper options to invoked programs so as to typeset documents in landscape view or specified paper format.
- Invoke certain user-specified programs during the compilation process according to the user's *clatex* setup.
- Clean temporary files generated in the compilation.
- Specify the .pdf compatibilty level (version) for the final .pdf file.
- More jobs can be found from the *Clatex Options* dialog shown in Figure 10.

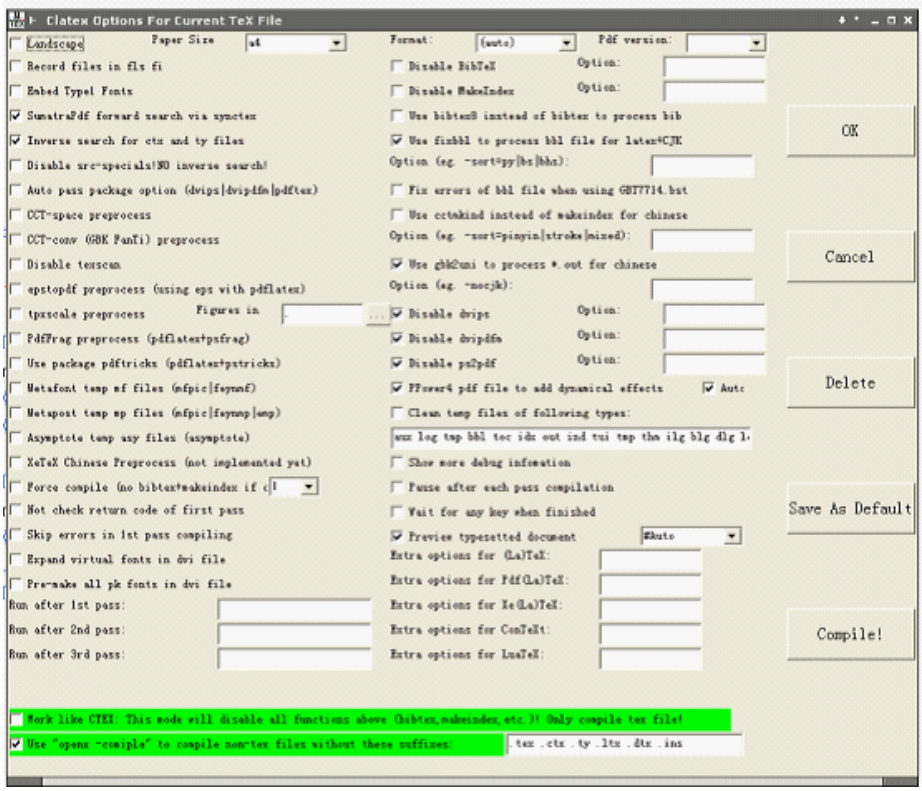

Figure 10: Snapshot of Clatex Settings

5 Brief Overview to Typical Installation

In the above, we have seen some unique features of $\mathcal{M}$TEX. In this section, we'd like to give a brief overview to the components provided in the typical installation.

5.1 $\mathcal{M}$TEX Kernel

The kernel of $\mathcal{M}$TEX (mainly the scripts and tools in folder *mtex\bin*) is the heart of $\mathcal{M}$TEX suite, which distinguishes $\mathcal{M}$TEX from most other TEX distributions. Some useful $\mathcal{M}$TEX tools in the kernel will be introduced in next subsection. Here we only list several examples of batch scripts in $\mathcal{M}$TEX to illustrate some unique features of $\mathcal{M}$TEX.

- *clatex.btm*: a script for smart compilation for all files.
- *add_doc.btm*: a script to download and install one document from the servers.
- *add_font.btm*: a script to download and install one font family from the servers or local archives.
- *add_map.btm*: a script to add one font map file and make necessary changes to map files for dvipdfm ,dvips and pdftex .
- *add_pkg.btm*: a script to download and install one font family from the servers or local archives.
- *add_util.btm*: a script to download and install one utility from the servers or local archives.
- *ask_server.btm*: a script to show available $\mathcal{M}$TEX servers and confirm user's choice for later downloading.
- *bit_server.btm*: a script to determine the $\mathcal{M}$TEX server by detecting whether the user is in the campus of Beijing Institute of Technology.
- *chkmsetup.btm*: a script to check local repository if it exists.
- *chkproxy.btm*: a script to check the Internet Explorer © proxy settings.
- *compile.btm*: a script to compile a TeX file especially the TeX file generated by TpX .
- *context.btm*: a script to compile ConTEXT file.
- *copyfnts.btm*: a script to copy font files to proper font folders from arbitrary font archives containing font files.
- *cropbmp.btm*: a script to crop bitmap images automatically.
- *cropeps.btm*: a script to crop `.eps` images automatically.
- *cropimg.btm*: a script to crop any image files automatically.
- *croppdf.btm*: a script to crop `.pdf` images automatically.
- *delx.btm*: a script to clean temporary files.
- *dir_server.btm*: a script to list files in the specified server path.
- *doc.btm*: a script to search and view local documents and even server-side documents.

- *dos2unix.btm*: a script to convert text files from DOS format to Unix format.
- *down_src.btm*: a script to download and run installer or package according to the settings given in specified utility folder.
- *dvi2img.btm*: a script to convert `.dvi` file to images, supporting frequently used image formats.
- *dvicpy.btm*: a script to expand virtual fonts to practical fonts in `.dvi` file.
- *dvimerge.btm*: a script to merge two `.dvi` files.
- *dvinup.btm*: a script to convert `.dvi` file by putting several pages on one page.
- *dviview.btm*: a script to view `.dvi` files, supporting most known `.dvi` viewers including DviWin, DviOut, WinDvi, Yap, CCTWin32, Dviscr.
- *editx.btm*: a script to invoke *openx.btm -edit*.
- *emf2eps.btm*: a script to convert `.emf` figure to `.eps` figure.
- *eps2pdf.btm*: a script to convert `.eps` figure to `.pdf` figure.
- *EqnEdit-Web.btm*: a script to invoke on-line equation editor.
- *fast-cfg.btm*: fast configuration for $\mathcal{M}$TEX.
- *gconvert.btm*: a script to make arbitrary image conversion.
- *gen_pkg_list.btm*: a script to batchly generate an Excel © file from `.tpm` files.
- *genfontdb.btm*: a script to generate font database file *fonts_db.cfg*.
- *genmakefile.btm*: a script to generate a Makefile template based on files in current folder.
- *genpkgdb.btm*: a script to generate package database file *pkgs_db.cfg*.
- *htmview.btm*: a script to view HTML files via installed or known web browser.
- *l2t.btm*: a script to convert LATEX file to pure text file.
- *latex-dtx.btm*: a script to batchly compile `.dtx` files.
- *latex-ins.btm*: a script to batchly compile `.ins` files.
- *license.btm*: a script to display license dialog.
- *main.btm*: a script to show the main menu of $\mathcal{M}$TEX.

- *makecmap.btm*: a script to generate **.cmap* files for using package [ccmap].
- *makefmts.btm*: a script to make various TEX /Metafont /Metapost formats, supporting most known TEX engines.
- *makefnt.btm*: a script to make configuration for True Type font.
- *makepk.btm*: a script to make `.pk` files from True Type fonts, Type1 fonts, metafont fonts, and Chinese fonts.
- *maketex.btm*: a script to invoke download-and-install-on-the-fly for missing macro packages.
- *maketfm.btm*: a script to make `.tfm` files from True Type fonts, Type1 fonts, metafont fonts, and Chinese fonts, supporting automatic download-and-install-on-the-fly for missing fonts when necessary.
- *mchange.btm*: a script to batchly make replacements to files via sed .
- *m-conv.btm*: a script to simply invoke smart conversion, i.e. *openx.btm -convert*.
- *mergefiles.btm*: a script to merge text files.
- *mergepdf.btm*: a script to merge `.pdf` files.
- *mftoeps.btm*: a script to convert `.mf` file to `.eps` file using mftoeps package.
- *mktexlsr.btm*: a script to generate file name database for $\mathcal{M}$TEX.
- *mp2eps.btm*: a script to convert `.mp` file to `.eps` file.
- *mp2pdf.btm*: a script to convert `.mp` file to `.pdf` file.
- *mproof.btm*: a script to compile `.mp` file and view generated mps file.
- *mrun.btm*: a script to run various commands conviniently, designed for configuring tools menu for other editors.
- *mtex-assoc.btm*: a script to help users to associate files.
- *mtexcfg.btm*: a script to configure basic settings of $\mathcal{M}$TEX.
- *mtex-cfg.btm*: a script to configure utilities in $\mathcal{M}$TEX.
- *mtex-edit.btm*: a script to invoke text editor.
- *mtex-env.btm*: a script to generate $\mathcal{M}$TEX environment cache file *mtex.env*.

- *mtex-font.btm*: a script to help users configure TrueType fonts via graphical user interface.
- *mtex-guru.btm*: a script to help users search or view macro files, useful for finding certain commands.
- *mtex-lfn.btm*: a script to resolve long file name problem in early $\mathcal{M}$TEX.
- *mtex-lnk.btm*: a script to create shortcuts for $\mathcal{M}$TEX.
- *mtex-pkg.btm*: a script to install or uninstall extra packages.
- *mtex-reg.btm*: a script to register right menu commands for $\mathcal{M}$TEX.
- *newer.btm*: a script to detect whether one file is newer than the other file.
- *notfind.btm*: a script to display an error message box when a file is not found.
- *openx.btm*: a script capable to open, view, edit, or convert any files, according to the settings of configuration file `openx.cfg` .
- *pdf2txt.btm*: a script to convert `.pdf` file to text file.
- *pdffrag.btm*: a script to convert `.eps` figures to `.pdf` figures, with symbols replaced with LATEX commands specified in a `.tex` file.
- *pdfmerge.btm*: a script to merge `.pdf` files into one `.pdf` file.
- *pdfnup.btm*: a script to convert `.pdf` file by placing several pages into one page.
- *pdfselect.btm*: a script to select or extract certain pages from a `.pdf` file.
- *pdfview.btm*: a script to view `.pdf` files, supporting most `.pdf` viewers such as SumatraPDF, PdfXCView, GsView, Acrobat Reader, and so on.
- *pdfview-s.btm*: a script to view `.pdf` files with forward searching feature, mainly supporting SumatraPDF .
- *pfshow.btm*: a script to view Type 1 fonts, i.e. `.pfb` / `.pfa` files.
- *picutil.btm*: a script to invoke picture utilities.
- *ppower.btm*: a script to post-process `.pdf` files to add movie effects generated by pause macro package.
- *preview.btm*: a script to preview multiple files.
- *ps2pdf.btm*: a script to convert `.ps` file to `.pdf` file.

- *psmerge.btm*: a script to merge `.ps` files.
- *pst2pdf.btm*: a script to produces `.pdf` files for all files of the form **-fig*.tex*.
- *pstex2eps.btm*: a script to convert `.pstex` file to `.eps` file.
- *pstex2jpg.btm*: a script to convert `.pstex` file to `.jpg` file.
- *pstex2pdf.btm*: a script to convert `.pstex` file to `.pdf` file.
- *psview.btm*: a script to view `.ps` / `.eps` files, supporting most PostScript viewers such as GsView , GS , RoPS , GsV .
- *regtool.btm*: a script to operate Windows registry.
- *res2dll.btm*: a script to convert `.res` file to `.dll` file via Delphi © compiler.
- *rtfview.btm*: a script to view `.rtf` file via the associated application.
- *run.btm*: a script to run an editable command.
- *run-edt.btm*: a script to run WinEdt ©commands.
- *runx.btm*: a script to ask for actions for given file, whose extension determines the possible actions.
- *search.btm*: a script to search for an executable file.
- *set_msg.btm*: a script to set an internal environment variable *_MSG*.
- *setclatex.btm*: a script to show a dialog for customize the options of smart compilation.
- *setemtex.btm*: a script to set environments for using EmTeX .
- *setjava.btm*: a script to search or set the path of *java.exe*.
- *setlang.btm*: a script to set up the language interface of $\mathcal{M}$TEX.
- *setproxy.btm*: a script to set the proxy server for commands including wget , curl and svn .
- *setttfpk.btm*: a script to set environment variables for program ttf2pk .
- *spell.btm*: a script to detect and invoke available speller shipped with $\mathcal{M}$TEX, supporting 4spell , aspell , ispell , amspell , Word-Spell , WPS-Spell , and WinEdt-Spell .
- *striptex.btm*: a script to strip line comments in TeX files.

- *svn-checkout.btm*: a script to emulate *svn checkout* command without installing utility svn .
- *t2h.btm*: a script to convert text file to HTML file.
- *t2l.btm*: a script to convert text file to LaTeX file.
- *t2r.btm*: a script to convert text file to `.rtf` file.
- *tcstart.btm*: a script to be called before any other batch scripts, mainly preparing necessary environments for MTeX.
- *testspeed.btm*: a script to test speed of specified servers.
- *tex_cmd.btm*: a script to determine the proper TeX engine of a `.tex` file.
- *texscan.btm*: a script to preprocess figures included in the TeX file by scanning contents of TeX file.
- *tpx2eps.btm*: a script to convert `.tpx` image file to `.eps` image file.
- *tpx2jpg.btm*: a script to convert `.tpx` image file to `.jpg` image file.
- *tpx2PDF.btm*: a script to convert `.tpx` image file to `.pdf` image file.
- *tpxscale.btm*: a script to process `.tpx` file so as to make it scalable by any factor defined in TeX file.
- *txt2dvi.btm*: a script to convert text file to `.dvi` file.
- *txt2eps.btm*: a script to convert text file to `.eps` file.
- *txt2img.btm*: a script to convert text file to image file of any format.
- *txt2pdf.btm*: a script to convert text file to `.pdf` file.
- *txt2ps.btm*: a script to convert text file to `.ps` file.
- *un_inst.btm*: a script to uninstall MTeX utility if un-installer found.
- *unbib.btm*: a script to post-process `.bib` file generated by BibEdit so as to use Chinese references.
- *uninstall.btm*: a script to uninstall MTeX (removing temporary folders and changes to the registry).
- *unix2dos.btm*: a script to convert Unix text file to DOS text file.
- *unknown_cmd.btm*: a script to be invoked when unknown command found in the MTeX DOS prompt.

- *upd_map.btm*: a script to update map files in $\mathcal{M}$TEX.
- *upd_mtex.btm*: a script to update $\mathcal{M}$TEX components from servers.
- *updafm.btm*: a script to update `.afm` files from `.pfb` files in $\mathcal{M}$TEX.
- *updpkg.btm*: a script to update the list of installed macro packages.
- *updtfm.btm*: a script to update `.tfm` files for fonts in $\mathcal{M}$TEX.
- *updvf.btm*: a script to update `vf.cfg` from `.vf` files in $\mathcal{M}$TEX.
- *userutil.btm*: a script to ask user to choose from user-defined user utilities.
- *util.btm*: a script to search or download-and-install-on-the-fly one utility.
- *view.btm*: a script to view `.dvi` file using dviscr , only for old EmTeX .
- *viewfont.btm*: a script to view any font file.
- *virfnt.btm*: a script to display real font name of a virtual font.
- *w-close.btm*: a script to close windows with certain title.
- *writable.btm*: a script to check whether a file/folder is writable.

5.2 Useful $\mathcal{M}$TEX Tools

TMac: Template and Macro Pad This small tool can help users to insert templates or code snippets to editor. This tool is fully configurable by editing the configuration file *tmac.ini*. Once a symbol is clicked, its corresponding code will be put into the clipboard and inserted into the active editor window. Hence this tool can be used with any editor. We have provided many templates and macros in the default configuration file, and two groups of HTML codes snippets. Besides normal code insertion, we have also implemented some unique special features, for example, it is possible to launch certain program by clicking an icon; or it is possible to pop up a color dialog so as to insert RGB values of selected colors. Therefore, this small tool can also serve as a small floating toolbar and a color picker for all applications.

BibX: Reference Extractor This small tool can help users to extract bibitem in BIBTEX format from some text containing a reference. This tool is very useful to generate bibitem from searching references in database like Web of Science © and

Ei Village ©. This tool is also configurable to add more formats of references. Its principle is to compare the text with each format defined in the configuration file, and generate the bibitem via the most matchable format.

Figure 11: Snapshot of BibX: one small reference extraction tool

MTEX-BMP: LATEX Bitmap Tool This small tool can help users to generate bitmap image from LATEX codes so as to use such image in any Windows © application like WinWord © or PowerPoint ©. This feature is very useful to "embed" powerful and beautiful LATEX mathematics typesetting in Windows applications. Its principle is to compile the LATEX codes, then convert `.dvi` to `.ps` format, and then convert `.ps` to bitmap image and put it in the clipboard, which will be then sent to the specified application window. Note that this tool can not only help to make PowerPoint © slides, but also help other applications to insert LATEX equations.

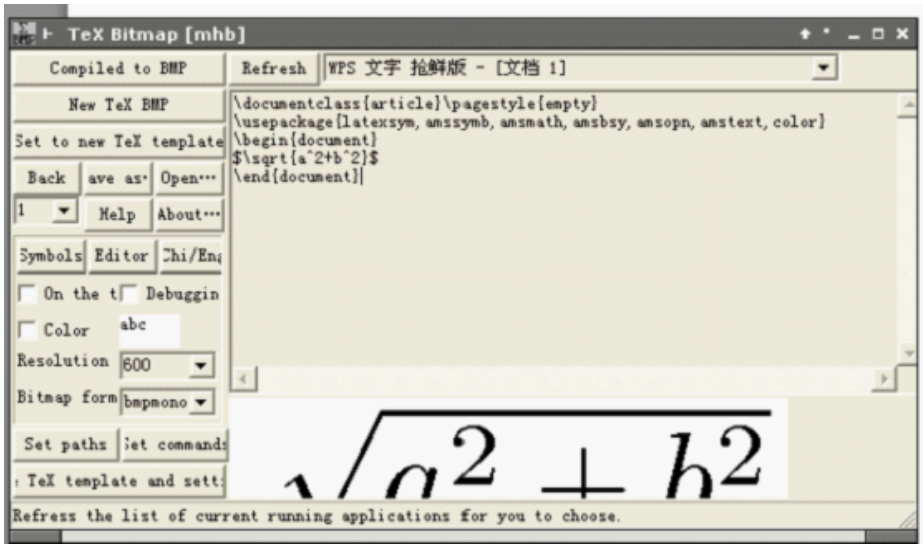

Figure 12: Snapshot of MTeX-BMP: using LaTeX for Windows applications

Net_Pkg: File or Package Downloader This small tool is used to search and download files from CTAN. During the compilation of TeX files, if a macro package is missing, $\mathcal{M}$TEX will launch a script *make-tex.btm*, which will search the missing macro file in the servers of $\mathcal{M}$TEX and then invoke this package downloader if server searching fails.

Figure 13: Snapshot of Net_Pkg: File or Package Downloader

UtilsMan: General Utilities Manager This tool is used to help users use various utilities with any text editor. Note that not all text editors provide feature of launching external tools or configuration of tools menu, hence generally it is very inconvenient to use LaTeX without a proper text editor. To resolve such a problem, this tool is invented to provide an external tools menu for all editors, even for notepad in windows. For example, after opening a `.tex` file in UtilsMan, we can select "Smart Compilation" from the drop-down menu of this tool to compile the `.tex` file. With this tool, it is not necessary to configure most text editors, and the users can use any editor as the default MTeX editor for editing `.tex` files.

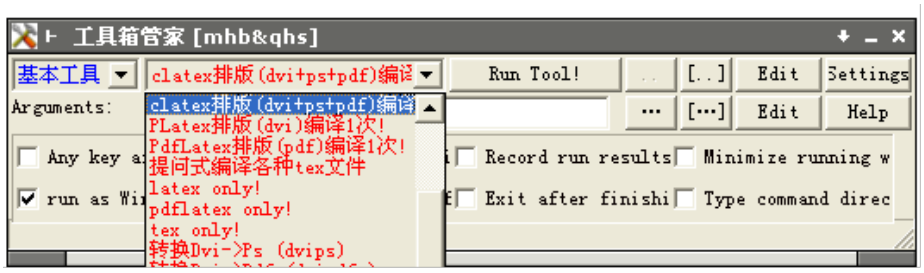

Figure 14: Snapshot of UtilsMan: external powerful tools menu for any text editor

M-Timer: Mini Timing Tool This tool is very helpful for timing reminder during rehearsal of slides.

5.3 Other Components

In the typical $\mathcal{M}$TEX installation, besides the $\mathcal{M}$TEX kernel, the following components are provided:

- Almost all standard macro packages in CTAN are provided in the compact form. Only macro files (e.g. **.sty*,**.cls*,**.cfg*) are included while their documents are packed as document archives and put on the servers of $\mathcal{M}$TEX for possible download-and-install-on-the-fly later. For example, typing *doc listings* in the $\mathcal{M}$TEX DOS Prompt will view the document after download-and-install-on-the-fly for document *listings.pdf* if it is not available in the local documents folder. It is also convenient to check all local documents and server documents via the *$\mathcal{M}$TEX Main Menu*.
- Almost all macro packages made by Chinese TEXers are provided also with brief usage introduction.
- Some selected documents for beginners (such as *lshort.pdf*) are provided in the *doc* folder of $\mathcal{M}$TEX. All local documents can be accessed directly by invoking *$\mathcal{M}$TEX Main Menu*/*$\mathcal{M}$TEX Documents*.
- To help users, a specific *demo* folder is provided in $\mathcal{M}$TEX so as to provide many simple TeX files for illustrating the straight-forward use of TEX, LATEX, and many macro packages.
- Some selected fonts are shipped with the typical installation, while most other fonts which are not likely to be used in daily work are packed and placed on the servers of $\mathcal{M}$TEX for possible download-and-install-on-the-fly later. For example, with the default installation, during the compilation of this article, the compiler requests for font *lmss12*, whose `.tfm` file cannot be found, hence $\mathcal{M}$TEX will search it in the font database file *fonts_db.cfg* and discover this font file belongs to lm (Latin Modern) font family, then $\mathcal{M}$TEX will try to download-and-install-on-the-fly lm font family which makes later compilation okay after automatic configuration of lm fonts. Note that lm font family is very large and not needed by most LATEX files, we do not put

it in the typical installation although XeTEX and ConTEXT users may highly depend on this font family.

- Main components of Web2C are included in the typical installation so as to provide basic TEX engines (*tex*, *latex*, *pdftex*, *pdflatex*) and command-line utilities (such as *metafont*, *dvips*, *ttf2pk*, *gftodvi*, etc.). Other TEX engines and utilities are packed and placed on the servers of $\mathcal{M}$TEX for possible download-and-install-on-the-fly later. For example, when a user tries to do *smart comilation* for demo file *mtex\demo\xetex\example-1.tex*, $\mathcal{M}$TEX will automatically detect that this file needs *xelatex* to compile it while XeTEX is not shipped with the typical installation, hence $\mathcal{M}$TEX will download and install XeTEX component on the fly and then use this engine to compile the document successfully.
- A customized Ghost Script as well as GsView are provided in the typical installation.
- The following selected utilities are shipped with the typical installation:
  - Aspell [34]: the default spell checker which can be used in any text editor.
  - Bibedit [35]: one simple reference management program to generate `.bib` files.
  - Dviwin [31]: the default `.dvi` viewer with many features.
  - Gnuplot [36]: one powerful scientific drawing software by scripts, used also by some other $\mathcal{M}$TEX utilities such as Rlab [37].
  - IrfanView [38]: one small picture viewer and converter, providing arbitrary image file conversion.
  - l2h [39]: one component to convert LATEX to HTML (web page).
  - l2r [40]: one component to convert LATEX to `.rtf` file (Word © document).
  - latexmac : a tiny tool to insert LATEX commands or symbols.
  - metapost [41]: a small powerful drawing program to generate PostScript figures.
  - ppower [15]: a small java application to assist the slides making with macro package pause.sty .

- RedMon [33]: a small utility to provide free `.pdf` and `.eps` printers by the help of GhostScript for converting any document to `.pdf` or `.eps` files in any Windows applications.
- SumatraPDF [32]: the default `.pdf` viewer capable of inverse searching.
- TeXaide [42]: a small utility to help LaTeX beginners to typeset formulas in the way of Equation Editor like in Microsoft Office.
- TpX [43]: a small drawing utility for most drawing jobs.
- x2l [44]: a small plugin of Excel © to help Excel © users to generate LaTeX tables from Excel © tables.

6 Sc1IDE: All-In-One IDE

Currently, the default editor in $\mathcal{M}$TeX is Sc1IDE , or All-In-One IDE , which is developed based on free software SciTE and mainly maintained by the author and two another researchers in China.

6.1 Brief Introduction

Sc1IDE is released as a free open-source software, whose source codes can be found from `http://code.google.com/p/scitelatexide`. The initial name of Sc1IDE was SciteLatexIDE , which was coined by *Instanton*[45], who made some changes and special configurations to enhance the official SciTE so that it can be more suitable for editing and compiling TeX files as well as using some related tools conveniently. Later, the author and another researcher, *Hongsheng Qi*, took over the job of enhancing and maintaining this software. We made significant improvements to previous *SciteLatexIDE*, and rename it to *Sc1IDE*, or *All-In-One IDE*, to reflect the nature that it aims to be a general-purpose text editor and integrated development environment which is suitable for TeXing, programming, web design and so on, supporting most file types as well as compilers and tools.

Roughly speaking, *Sc1IDE* not only keeps all features of SciTE [46], but also incorporates most enhancements made by SciTE-Ru [47], and it adds more unique features for TeXing and programming jobs. We made many efforts to make this small text editor as powerful as other editors and easy to use by providing preconfigured settings for TeX files and many programming languages in unified

ways. In this section, due to the page limit, we only introduce some features of Sc1IDE by example.

6.2 Main Features

Briefly speaking, Sc1IDE has the following main features:

- Customizable locales;
- Support Unicode encoding;
- Customizable tools menu even submenus;
- Customizable toolbar buttons;
- Customizable keyboard shortcuts;
- Multi-buffer editing;
- Row block and column block operations;
- Output buffer for running commands;
- Richful command-line arguments;
- Customizable language support;
- Customizable syntax highlight;
- Customizable code folding;
- Customizable code auto-completion;
- Customizable code API call-tips;
- Customizable abbreviation expansion;
- Built-in lua [48] scripting;
- Customizable lua extensions;
- Regular expression searching and replacing;
- Full-screen editing;
- Editing macros support;
- Compilation error locating;
- Brace auto matching;

- Block or line commenting;
- Unique *Files* panel to show files in current folder, favorite files, and project files;
- Unique *Outline* panel to show structure and bookmarks of current file;
- Unique *Abbrev* panel to show available abbreviations and code completion API;
- Unique *Docs* panel to show classified help documents or on-line documents and even searching engines;
- Unique *Ltx-Labels* panel to show labels, bibitems, and included filenames in current file;
- Unique *Ltx-Cmds* panel to show insertable LaTeX Greek commands, environments, mathematics functions;
- Unique integrated debugging for *C/C++*,*Pascal*,*C#*,and *Lua* with the help of gdb [49]/mdb [50];
- Unique integrated subversion version control;
- Unique LaTeX block compilation;
- Unique customizable F1 keyword help;
- Unique embedded expression calculator;
- Unique E-book mode for viewing or reading files;
- Unique preconfigured monofont schemes for programming jobs;
- Unique Hex editing mode for editing arbitrary files;
- Unique word counting for both ASCII files and Chinese files;
- Spell checking by internal or external spell checkers;
- Many additional features provided by lua scripts.

Among these features, we need to remark that the abbreviation expansion is very convenient. For example, with Sc1IDE , typing *eq* followed by hot key *Ctrl+B* will generate an empty *equation* environment, similarly *itm* can expand to an empty *itemize* environment, *fig* can expand to an empty *figure* environment, and so. Note that the abbreviation settings can be configured for each file type, and the users can arbitrarily add new abbreviations or modify existing abbreviations.

6.3 TEXing Support

As to TEXers, we have some special features for happy TEXing:

- Automatic brace completion, e.g. completing `{` by `}`, completing `\left(` by `\right)`.
- Automatic environment completion, e.g. completing `\begin{xyz}` by `\end{xyz}`.
- Automatic ConTEXT command completion, e.g. completing `\starttext` by `\stoptext`.
- Automatic inserting matching `$` when typing `$`.
- Automatic quote replacement, e.g. typing `"` yielding `` `` `` and `''` in turn.
- Automatic inserting braces for mathematics typesetting when typing `_` or `^`, e.g. typing `_` yielding `_{}` with cursor inside the braces.
- Customizable folding support for sectioning commands (like `\section`, `subsection`, etc.), environments (`\begin{...}` and `\end{...}`), code blocks (like `\if`, `\def`, etc.).
- Two useful sidebar panels for LATEX labels, references, subfiles, commands.
- Easy inserting of label references and citations, e.g. clicking the braces of `\ref{}` or `\cite{}` yielding a pop-up list of defined labels or found bibitems for selection.
- Integrating support to more TEX engines such as XeTEX.
- Integrating many tools related with LATEX in the *Tools* menu, e.g. converting LATEX file to HTML or RTF file.
- Smart compilation for TeX files.
- Support for compiling selected text only.
- Switching between TeX file and log file.

7 Other Addons of $\mathcal{M}$TEX

With $\mathcal{M}$TEX, we do not only provide essentially necessary tools for TEXing, but also provide many other utilities which are unlikely to be included in other TEX

distributions. All the utilities provided in $\mathcal{M}$TEX were carefully chosen, and most of them are less than 2 Megabytes if packed with Rar .

The utilities provided in $\mathcal{M}$TEX can be roughly classified into the following categories:

- Picture viewing and converting: for example, Irfan View [38], XnView [51], etc.
- Picture drawing and scientific drawing: for example, TpX [43],TeXCAD32 [52], GnuPlot [36],Asymptote [53],Kseg [54],GraphViz [55],JsPlot ,EDraw , PhotoFiltre [56], and so on.
- `.dvi` / `.ps` / `.pdf` file viewers: for example, DviOut [57], MuPdf .
- `.pdf` tools: for example, PdfTk [58], xpdf [59].
- References management: for example, BibDB [60], JabRef [61].
- Equation editing: for example, LatexMac , TeXaide [42], EqmLite [62].
- Scientific computing: for example, Rlab [37], Yacas [63].
- Version control: for example, SVN [64], RapidSVN [65], CVS [66].
- Demo making: for example, Wink [67], InstantDemo [68]©.
- Packing and unpacking: for example, Rar [69], Wim [70], Upx [24].
- Embedded system compiler: for example, C51 [71],SDCC [72],Arm-Gcc ,Avr-GCC .
- Compilers and interpreters: for example, MinGW [73], Tiny C Compiler [74],Lua [48], Perl [75].
- Code formators: for example, Astyle [76], Uncrustify ,Ctags .
- Spell checkers: for example, Aspell [34], Ispell [77], 4Spell [78].
- Font utilities: for example, FontViewer [79], TypoGraf [80].
- Misc utilities: for example, Zoomer , Mempad [81], Qemu [82], Commander [83].
- More useful utilities of other types.

Most third-party utilities can be accessed by invoking *$\mathcal{M}$TEX Main Menu/[Choose User Utils]*. The utilities in this menu can be customized in configuration file

`utils.cfg`, which defines possible editors, `.dvi` / `.ps` / `.pdf` viewers, spell checkers, converters, user utilities, and so on. Note that the menu of *User Utilities* can also have configured submenus, which make hundreds of utilities well organized in simple and elegant way.

Figure 15: Snapshot of Choosing User Utilities in $\mathcal{M}$TEX

Listing 2: Configuration example of `utils.cfg`

```
[Utils]
Editors=Sc1IDE/WinEdt/EditPlus/Sc1/SciTE/ED/...
DviViewers=#Auto/DviWin/Yap/Dviout/WinDvi/CCTWin32/...
```

```
PsViewers=#Auto/GsView/RoPS/PsV/Gs/Ps2pdf/Open/...
PdfViewers=#Auto/SumatraPdf/MuPdf/Open/GsView/PsV/Gs/...
SpellCheckers=4Spell/ASpell/ISpellw/ISpell/AmSpell/...
PicUtils=TpX/MDraw/PageDraw/TkPaint/LatexCAD/TexCad32/
    TeXCad/...
Converters=Gconvert/GS-convert/ltx2txt/txt2ltx/.../?
DefUserUtils=M-Timer/LyX/LatexMac/TeXaide/BibEdit/WBibDB/
    JabRef/...
UserUtils=office:[Office]/edit:[Editors]/draw:[DrawiSystem
    ]/bib:[References]/eq:[Equations]/math:[Mathematics]/vcs
    :[Subversion]/demo:[DemoMaking]/tv:[TV]/media:[Players]/
    arc:[Archives]/browser:[Browsers]/im:[Chatting]/game:[
    Games]/dev:[Programming]/emb:[Embedded]/%DefUserUtils
Formats=tex/etex/latex/ptex/platex/pdftex/pdflatex/xetex
    /...
[Menus]
menu.misc=MemPad/ICalClk/M-Timer/Zoomer/Lingoes/...
menu.spell=FreeSpell/ProSpell/%SpellCheckers
menu.math=Rlab/FreeMat/MathViews/MLAB/Jmath/Yorick/SysQuake
    /...
menu.vcs=RapidSVN/SVN-Checkout/SVN/CVS
menu.sys=Commander/QEmu/UltraISO/Everest/...
menu.bib=BibEdit/BibDB/WBibDB/JabRef
...
[Commands]
```

Note that any utility (say xyz) can be easily invoked via command like *util xyz* in the $\mathcal{M}$TEX DOS Prompt, which will invoke *add_util.btm* to start download-and-install-on-the-fly if the utility is not installed with $\mathcal{M}$TEX.

8 Additional Notes

Users of $\mathcal{M}$TEX may send suggestions, comments, or bug reports to `mtex-suite@googlegroups.com` or submit/reply posts in $\mathcal{M}$TEX-Suite Googlegroup[84]. Users of $\mathcal{M}$TEX are suggested to subscribe to $\mathcal{M}$TEX-Suite Googlegroup by sending an

email to mtex-suite+subscribe@googlegroups.com. After subscription, users will be able to receive latest updates or messages on using $\mathcal{M}$TEX, and can also post questions or suggestions in using $\mathcal{M}$TEX or LATEX or XeTEX or any meaningful related things. Usually, the authors of $\mathcal{M}$TEX or other $\mathcal{M}$TEX users may help to answer the questions soon. The official website[1] of $\mathcal{M}$TEX is still under construction and it will be updated soon with a new release in year 2012. And the users can find more personal information of the author on the author's homepage [85].

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Bashful Writing and Active Documents

Yossi Gil

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Abstract: Computerized typesetting still relies on metaphors drawn from the letterpress printing domain and is still concerned largely with the production of documents printed on paper. *Active documents* is an emerging technology by which the product of computerized typesetting is more than an aesthetically pleasing composition of letters, words and punctuation characters broken into lines and pages. An active document offers modes of interaction with its reader, while the document itself may change its content in response to events taking place in the external world. *Bashful documents*, the concept proposed by the `bashful` package, and discussed in this article, extend the user interaction offered by active documents to the time of the document creation. For example, the author of a textbook on computer programming may use `bashful` to automatically include in the text a transcript of a demonstration program, that is a precise replica of the program's execution at the time the document was authored. When writing a report on an important experiment, a scientist may employ `bashful` to automatically execute the experiment, whenever the report's text is run through LaTeX, and even include the experiment's results in the output document.

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Bashful Writing and Active Documents

Joseph (Yossi) Gil*

Abstract In many ways, computerized typesetting still relies on metaphors drawn from the letterpress printing domain and is concerned largely with the production of documents printed on paper. Active documents is an emerging technology by which the product of computerized typesetting is more than an aesthetically pleasing composition of letters, words and punctuation characters broken into lines and pages. An active document offers modes of interaction with its reader, while the document itself may change its content in response to events taking place in the external world.

Bashful documents, the concept proposed by the LaTeX bashful package (implemented as a wrapper around the `\write18` internal macro[a] extend this interaction to the *time of the document creation*. The author of a textbook on computer programming, may use bashful to automatically include in the text a transcript of a demonstration program, as it was executed in the time the document was authored. When writing a report on an experiment, a scientist may employ bashful to automatically execute the experiment, whenever the report text is run through LaTeX, and even include the results in the output document. In fact, using bashful a document may include anything that can be computed, at the time of creation, by BASH, and the numerous Unix commands[b] it may invoke.

[a] In this document, I refer to TeX commands or macros, also called control sequences, solely as "macros".

[b] The term "commands" shall refer both to Unix programs which can be invoked from the command line prompt, and to BASH internal commands.

1 Introduction

At the time I run this document through LaTeX, the temperature in Jerusalem, Israel, was *18°C*, while the weather condition was *clear*.

You may not care so much about these bits of truly ephemeral value, but you may be surprised that this information was produced automatically by the very

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process of LaTeXing. The LaTeX source of this document included two sequences of commands, the first responsible for producing the temperature and the second for producing the weather condition. Each of these sequences was executed as the source was run through LaTeX; the output of this execution then replaced the sequence and then laid out as part of the text.

1.1 Dynamic Web Pages

It should be mentioned that the entire bashful process is similar to the method of generating dynamic web pages by "server-side scripting", including processors such as PHP, ASP, and Java server pages.

An author of a web site which employs PHP technology may start the creation of a page in his site by writing a simple text file named `good.php`, with the following content

```
<html>
  <body bgcolor="black" text="yellow">
    <?php
     $hour = date("G");
      if ($hour < 12)
        echo "Good morning, dear surfer!";
      else
        echo "Good evening, dear surfer!";
    ?>
  </body>
</html>
```

Just before this web page is delivered to the surfing user, the web server runs the page through a *PHP processor*, which executes all text enclosed between "`<?php`" and "`?>`" as a PHP program, replacing this text with the output of this program. The PHP program in this case is

```
$hour = date("G");
 if ($hour < 12)
   echo "Good morning, dear surfer!";
 else
   echo "Good evening, dear surfer!";
```

while the output of this program is either

```
Good morning, dear surfer!
```

or

```
Good evening, dear surfer!
```

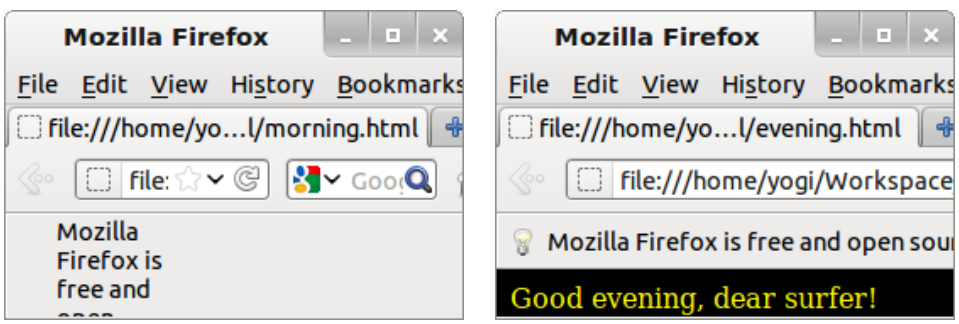
Thus, depending on the time of day in which the request was made to the web server, file `good.php` will be sent to the user's browser as either

```
<html>
  <body bgcolor="black" text="yellow">
    Good morning, dear surfer!  </body>
</html>
```

or

```
<html>
  <body bgcolor="black" text="yellow">
    Good evening, dear surfer!  </body>
</html>
```

And, the display on the user's web browser will be as in Figure 1.



(a) **(b)**

Figure 1: Two views of the same dynamic web page

1.2 Dynamic vs. Active vs. Bashful Documents

As we have seen a *dynamic document* is a document whose content may change just before it is delivered to the end user. *Active documents* go a step further, allowing the user to interact with document, by e.g., filling in forms included in the document, to click on buttons, navigate within and outside the document etc. This is made possible by technologies such as "client-side scripting", HTML forms and PDF interactive elements.

In contrast, *bashful documents* are characterized by the fact that their *generation* may yield different results, based on the time and the environment of the creation. For example, the weather report at the beginning of this document was produced by employing the bashful package to automatically make an HTTP connection to Google's weather service and then incorporate the result into the document.

We can also distinguish a class of *introspective documents*, whose content depends on meta-information of the contents. The sentence

> *"The document you are reading now was prepared from a single input file named* `00.tex`*, containing* 737 *lines and* 3790 *words of text."*

is an example of an introspective content in this article.

The main application of the bashful package is in the preparation of computer programming articles and textbooks. Ideally, such a textbook would not use a single programming example without testing it. My inspiration in writing the bashful package dates to back to first edition of the seminal "The C Programming Language" book by Kernighan and Ritchie, widely known as K&R. The preface of this first edition tells its reader:

> *All examples have been tested directly from the text, which is in machine-readable form.*

And the second edition of K&R reiterates:

> *As before, all examples have been tested directly from the text, which is in machine-readable form.*

Bashful documents extend this idea a step further by executing and testing the programs directly by the processing of the text by LaTeX.

The article you are reading now is in itself a bashful document. The little PHP program you have just seen was generated and executed directly by the text processor, which was even employed to generate the screen captures in Figure 1.

This article also makes an example of an introspective document: It not only uses the bashful package a number of times to show programming examples; it also shows the reader what exactly I wrote in the input to produce this examples. And, as you may expect, the macros that I used are not shown to you by me manually copying the LaTeX input and then pasting it into a `verbatim` environment. Instead, the text processor is employed to introspectively fetch these macros from the input text. Clearly, one of the main applications of introspection is for writing documents that teach their readers how to use LaTeX.

Outline The remainder of this article is organized as follows. Section 2 explains the bashful basics and demonstrates how it can be used for writing computer programming textbooks. If you are interested in using bashful for writing documents discussing computer programming, this section, together with the bashful package documentation should suffice.

The process by which the weather report at the time of authoring was included in the beginning of this article is revealed in Section 3. Section 4 sheds some light on bashful internals, providing hints on dealing with errors.

As you read this article, note that document introspection is used extensively to show the actual input text in which the bashful package was used. I explain how this was done in Section 5.

For the sake of completeness, the full LaTeX source of this article is offered in Appendix A. Interested readers may examine this source to learn more, e.g., how Figure 1 was generated.

2 Bashful in Action

To demonstrate the bashful process, I now present a simple story of writing, compiling and executing and a simple program: Hello, World! in the C programming language: Then, I shall explain how the bashful package was employed to play the story live, that is, authoring the program, compiling it and executing it, all from within LaTeX.

2.1 "Hello, World!", Said Again

My story begins with the creation of a text file named `hello.c`, in which the program is stored.

```
% cat << EOF > hello.c
/*
** hello.c: My first C program; it prints
** "Hello, World!", and dies.
*/
#include <stdio.h>
int main()
{
  printf("Hello, World!\n");
```

```
  return 0;
}
EOF
```

(In the above, I used the `cat` Unix command to create a file in a manner known as *here document*, where my delimiting identifier was the string `EOF`.)

Once I have written my program, it is only natural to invoke the C compiler to translate it into an executable.

```
% cc hello.c
```

My little story reaches its climax when the program I created and compiled is executed, making sure that it prints the desired "Hello, World!" greeting.

```
% ./a.out
Hello, World!
```

2.2 Retrospection

The document you are reading was generated from a LaTeX input file whose name is `00.tex`. Examining file `00.tex`, you can see what I wrote in it to tell my story of the creation of file `hello.c` at the beginning of Section 2.1 above.

```
325  \subsection{``Hello, World!'', Said Again}\label{Section:story}
326  My story begins with the creation of a text file named
327    \texttt{hello.c}, in which the program is stored.
328  \bash[environment=quote,script]
329  cat << EOF > hello.c
330  /*
331  ** hello.c: My first C program; it prints
332  ** "Hello, World!", and dies.
333  */
334  #include <stdio.h>
335  int main()
336  {
337    printf("Hello, World!\n");
338    return 0;
339  }
340  EOF
341  \END
```

In doing so, all the text between the `\bash` (line 328) and `\END` (line 341) was copied by LaTeX to a temporary script file; this script is then sent for execution by Bash. The `script` option instructed the `\bash` macro to list this file in

the main document, while the `environment=quote` option instructed the `\bash` macro enclose the listing in a `quote` environment, i.e., between `\begin{quote}` and `\end{quote}`.

Note that two characters, "%␣", were automatically prepended to the script by the `\bash` macro. This is not an incident: %␣ is the default BASH prompt. Prepending it makes it clear to the reader that the script file is input to BASH. (The `prefix` option to the `\bash` macro can be used to change this prefix string.)

To compile file `hello.c` that I just created, my `00.tex` included another `\bash` ... `\END` pair.

```
Once I have written my program, it is only natural to invoke
  the~C compiler to translate it into an executable.
\bash[environment=quote,script,stderr]
cc hello.c
\END
```

As before, in writing these I achieved two objectives: first, when LaTeX processed `00.tex`, it also invoked the C compiler to compile file `hello.c`, the file which I just created. Second, thanks to the `script` option, the command for compiling this program was included in the typeset version of this document. The `stderr` flag instructed the `\bash` macro to record the standard error stream of the script's execution, and layout this record further to the script. As can be seen above, the program I wrote was correct, the compilation process did not generate any error messages, and the standard error stream was left empty.

Finally, I executed the program I wrote. Here is another excerpt of `00.tex` showing how this was done.

```
My little story reaches its climax when the program I created
  and compiled is executed, making sure that it prints the
  desired ``Hello, World!'' greeting.
\bash[environment=quote,script,stdout]
./a.out
\END
```

The `stdout` flag passed to the `\bash` macro above, instructs it to append to the script's listing the standard output stream that this execution produces, i.e., the string `Hello, World!`, as printed by program `a.out` to its standard output stream.

2.3 Input Processing

The \bash command is defined in package bashful. To make use of this package, I wrote in the preamble of 00.tex:

```
\usepackage[verbose,unique]{bashful}
```

The verbose boolean package option instructed the bashful package to be chatty, typing out for me a lot of information on what it does as the document is processed by LaTeX. The unique option instructs the package to use unique names, generated from the TeX's job name (\jobname) and the current line number. This option is essential for documents, such as the present document, in which the \bash command is used many times.

Allowing LaTeX to run arbitrary shell commands can be dangerous—you never know whether that nice looking .tex file you received by email was prepared by a friend or a foe. This is the reason that you have to tell LaTeX explicitly that shell escapes are allowed. The -shell-escape command line flag does that. To process my document, I typed, at the command line,

```
% xelatex -shell-escape 00.tex
```

3 Producing The Weather Information

A similar application of \bash to escape to shell was also used to produce the above Jerusalem weather report. However, since I wanted this information inlined in the text, I could not rely on the stdout flag to list the standard output of commands.

Instead, I wrote a series of shell commands that retrieve the current temperature, and another such series to obtain the current weather conditions. The command series to obtain the current temperature, was placed in a file named temperature.sh:

```
location=Jerusalem,Israel
server="http://www.Google.com/ig/api"
request="$server?weather=$location"
wget -q -O - $request |\
tr "<>" "\012\012" |\
grep temp_c |\
sed 's/[^0-9]//g'
```

while the weather condition was placed in a file named `condition.sh`

```
location=Jerusalem,Israel
server="http://www.Google.com/ig/api"
request="$server?weather=$location"
wget -q -O - $request |\
tr "<>" "\012\012" |\
grep "condition data" |\
head -n 1 |\
sed -e 's/^.*="//' -e 's/"\/*//' |\
tr 'A-Z' 'a-z'
```

I then executed the scripts `temperature.sh`, and `temperature.sh`, redirecting their output to files `temperature.tex` and `condition.tex`. All that remained was `\input` these two files in my `00.tex`.

```
At the time I run this document through
  \href{http://www.latex-project.org/}{\LaTeX},
  the \hypertarget{report}{temperature} in
  \href{http://en.wikipedia.org/wiki/Jerusalem}{Jerusalem},
  Israel, was~\emph{\input{temperature}\unskip\celsius},
  while the weather condition was \emph{\input{condition}}\unskip.
```

I could have created files `temperature.sh` and `condition.sh` manually, but it made much more sense to both create and execute these using the `\bash` macro. For `temperature.sh`, I wrote in `00.tex`

```
\bash[scriptFile=temperature.sh,prefix={},stdoutFile=temperature.tex]
location=Jerusalem,Israel
server="http://www.Google.com/ig/api"
request="$server?weather=$location"
wget -q -O - $request |\
tr "<>" "\012\012" |\
grep temp_c |\
sed 's/[^0-9]//g'
\END
```

Passing the option `scriptFile=temperature.sh` instructed `\bash` to use the name `temperature.sh` to the script file it generated. The `prefix={}` option eliminated the Bash prompt that is normally prepended to the script. The third option, `stdoutFile=temperature.tex` saved the redirected output in a file named `temperature.tex`. Since none of the `script`, `stdout` and `stderr` flags was used, the execution of the script did not generate any text for typesetting by LaTeX.

What I wrote for generating `condition.sh`, executing it, and saving the output in

`condition.tex` was very similar.

```
\bash[scriptFile=condition.sh,prefix={},stdoutFile=condition.tex]
location=Jerusalem,Israel
server="http://www.Google.com/ig/api"
request="$server?weather=$location"
wget -q -O - $request |\
tr "<>" "\012\012" |\
grep "condition data" |\
head -n 1 |\
sed -e 's/^.*="//' -e 's/"\/*//' |\
tr 'A-Z' 'a-z'
\END
```

4 Dealing with Errors

Using bashful to demonstrate my *Hello, World!* program, made sure that the story I told is accurate: I really did everything I told the reader I did. More accurately, the `\bash` command, acting as my proxy, did it for me.

Luckily, the program I wrote was correct. But, if it was not, the `\bash` macro would have detected the error, and would have stopped the LaTeX process, indicating that the compilation did not succeed. To manage errors you should understand that the execution of the `\bash` macro involves the following steps:

1. collecting all text up to `\END`;
2. placing this text in a script file;
3. executing this script file, redirecting its standard output and its standard error streams to distinct files;
4. checking whether the exit code of the execution indicates an error (i.e., exit code which is different from 0), and if so, place this exit code in a distinct file;
5. checking whether the file containing the standard error is empty, and if not, pausing execution after displaying an error message; and,
6. checking whether the file containing the exit code is empty, and if not, pausing execution after displaying an error message;

After the completion of these steps, the `\bash` macro may incorporate for typesetting three files in order: the script file (if the script flag is present), the standard output file (if the stdout flag is present), and then the standard error file (if the stderr flag is present).

Let me demonstrate a situation in which the execution of the script generates an error. To do that, I will write a short LaTeX file, named `error.tex` which tries to use `\bash` to compile an incorrect C program. Since `error.tex` contains `\END`, I will have to author this file in three steps:

1. Creating the header of `error.tex`:
```
% cat << EOF > error.tex
\documentclass{article}
\usepackage[a6paper]{geometry}
\usepackage{bashful}
\pagestyle{empty}
\begin{document}
This document creates a simple erroneous C program
  and then compiles it.
\bash[script,stdout]
echo "main(){return int;}" > error.c
cc error.c
EOF
```
2. Adding `\END` to `error.tex`
```
% echo "\\END" >> error.tex
```
3. Finalizing `error.tex`
```
% cat << EOF >> error.tex
(I do not really expect the one-line
program generated above to compile.)
\end{document}
EOF
```

Let me verify that `error.tex` is what I expect it to be:
```
% cat error.tex
\documentclass{article}
\usepackage[a6paper]{geometry}
\usepackage{bashful}
\pagestyle{empty}
\begin{document}
This document creates a simple erroneous C program
  and then compiles it.
```

```
\bash[script,stdout]
echo "main(){return int;}" > error.c
cc error.c
\END
(I do not really expect the one-line
program generated above to compile.)
\end{document}
```

I am now ready to run `error.tex` through LaTeX, but since I will not run the `latex` command myself, I will send a "q" character to it to abort execution when the anticipated error occurs.

```
% yes q | xelatex -shell-esc error.tex | sed /texmf-dist/d
This is XeTeX, Version 3.1415926-2.3-0.9997.5 (TeX Live 2011)
 \write18 enabled.
entering extended mode
(./error.tex
LaTeX2e <2011/06/27>
Babel <v3.8m> and hyphenation patterns for english, dumylang, nohyphenation, ge
rman-x-2011-07-01, ngerman-x-2011-07-01, afrikaans, ancientgreek, ibycus, arabi
c, armenian, basque, bulgarian, catalan, pinyin, coptic, croatian, czech, danis
h, dutch, ukenglish, usenglishmax, esperanto, estonian, ethiopic, farsi, finnis
h, french, galician, german, ngerman, swissgerman, monogreek, greek, hungarian,
 icelandic, assamese, bengali, gujarati, hindi, kannada, malayalam, marathi, or
iya, panjabi, tamil, telugu, indonesian, interlingua, irish, italian, kurmanji,
 lao, latin, latvian, lithuanian, mongolian, mongolianlmc, bokmal, nynorsk, pol
ish, portuguese, romanian, russian, sanskrit, serbian, serbianc, slovak, sloven
ian, spanish, swedish, turkish, turkmen, ukrainian, uppersorbian, welsh, loaded
.
Document Class: article 2007/10/19 v1.4h Standard LaTeX document class
*geometry* driver: auto-detecting
*geometry* detected driver: xetex

Standard error not empty. Here is how
file error.stderr begins:
>>>>error.c: In function main:
>>>>
but, you really ought to examine this file yourself!
! Your shell script failed....
\checkScriptErrors@BL ...r shell script failed...}
                                                  \BL@verbosetrue \logBL {Sw...
l.11 \END

? OK, entering \batchmode
```

(Observe that in the above I used the `sed` command to remove the mundane and lengthy logging messages of my `textmf` distribution.[1])

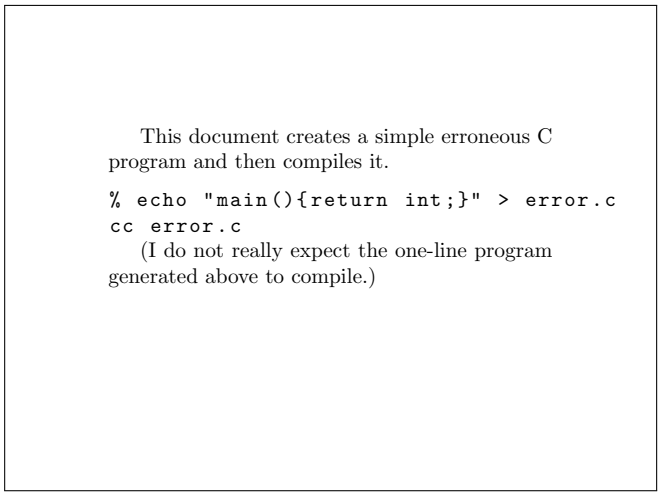
You can see that when LaTeX tried to process `error.tex`, it stopped execution

1. I also switched to a smaller font size, to allow the output to fit within the boundaries of the printed page.

while indicating that file `error.stderr` was not empty after the compilation. The first line of `error.stderr` was displayed, and I was advised to examine this file myself. Inspecting `error.stderr`, we see the C compiler error messages:

```
% cat error.stderr
error.c: In function main:
error.c:1:15: error: expected expression before int
```

The compilation error did not prevent LaTeX from typesetting my document. This final layout is presented in Figure 2. Note that the failure to compile `hello.c`, did not stop `\bash` from including this file in the source.



This document creates a simple erroneous C program and then compiles it.

```
% echo "main(){return int;}" > error.c
cc error.c
```

(I do not really expect the one-line program generated above to compile.)

Figure 2: File `error.pdf`

There are cases in which the author intends the executed script to generate errors. The `stderr` option to the `\bash` macro instructs it to *ignore* the exit code of the executed programww, and the fact that that output was generated to the standard error stream. Instead, `\bash` will include in its listing the contents of the standard error stream.

For example, to give you a taste of dealing with Bash script errors, I shall write below a passage expressing the frustration over Bash insisting on syntax trivialities.

```
A space must follow the opening square bracket; if not
  \textsc{Bash} would not find the~``\verb+[+'' command.
The following script may seem correct on first sight, yet, the
  error message it produces may seem weird to beginners.
```

```
\bash[prefix={},script,stdout,stderr]
if [2+2==5] ; then
  echo "Freedom is the freedom to say that two plus two"
  echo "make four. If that is granted, all else follows."
fi
\END
```

Indeed, newcomers to Bash may find conditionals confoudning. Annoying as it may sound, you have to remember rules such as: A space must follow the opening square bracket; if not Bash would not find the "[" command. The following script may seem correct on first sight, yet, the error message it produces may seem weird to beginners.

```
if [2+2==5] ; then
  echo "Freedom is the freedom to say that two plus two"
  echo "make four. If that is granted, all else follows."
fi
00@647.sh: line 1: [2+2==5]: command not found
```

The error message in the above was anticipated; it was included in the listing thanks to the `stderr` option. As explained, listing `stdout` instructs `\bash` to ignore the script's error code. LaTeX processing of `00.tex` does not stop as a result of this error.

5 Introspection

This article uses document introspection to show the actual input used to produce the examples. To achieve this, I used Unix commands to retrieve portions of `00.tex`, my input file, and `\input` these. As we shall see, the `sed` command proved instrumental in doing this.

Recall that at the beginning of Section 2.1, I wrote

> *My story begins with the creation of a text file named `hello.c`, in which the program is stored.*

Recall also that later, at the beginning of Section 2.2, I wrote

> *Examining file `00.tex`, you can see what I wrote in it to tell my story of the creation of file `hello.c` at the beginning of Section 2.1 above.*

And, immediately afterwards, I gave an excerpt of file `00.tex`.

To produce this excerpt, I applied the `sed` command to search in `00.tex`. Specifically, what I wrote in `00.tex` was the following

```
Examining file \me, you can see what I wrote in it to
  tell my story of the creation of file \texttt{hello.c}
  at the beginning of \autoref{Section:story} above.
\bash[stdout]
cat -n 00.tex | sed -n '/Said Again/,// { p
  /END/q }'
\END
```

I used the `cat` command to number my input lines, and then the `sed` command to printing these lines, starting at the first line that contains the string "Said Again", and ending with line that contains the string "END".

My use of `sed` implies that file `00.tex` includes the string "Said Again" at least twice. The first such occurrence was in the title of Section 2.1; the second occurrence was in the application of `sed` to introspectively search for the use of the `\bash` that followed this title. Subsequently, this document included several other occurrences of "Said Again" (including this sentence itself); but let us concentrate on the first two.

The search succeeded in finding the correct occurrence, since the search instructions occurred *after* it. You would need to apply a more sophisticated search in the case that you wish to present an input excerpt prior to its actual occurrence in the text. This was, for example, the case in the "taste" of Bash script errors offered in the previous section. I applied Gawk for this search. In case you are interested, the actual Unix pipeline I wrote was:

```
cat -n 00.tex|gawk '/A space must/{c++}c>1{print}/END/{if(c>1)exit}'
```

Acknowledgments The manner by which `\bash` collects its arguments is based on that of tobiShell. Martin Scharrer tips on TEX internals were invaluable in writing bashful.

A Source of `00.tex`

```
\documentclass{pracjourn}\TPJrevision{2012}{10}{18}
 \TPJissue{2012}{1} \TPJcopyright{ }

\usepackage[verbose,unique]{bashful}
\usepackage{gensymb,graphicx,xspace,amsmath}
```

```
\newcommand\bashful{\textsf{bashful}\xspace}
\newcommand\Bash{\texttt{\textup{\textbackslash bash}}\xspace}
\newcommand\me{\texttt{\textup{\jobname.tex}}\xspace}

\lstdefinestyle{input}{basicstyle=\ttfamily\footnotesize,
    keywords={},upquote=true,extendedchars=false,
    showstringspaces=false,aboveskip=0pt,belowskip=0pt}
\lstdefinestyle{scriptsize}{style=input,basicstyle=\ttfamily\scriptsize}

% listings style for the script, standard output file, and standard error file.
\lstdefinestyle{bashfulScript}{style=input}
\lstdefinestyle{bashfulStdout}{style=input}
\lstdefinestyle{bashfulStderr}{style=input,
        basicstyle=\ttfamily\footnotesize\color{red}}

\newcommand\listFile[1]{%
  \vspace{0.8em plus 0.3em minus 0.3em}%
  \lstinputlisting[style=input,frameround=ftttt,frame=trBL]{#1}%
  \vspace{0.8em plus 0.3em minus 0.3em}}

\title{Bashful Writing and Active Documents}
\author{Joseph (Yossi) Gil\thanks{yogi@CS.Technion.AC.IL}}
\abstract{%
In many ways, computerized typesetting still relies on metaphors drawn from the
  \href{http://en.wikipedia.org/wiki/Letterpress_printing} {letterpress
  printing} domain and is concerned largely with the production of documents
  printed on paper.
Active documents is an emerging technology by which the product of computerized
  typesetting is more than an aesthetically pleasing composition of letters,
  words and punctuation characters broken into lines and pages.
An active document offers modes of interaction with its reader, while the
  document itself may change its content in response to events taking place in
  the external world.
  \par
\emph{Bashful documents}, the concept proposed by the \LaTeX{}
  \href{http://ctan.org/tex-archive/macros/latex/contrib/bashful}{\bashful}
  package (implemented as a wrapper around the \texttt{\textbackslash write18}
  internal macro\footnote{%
    In this document, I refer to \TeX{} commands or macros, also called control
    sequences, solely as ``macros''.}\mbox{ }
  extend this interaction to the \emph{time of the document creation}.
The author of a textbook on computer programming, may use \bashful to
  automatically include in the text a transcript of a demonstration program, as
  it was executed in the time the document was authored.
When writing a report on an experiment, a scientist may employ \bashful to
  automatically execute the experiment, whenever the report text is run through
  \LaTeX{}, and even include the results in the output document.
In fact, using \bashful a document may include anything that can be computed,
  at the time of creation, by
 \href{http://en.wikipedia.org/wiki/Bash\_(Unix\_shell)}{\textsc{bash}},
  and the numerous Unix commands\footnote{The term ``commands'' shall
    refer both to \href{http://en.wikipedia.org/wiki/Unix}{Unix} programs which
    can be invoked from the command line prompt, and to \textsc{Bash} internal
```

```
    commands.}\mbox{ } it may invoke.
}

\begin{document}

\maketitle

\section{Introduction}
\bash[scriptFile=temperature.sh,prefix={},stdoutFile=temperature.tex]
location=Jerusalem,Israel
server="http://www.Google.com/ig/api"
request="$server?weather=$location"
wget -q -O - $request |\
tr "<>" "\012\012" |\
grep temp_c |\
sed 's/[^0-9]//g'
\END

\bash[scriptFile=condition.sh,prefix={},stdoutFile=condition.tex]
location=Jerusalem,Israel
server="http://www.Google.com/ig/api"
request="$server?weather=$location"
wget -q -O - $request |\
tr "<>" "\012\012" |\
grep "condition data" |\
head -n 1 |\
sed -e 's/^.*="//' -e 's/"\/*//' |\
tr 'A-Z' 'a-z'
\END

At the time I run this document through
  \href{http://www.latex-project.org/}{\LaTeX},
  the \hypertarget{report}{temperature} in
  \href{http://en.wikipedia.org/wiki/Jerusalem}{Jerusalem},
  Israel, was~\emph{\input{temperature}\unskip\celsius},
  while the weather condition was \emph{\input{condition}}\unskip.

You may not care so much about these bits of truly ephemeral value,
  but you may be surprised that this information was produced automatically
  by the very process of \LaTeX{}ing.
The \LaTeX{} source of this document included two sequences of commands, the
  first responsible for producing the temperature and the second for producing
  the weather condition.
Each of these sequences was executed as the source was run through \LaTeX{};
  the output of this execution then replaced the sequence and then laid out as
  part of the text.

\subsection{Dynamic Web Pages}
It should be mentioned that the entire bashful process is similar to the method
  of generating \href{http://en.wikipedia.org/wiki/Dynamic_web_page}{dynamic
  web pages} by ``\href{http://en.wikipedia.org/wiki/Server-side_scripting}
  {server-side scripting}'', including processors such as
  \href{http://en.wikipedia.org/wiki/PHP}{PHP},
```

```
  \href{http://en.wikipedia.org/wiki/Active_Server_Pages}{ASP}, and
  \href{http://en.wikipedia.org/wiki/JavaServer_Pages}{Java server pages}.

An author of a web site which employs PHP technology may start the creation of
 a page in his site by writing a simple text file named \texttt{good.php}, with
  the following content
\bash[scriptFile=good.sh]
cat << EOF > good.php
<html>
  <body bgcolor="black" text="yellow">
    <?php
     \$hour = date("G");
      if (\$hour < 12)
        echo "Good morning, dear surfer!";
      else
        echo "Good evening, dear surfer!";
    ?>
  </body>
</html>
EOF
\END
\listFile{good.php}

Just before this web page is delivered to the surfing user, the web server runs
  the page through a \emph{PHP processor}, which executes all text enclosed
  between~``\texttt{<?php}'' and ``\texttt{?>}'' as a PHP program, replacing
  this text with the output of this program.
The PHP program in this case is
\bash[stdout,stdoutFile=good.html,scriptFile=good.php.sh]
sed -n "/hour/,/evening/ p" good.php
\END
while the output of this program is either
\bash[stdout,stdoutFile=morning.out,scriptFile=morning.sh]
grep morning good.php | sed -e s/echo// -e "s/;//" -e "s/\"//g"
\END
or
\bash[stdout,stdoutFile=evening.out,scriptFile=evening.sh]
grep evening good.php | sed -e s/echo// -e "s/;//" -e "s/\"//g"
\END

Thus, depending on the time of day in which the request was made to the web
  server, file \texttt{good.php} will be sent to the user's browser as either
\bash[scriptFile=morning.html.sh]
php good.php | sed s/evening/morning/ > morning.html
\END
\listFile{morning.html}
or
\bash[scriptFile=evening.html.sh]
php good.php | sed s/morning/evening/ > evening.html
\END
\listFile{evening.html}

And, the display on the user's web browser will be
```

```
  as in \autoref{Figure:firefox}.

\begin{figure}[!h]
\bash[scriptFile=firefox.sh,ignoreStderr]
rm evening.png morning.png
firefox=`pgrep firefox`
if [ -n "$firefox" ]; then
  wmctrl -c firefox
  kill $firefox
  killall firefox
fi
firefox -CreateProfile delme
firefox -P delme morning.html &
sleep 2
wmctrl -r "Mozilla Firefox" -b remove,maximized_vert,maximized_horz
wmctrl -r "Mozilla Firefox" -e 0,0,0,270,150
sleep 1
scrot -u morning.png
wmctrl -c firefox
killall firefox
firefox -P delme evening.html &
sleep 2
wmctrl -r "Mozilla Firefox" -b remove,maximized_vert,maximized_horz
wmctrl -r "Mozilla Firefox" -e 0,0,0,270,150
scrot -u evening.png
wmctrl -c firefox
killall firefox
if [ -n "$firefox" ]; then
  echo $firefox
  firefox -P default &
fi
\END
\centering
\begin{tabular}{cc}
\includegraphics[width=0.4\textwidth]{morning.png}
&
\includegraphics[width=0.4\textwidth]{evening.png}
\\
\bfseries (a) & \bfseries (b)
\end{tabular}
\caption{Two views of the same dynamic web page}
\label{Figure:firefox}
\label{firefox}
\end{figure}

\subsection{Dynamic vs. Active vs. Bashful Documents}
As we have seen a \emph{dynamic document} is a document whose content may
  change just before it is delivered to the end user.
\emph{Active documents} go a step further, allowing the user to interact with
  document, by e.g., filling in forms included in the document, to click on
  buttons, navigate within and outside the document etc.
This is made possible by technologies such as
  \href{http://en.wikipedia.org/wiki/Client\_side\_scripting}{``client-side
```

```
  scripting''}, \href{http://en.wikipedia.org/wiki/HTML\_forms}{HTML forms}
  and \href{http://en.wikipedia.org/wiki/%
  Portable\_Document\_Format\#Interactive\_elements}
  {PDF interactive elements}.

In contrast, \emph{bashful documents} are characterized by the fact that their
 \emph{generation} may yield different results, based on the time and the
  environment of the creation.
For example, the weather report at the \hyperlink{report}{beginning} of this
  document was produced by employing the \bashful package to automatically make
  an \href{http://en.wikipedia.org/wiki/Hypertext_Transfer_Protocol}{HTTP}
  connection to \href{http://www.Google.com/support/forum/p/ apps-apis/thread?%
  tid=0c95e45bd80def1a&hl=en}{Google's weather service} and then incorporate
  the result into the document.

We can also distinguish a class of \emph{introspective documents}, whose
  content depends on meta-information of the contents.  The sentence
\begin{quote}
\bash
wc -l 00.tex | sed s/00.tex// > lines.tex
wc -w 00.tex | sed s/00.tex// > words.tex
\END
``\textsl{The document you are reading now was prepared from a single input file
  named \me, containing \emph{\input{lines}\unskip} lines and
  \emph{\input{words}\unskip} words of text.}''
\end{quote}
is an example of an introspective content in this article.

The main application of the \bashful package is in the preparation of computer
  programming articles and textbooks.
Ideally, such a textbook would not use a single programming example without
  testing it.
My inspiration in writing the \bashful package
  dates to back to first edition of the seminal
  \href{http://en.wikipedia.org/wiki/The_C_Programming_Language}
    {``The C Programming Language''} book by
 \href{http://en.wikipedia.org/wiki/Brian_Kernighan}
      {Kernighan} and
 \href{http://en.wikipedia.org/wiki/Dennis\_Ritchie}
    {Ritchie}, widely known as K\&R.
The preface of this first edition tells its reader:
\begin{quote}
  \textit{All examples have been tested directly from the text,
  which is in machine-readable form.}
\end{quote}
And the second edition of K\&R reiterates:
\begin{quote}
  \textit{As before,
      all examples have been tested directly from the text,
        which is in machine-readable form.}
\end{quote}
Bashful documents extend this idea a step further by executing and testing the
  programs directly by the processing of the text by \LaTeX.
```

```
The article you are reading now is in itself a bashful document.
The little PHP program you have just seen was generated and executed directly
  by the text processor, which was even employed to generate the screen captures
  in \autoref{Figure:firefox}.

This article also makes an example of an introspective document:
It not only uses the \bashful package a number of times to show programming
  examples; it also shows the reader what exactly I wrote in the input to
  produce this examples.
And, as you may expect, the macros that I used are not shown to you by me
  manually copying the \LaTeX{} input and then pasting it into a
  \texttt{verbatim} environment.
Instead, the text processor is employed to introspectively fetch these macros
  from the input text.
Clearly, one of the main applications of introspection is for writing documents
  that teach their readers how to use \LaTeX{}.

\renewcommand\sectionautorefname{Section}
\renewcommand\subsectionautorefname{Section}
\paragraph{Outline}
The remainder of this article is organized as follows.
\autoref{Section:action} explains the \bashful basics and demonstrates how it
  can be used for writing computer programming textbooks.
If you are interested in using \bashful for writing documents discussing
  computer programming, this section, together with the \bashful package
  documentation should suffice.

The process by which the weather report at the time of authoring was included
  in the \hyperlink{report}{beginning} of this article is revealed in
  \autoref{Section:weather}.
\autoref{Section:errors} sheds some light on \bashful internals, providing hints
  on dealing with errors.

As you read this article, note that document introspection is used extensively
  to show the actual input text in which the \bashful package was used. I
  explain how this was done in \autoref{Section:introspection}.

For the sake of completeness, the full \LaTeX{} source of this article is
  offered in \autoref{Section:source}.
Interested readers may examine this source to learn more, e.g., how
  \autoref{Figure:firefox} was generated.

\section{Bashful in Action}\label{Section:action}
To demonstrate the bashful process, I now present a simple story of writing,
  compiling and executing and a simple program:
  \href{http://en.wikipedia.org/wiki/Hello_world_program}{Hello, World!} in the
  \href{http://en.wikipedia.org/wiki/C_(programming_language)}{C programming
  language}:
Then, I shall explain how the \bashful package was employed to play the story
  live, that is, authoring the program, compiling it and executing it, all from
  within \LaTeX{}.
```

```
\subsection{``Hello, World!'', Said Again}\label{Section:story}
My story begins with the creation of a text file named
  \texttt{hello.c}, in which the program is stored.
\bash[environment=quote,script]
cat << EOF > hello.c
/*
** hello.c: My first C program; it prints
** "Hello, World!", and dies.
*/
#include <stdio.h>
int main()
{
  printf("Hello, World!\n");
  return 0;
}
EOF
\END
(In the above, I used the \href{http://en.wikipedia.org/wiki/Cat\_(Unix)}
  {\texttt{cat}} Unix command to create a file in a manner known as
  \href{http://en.wikipedia.org/wiki/Here_document}{\emph{here document}}, where
   my delimiting identifier was the string \texttt{EOF}.)

Once I have written my program, it is only natural to invoke
  the~C compiler to translate it into an executable.
\bash[environment=quote,script,stderr]
cc hello.c
\END
My little story reaches its climax when the program I created
  and compiled is executed, making sure that it prints the
  desired ``Hello, World!'' greeting.
\bash[environment=quote,script,stdout]
./a.out
\END

\subsection{Retrospection}\label{Section:retrospection}
The document you are reading was generated from a \LaTeX{} input file whose name
  is \me.
Examining file \me, you can see what I wrote in it to
  tell my story of the creation of file \texttt{hello.c}
  at the beginning of \autoref{Section:story} above.
\bash[stdout]
cat -n 00.tex | sed -n '/Said Again/,// { p
  /END/q }'
\END
% Applies sed to introspectively search the input

\bash
cat -n 00.tex | sed -n '/Said Again/,// {
  /\\bash/ { =
    q
  }
}'
\END\let\firstBash\bashStdout
```

```
\bash
cat -n 00.tex | sed -n '/Said Again/,// {
  /END/ {
    =
    q
  }
}'
\END\let\lastBash\bashStdout

In doing so, all the text between the \Bash (line \firstBash) and \verb+\END+
  (line \bashStdout) was copied by \LaTeX{} to a temporary script file; this
  script is then sent for execution by \textsc{Bash}.
The \texttt{script} option instructed the \Bash macro to list this file in the
  main document, while the \texttt{environment=quote} option instructed the
 \Bash macro enclose the listing in a \texttt{quote} environment, i.e., between
 \verb+\begin{quote}+ and \verb+\end{quote}+.

Note that two characters, ``\verb*+% +'', were automatically prepended to the
  script by the \Bash macro.
This is not an incident: \verb*+% + is the default \textsc{Bash}
  \href{http://en.wikipedia.org/wiki/Command-line_interface\#Command_prompt}
  {prompt}.
Prepending it makes it clear to the reader that the script file is input to
  \textsc{bash}.
(The \texttt{prefix} option to the \Bash macro can be used to change this
  prefix string.)

To compile file \texttt{hello.c} that I just created, my \texttt{00.tex}
  included another \Bash \ldots \verb+\END+ pair.
\bash[stdout]
cat -n 00.tex | sed -n '/Once I have written/,// { p
  /END/q }'
\END
As before, in writing these I achieved two objectives: first, when \LaTeX{}
  processed \me, it also invoked the~C compiler to compile file
  \texttt{hello.c}, the file which I just created.
Second, thanks to the \texttt{script} option, the command for compiling this
  program was included in the typeset version of this document.
The \texttt{stderr} flag instructed the \Bash macro to record the standard
  error stream of the script's execution, and layout this record further to the
  script.
As can be seen above, the program I wrote was correct, the compilation process
  did not generate any error messages, and the standard error stream was left
  empty.

Finally, I executed the program I wrote.
Here is another excerpt of \me showing how this was done.
\bash[stdout]
cat -n 00.tex | sed -n '/climax/,// { p
  /END/q }'
\END
The \texttt{stdout} flag passed to the \Bash macro above, instructs it to
  append to the script's listing the standard output stream that this execution
```

```
  produces, i.e., the string \texttt{Hello, World!}, as printed by program
  \texttt{a.out} to its standard output stream.

\subsection{Input Processing}
The \Bash command is defined in package \bashful.
To make use of this package, I wrote in the preamble of \me:
\bash[stdout]
cat -n 00.tex | sed -n '/bashful/,// { p
  /bashful/q }'
\END
The \texttt{verbose} boolean package option instructed the \bashful package to
  be chatty, typing out for me a lot of information on what it does as the
  document is processed by \LaTeX{}.
The \texttt{unique} option instructs the package to use unique names,
  generated from the \TeX{}'s job name (\verb+\jobname+) and the
  current line number.
This option is essential for documents, such as the present document,
  in which the \verb+\bash+ command is used many times.

Allowing \LaTeX{} to run arbitrary shell commands can be dangerous---you never
  know whether that nice looking \texttt{.tex} file you received by email was
  prepared by a friend or a foe.
This is the reason that you have to tell \LaTeX{} explicitly that shell escapes
  are allowed.
The \texttt{-shell-escape} command line flag does that.
To process my document, I typed, at the command line,
\begin{quote}
  \texttt{\% xelatex -shell-escape \me}
\end{quote}

\section{Producing The Weather Information} \label{Section:weather}
A similar application of \Bash to escape to shell was also used to
  produce the above Jerusalem weather report.
However, since I wanted this information inlined in the text, I could not rely
  on the \texttt{stdout} flag to list the standard output of commands.

Instead, I wrote a series of shell commands that retrieve the current
  temperature, and another such series to obtain the current weather conditions.
The command series to obtain the current temperature, was placed in a file
  named \texttt{temperature.sh}:
\listFile{temperature.sh}
while the weather condition was placed in a file named \texttt{condition.sh}
\listFile{condition.sh}

I then executed the scripts \texttt{temperature.sh}, and
  \texttt{temperature.sh}, redirecting their output to files
  \texttt{temperature.tex} and \texttt{condition.tex}.
All that remained was \verb+\input+ these two files in my \texttt{\jobname.tex}.
\bash[stdout,stdoutFile=weather.tex]
cat -n 00.tex | sed -n '/At the time I run/,// { p
  /while the weather condition/q }'
\END
```

```
I could have created files \texttt{temperature.sh} and \texttt{condition.sh}
  manually, but it made much more sense to both create and execute these using
  the \Bash macro.
For \texttt{temperature.sh}, I wrote in \texttt{\jobname.tex}
\bash[stdout,stdoutFile=temperature.lst]
cat -n 00.tex | sed -n '/temperature.sh/,// { p
  /END/q }'
\END
\noindent
Passing the option \texttt{scriptFile=temperature.sh} instructed \Bash to
  use the name \texttt{temperature.sh} to the script file it generated.
The \verb+prefix={}+ option eliminated the \textsc{Bash} prompt that is normally
        prepended to the script.
The third option, \verb+stdoutFile=temperature.tex+ saved the
  redirected output in a file named \texttt{temperature.tex}.
Since none of the \texttt{script}, \texttt{stdout} and \texttt{stderr} flags
  was used, the execution of the script did not generate any text for
  typesetting by \LaTeX{}.

\noindent What I wrote for generating \texttt{condition.sh},
  executing it, and saving the output in \texttt{condition.tex}
  was very similar.
\bash[stdout]
cat -n 00.tex | sed -n '/condition.sh/,// { p
  /END/q }'
\END

\section{Dealing with Errors}\label{Section:errors}
Using \bashful{} to demonstrate my \emph{Hello, World!} program, made sure that
  the story I told is accurate:
I really did everything I told the reader I did.
More accurately, the \Bash command, acting as my proxy, did it for me.

Luckily, the program I wrote was  correct.
But, if it was not, the \Bash macro would have detected the error, and
  would have stopped the \LaTeX{} process, indicating that the compilation did
  not succeed.
To manage errors you should understand that the execution of the \Bash
  macro involves the following steps:
\begin{enumerate}
\item collecting all text up to \verb+\END+;
\item placing this text in a script file;
\item executing this script file, redirecting its standard output
      and its standard error streams to distinct files;
\item checking whether the exit code of the execution indicates an error (i.e.,
  exit code which is different from~$0$), and if so, place this exit code in a
  distinct file;
\item checking whether the file containing the standard error is empty, and if
  not, pausing execution after displaying an error message; and,
\item checking whether the file containing the exit code is empty, and if not,
  pausing execution after displaying an error message;
\end{enumerate}
After the completion of these steps, the \Bash macro may incorporate for
```

```
  typesetting three files in order: the script file (if the \text{script} flag
  is present), the standard output file (if the \text{stdout} flag is present),
  and then the standard error file (if the \text{stderr} flag is present).

Let me demonstrate a situation in which the execution of the script generates
  an error.
To do that, I will write a short \LaTeX{} file, named \texttt{error.tex} which
  tries to use \Bash to compile an incorrect~C program.
Since \texttt{error.tex} contains \verb+\END+, I will have to author this file
  in three steps:
\begin{enumerate}
\item Creating the header of \texttt{error.tex}:
\bash[script]
cat << EOF > error.tex
\documentclass{article}
\usepackage[a6paper]{geometry}
\usepackage{bashful}
\pagestyle{empty}
\begin{document}
This document creates a simple erroneous C program
  and then compiles it.
\bash[script,stdout]
echo "main(){return int;}" > error.c
cc error.c
EOF
\END
\item Adding \verb+\END+ to \texttt{error.tex}
\bash[script]
echo "\\END" >> error.tex
\END
\item Finalizing \texttt{error.tex}
\bash[script]
cat << EOF >> error.tex
(I do not really expect the one-line
program generated above to compile.)
\end{document}
EOF
\END
\end{enumerate}
Let me verify that \texttt{error.tex} is what I expect it to be:
\bash[script,stdout]
cat error.tex
\END

I am now ready to run \texttt{error.tex} through \LaTeX{}, but since I will not
  run the \texttt{latex} command myself, I will send a ``\texttt{q}'' character
  to it to abort execution when the anticipated error occurs.

\lstdefinestyle{bashfulScript}{style=scriptsize}
\lstdefinestyle{bashfulStdout}{style=scriptsize}
\bash[script,stdout]
yes q | xelatex -shell-esc error.tex | sed /texmf-dist/d
\END
```

```
\lstdefinestyle{bashfulScript}{style=input}
\lstdefinestyle{bashfulStdout}{style=input}

(Observe that in the above I used the
  \href{http://www.gnu.org/software/sed/manual/sed.html}{\texttt{sed}}
  command to remove the mundane and lengthy logging messages of my
  \texttt{textmf} distribution.%
                \footnote{I also switched to a smaller font size, to allow
                        the output to fit within the boundaries of the printed page.})

You can see that when \LaTeX{} tried to process \texttt{error.tex}, it stopped
  execution while indicating that file \texttt{error.stderr} was not empty
  after the compilation. The first line of \texttt{error.stderr} was displayed,
  and I was advised to examine this file myself.
Inspecting \texttt{error.stderr}, we see the C compiler error messages:
\bash[script,stdout]
cat error.stderr
\END

The compilation error did not prevent \LaTeX{} from typesetting my document.
This final layout is presented in \autoref{Figure:error}.
Note that the failure to compile \texttt{hello.c}, did not stop \Bash
  from including this file in the source.

\begin{figure}[!h]
\begin{center}
  \fbox{\includegraphics[scale=0.8,trim=0 200 0 0]{error.pdf}}
\end{center}
\caption{File \texttt{error.pdf}}\label{Figure:error}
\end{figure}

There are cases in which the author intends the executed script to generate
  errors.
The \texttt{stderr} option to the \Bash macro instructs it to
  \emph{ignore} the exit code of the executed programww, and the fact that that
  output was generated to the standard error stream.
Instead, \Bash will include in its listing the contents of the standard
  error stream.

For example, to give you a taste of dealing with \textsc{Bash} script errors, I
  shall write below a passage expressing the frustration over \textsc{Bash}
  insisting on syntax trivialities.
\bash[stdout]
cat -n 00.tex|gawk '/A space must/{c++}c>1{print}/END/{if(c>1)exit}'
\END

Indeed, newcomers to \textsc{Bash} may find conditionals confoudning.
Annoying as it may sound, you have to remember rules such as:
A space must follow the opening square bracket; if not
  \textsc{Bash} would not find the~``\verb+[+'' command.
The following script may seem correct on first sight, yet, the
  error message it produces may seem weird to beginners.
\bash[prefix={},script,stdout,stderr]
```

```
if [2+2==5] ; then
  echo "Freedom is the freedom to say that two plus two"
  echo "make four. If that is granted, all else follows."
fi
\END

The error message in the above was anticipated; it was included
  in the listing thanks to the \texttt{stderr} option.
As explained, listing \texttt{stdout} instructs \Bash to ignore
  the script's error code.
\LaTeX{} processing of \texttt{\jobname.tex}
  does not stop as a result of this error.

\section{Introspection}
\label{Section:introspection}
This article uses document introspection to show the actual input used to
  produce the examples.
To achieve this, I used Unix commands to retrieve portions of
  \texttt{\jobname.tex}, my input file, and \verb+\input+ these.
As we shall see, the \texttt{sed} command proved instrumental in doing this.

Recall that at the beginning of \autoref{Section:story}, I wrote
\bash[stdoutFile=begins.tex]
cat 00.tex | sed -n '/begins/,// { p
  /stored/q }'
\END
\begin{quote}
  \textit{\input{begins.tex}}
\end{quote}
Recall also that later, at the beginning of
  \autoref{Section:retrospection}, I wrote
\bash[stdoutFile=examining.tex]
cat 00.tex | sed -n '/Examining/,// { p
  /above/q }'
\END
\begin{quote}
  \textit{\input{examining.tex}}
\end{quote}
And, immediately afterwards, I gave an excerpt of file \texttt{\jobname.tex}.

To produce this excerpt, I applied the \texttt{sed}
  command to search in \texttt{\jobname.tex}.
Specifically, what I wrote in \texttt{\jobname.tex} was the following
\bash[stdout]
cat -n 00.tex | sed -n '/Examining/,// {
  /introspectively search the input/q
  p }'
\END
I used the \texttt{cat} command to number my input lines, and then the
  \texttt{sed} command to printing these lines, starting at the first line that
  contains the string ``Said Again'',  and ending with line that contains the
  string ``END''.
```

```
My use of \texttt{sed} implies that file \texttt{\jobname.tex} includes
  the string ``Said Again'' at least twice.
The first such occurrence was in the title of \autoref{Section:story}; the
  second occurrence was in the application of \texttt{sed} to introspectively
  search for the use of the \Bash that followed this title.
Subsequently, this document included several other occurrences of
 ``Said Again'' (including this sentence itself); but let us concentrate
   on the first two.

The search succeeded in finding the correct occurrence, since the search
  instructions occurred \emph{after} it.
You would need to apply a more sophisticated search in the case that you
  wish to present an input excerpt prior to its actual occurrence in the text.
This was, for example, the case in the ``taste'' of \textsc{Bash} script errors
  offered in the previous section.
I applied \href{http://www.gnu.org/software/gawk/}{Gawk}
  for  this search.
In case you are interested, the actual \href{http://en.wikipedia.org/wiki/%
  Pipeline\_(Unix)} {Unix pipeline} I wrote was:
\bash[stdout]
cat -n 00.tex | sed -n '/gawk/,// { p
  q }'
\END

\paragraph{Acknowledgments}
The manner by which \Bash collects its arguments is based on that of
 \href{http://www.tn-home.de/Tobias/Soft/TeX/tobiShell.pdf}{\textsf{tobiShell}}.
Martin Scharrer tips on \TeX{} internals were invaluable in writing \bashful.
\appendix
\section{Source of \texttt{\jobname.tex}}
\label{Section:source}
  \lstinputlisting
    [    style=input,
        basicstyle=\scriptsize\ttfamily,
        numbers=left,
        stepnumber=10,
        firstnumber=1,
        numberfirstline=true,
        numberstyle=\scriptsize\rmfamily\bfseries
    ]
    {\jobname.tex}
\end{document}
```

THE PracTEX Journal

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Documenting ITIL processes with LaTeX (Portuguese)

Rayans Carvalho and Francisco Reinaldo

Article PDF
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Abstract: Many companies have evolved with the implementation of the Information Technology Infrastructure Library (ITIL), using the best practices and processes to achieve practical results. Good practice suggests what to do, but at the same time raise doubts about how to do it and which tools to use to get better work performance in ITIL. Noting these facts, this article presents a LaTeX-based processes and services documentation tool, as suggested by ITIL.

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Documentação em Processos ITIL com LaTeX

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Resumo Muitas empresas evoluiram com a implantação da ITIL, utilizando as boas práticas e processos constituídos que apresentam a transparência da eficiência e eficácia. As boas práticas sugerem o que fazer, mas ao mesmo tempo geram dúvidas sobre como fazer, quais são as ferramentas de trabalho existentes no mercado para desenvolver a atividade em ITIL. Observando estes pontos, o artigo apresenta uma opção de ferramenta de documentação dos processos e serviços sugeridos pela ITIL com LaTeX a um caso de uso com ITIL.

1 Introdução

Quando a questão é sobre gerenciamento de serviços para propor processos de melhoria, a ITIL (*Information Technology Infrastructure Library*) já mostrou ser eficiente e eficaz em seu ciclo de vida. Gerentes de TI (Tecnologia da Informação) aprendem o que fazer com as boas práticas da ITIL, mas muitos não atingem a qualidade do como fazer. Neste sentido algumas caracteristicas devem ser anotadas, tais como as ferramentas a utilizar para atingir a sustentabilidade do projeto e da empresa.

Uma parte muito importante da ITIL que está em todos em seus processos, é a questão da documentação desenvolvida. Independente do tipo de objeto desenvolvido, tal como os processos e os SLAś (*Service Level Agreement*) é sempre necessário documentar. Em posse da documentação, o gerente de TI tem controle e respaldo a qualquer problema que possa surgir. A documentação é um facilitador para escolhermos a sequência apropriada para desenvolver e migrar sistemas, por exemplo. Podemos gerenciar projetos, antecipar ações, executar planejamento de capacidade, gerenciar expectativas, enfim, podemos ter controle das mudanças.

É incrível como gerentes de TI não tem conhecimento horizontal, tampouco vertical das diferentes ferramentas voltadas à documentação que existem no mercado, ou somente tem as que chamam de homologadas, tal como o MS Word. Felizmente, existe um universo de ferramentas voltadas para edição de texto e muitas com qualidade superiores ao MS Word. E é neste foco que o artigo aborda, apresentando LaTeX como ferramenta de documentação.

2 LaTeX como ferramenta para TI

LaTeX foi desenvolvido por Leslie Lamport na década de 80 como sendo um conjunto de macros de alto nível para facilitar o processamento de textos com TeX. LaTeX é utilizado amplamente para a produção de textos acadêmicos, matemáticos e científicos devido à sua alta qualidade tipográfica.

O sistema LaTeX é utilizado para produção de cartas pessoais, artigos e livros. Também possui abstrações para lidar com bibliografias, citações, formatos de páginas, e referência cruzada. Para manter os padrões LaTeX, o designer disponibiliza um modelo, com tamanhos de margens, letras e espaçamento para o utilizador.

Com LaTeXe *templates*, o gerente de TI irá se preocupar somente com o conteúdo, economizando tempo e dinheiro das organizações. Para este primeiro momento, podemos ter o designer como a pessoa responsável em desenvolver modelos em LaTeX para diferentes situações. Pode-se criar vários modelos de documentação como por exemplo de diversas normas decorrente de sua empresa de trabalho. Além disso, o arquivo PDF pode ser gerado sem a necessidade de outros programas pagos.

3 Casos de Uso para TI

Abaixo, apresentamos dois importantes casos de uso comumente relacionados ao mundo da TI.

3.1 Caso de Uso I

Para melhor entendimento vamos aplicar LaTeX a uma documentação em ITIL.

Imagine que uma empresa chamada MaxSolutions, trabalha com o desenvolvimento de softwares e irá desenvolver um software que necessita ser documentado. A empresa ContabilPorticus encomendou o software e irá estabelecer acordos de SLA. Tal como o software, os acordos de SLA também necessitam ser documentados.

O profissional responsável pela documentação estabeleceu ao final do planejamento da documentação que serão necessários sete documentos diferentes e contendo 134 páginas em média. Em cada etapa da documentação existe um conjunto de normas a ser seguida sobre a formatação do texto. Nesta vertente, LaTeXfoi desenvolvido justamente para trabalhar com estes modelos. Assim, respondendo a questão de economia de tempo já relatada.

3.1.1 Estrutura dos Arquivos

Antes de implementar os modelos propostos, é necessário estruturar os arquivos que serão utilizados, como por exemplo o diretório de figuras, os arquivos de formatação cada parte da documentação e outros. Abaixo apresenta-se os modelos tipo padrão para a estrutura de arquivos.

Arquivo raiz que terá a documentação completa:

- doc-exemplo.tex

Arquivos modelos que contém as formatações criadas em LaTeX para cada parte da documentação:

- cap-rosto.tex
- cap-sobcapa.tex
- cap-introducao.tex
- cap-resumo.tex
- cap-desenvolvimento.tex
- cap-final.tex

Arquivo de bibliografia responsável pela a biblioteca necessária para que o LaTeX possa carregar toda a documentação bibliográfica:

- bibliografia.bib

Diretório de figuras que armazenará quaisquer imagens utilizadas pela documentação:

– ./figuras/

Cabeçalho a ser utilizado dentro do documento principal `.tex`:

```
\documentclass[a4paper,10pt]{article}
\usepackage{hyperref}    % para inserir hiperlinks ao texto.
\usepackage{xunicode}    % para caracteres Unicode.
\setmainlanguage{brazil} % para especificar a linguagem da escrita.
\setmainfont{Minion Pro} % define a fonte principal.
\setsansfont{Myriad Pro} % define a fonte sem serif.
\usepackage{graphicx}    % para adicionar figuras ao texto.
```

3.2 Caso de Uso II

Um problema encontrado em muitos editores de textos WYSIWYG "*What You See Is What You Get*" é a questão de um mesmo documento ser utilizado por vários usuários e ser salvo por extensões de arquivos diferentes, causando variações no tamanho do arquivo, futura incompatibilidade, inconsistênica e lixo de código interno.

Imagine o seguinte cenário onde o usuário A salva o documento em uma extensão `.xyz` - que é a extensão da versão do software do ano passado. Suponhamos que esta versão adiciona 123KB de informação além do texto desenvolvido a cada novo salvamento automático, envolvendo data de modificação, entre outros dados pertinentes ao documento e ao software utilizado.

Neste ano, a mesma fabricante de software desenvolve uma nova versão e a extensão de arquivo é modificada para `.xyza`. Esta nova extensão tem novas bibliotecas, novas funções de processamento de textos e passará a gravar 170KB de informações além do texto criado. Este novo software carrega os arquivos `.xyz`, quanto `.xyza` assim podendo gravar o documento nas duas versões. Ao princípio parece que só há vantagens neste processo. Mas observa-se que para o programa fazer esta permutação entre as duas extensões, é adicionado mais KB de informação, pois o software que lê `.xyza` também lê `.xyz` uma questão chamada compatibilidade. Então vamos adicionar mais 10KB para esta compatibilidade. Seria no total de 180KB no total além do conteúdo do texto.

Imagine agora que este documento está desenvolvido com o software da versão da extensão `.xyz`, é de suma importância, e está sendo utilizado por 100 usuários diferentes. Cada usuário irá desenvolver uma parte do documento. Somente 50% dos usuários que irão desenvolver o documento tem a versão do software do ano passado e a parte restante tem a versão mais nova deste mesmo software. Com isso é observado que quando o software for salvo em `.xyz` e depois ser salvo em `.xyza` e continuar permutando, então haverá a adição de mais e mais KB de informação além do texto do usuário já inserido.

É perceptível o tamanho que ficará o documento com informações sem necessidade. Uma prática disso é observando as tabelas de comparação a seguir:

Os critérios de avaliação foram para MS Word 97-2003 (.doc) e MS Word 2007-2010 (.docx):

- Arquivo em branco;
- Arquivo com uma página completa sem formatação;
- Arquivo com uma página completa com formatação;
- Arquivo com imagem;
- Tempo de execução de abertura do programa;
- Tamanho do processo em execução.

Os testes a seguir, ocorreram em um notebook Acer 5920 com Intel Core 2 Duo 1,66GHz com 2MB L2 cache, 3GB RAM DDR2 de 800 MHz, HD SATA 2 7200 RPM de 160GB, com placa de Video Integrada de 358 MB Mobile Intel Grafic Media Accelerator X3100. Ressalta-se que o tempo de execução de abertura do programa nos testes, é o momento após a máquina iniciar no sistema operacional Windows 7 Ultimate 64 bits. Ambos os softwares utilizados também contém a arquitetura de 64bit.

3.2.1 Utilização dos MS Word 97-2003 (`.doc`) e MS Word 2007-2010 (`.docx`)

Documento Teste Gerado sem Conteúdo			
Office	Programa	Tamanho	Extensão
97-2003	Word	22,016 bytes	`.doc`
2007-2010	Word	12,541 bytes	`.docx`

Tabela 1 - Documento Teste Gerado sem Conteúdo

Documento Teste Somente com Texto Não Formatado			
Office	Programa	Tamanho	Extensão
97-2003	Word	25,600 bytes	`.doc`
2007-2010	Word	13,431 bytes	`.docx`

Tabela 2 - Documento Teste Somente com Texto Não Formatado

Documento Teste com Conteúdo Formatado			
Office	Programa	Tamanho	Extensão
97-2003	Word	26,112 bytes	`.doc`
2007-2010	Word	14,480 bytes	`.docx`

Tabela 3 - Documento Teste com Conteúdo Formatado

Documento Teste com Conteúdo e Imagem				Imagem	
Office	Programa	Tamanho	Extensão	Tamanho	Extensão
97-2003	Word	138,752 bytes	`.doc`	115,32 bytes	.png
2007-2010	Word	128,980 bytes	`.docx`	115,32 bytes	.png

Tabela 4 - Documento Teste com Conteúdo e Imagem

Imagem:

Nota-se que mesmo o arquivo em branco já ocupa um espaço que deveria ser de 0 a 1 byte, tendo em vista que o documento não contém informação. Este é um aspecto de desperdício de espaço no disco rígido ou durante envio/recebimento por e-mail.

3.2.2 Tempo de execução de abertura do programa

Ao requisito tempo de execução de abertura do programa, o tempo utilizado no teste é o momento após iniciar o computador, e o LaTeX compilou a 1,023 segundos e o MS Word 2010 abriu o arquivo a 6,742 segundos.

3.2.3 Tamanho do processo em execução e Tempo de execução de abertura do programa

No conceito tamanho do processo em execução, nota-se que o programa de LaTeX ocupa 16.732 KB de memória e que o MS Word 2010 atingiu 32.068 KB, representando quase o dobro de tamanho.

Nome da imagem	Tempo de Execução	Uso de memória
WINWORD.EXE	2,453 segundos	32.068 KB
texmaker.exe	6,742 segundos	16.732 KB
notepad.exe	1,048 segundos	1.404 KB

Obs: O notepad também foi listado pois muitos utilizadores de LaTeX podem utilizar o mais simples editor de texto.

Outro problema encontrado ao MS Word, é a utilização de macros ao qual o documento pode estar infectado por vírus. Não há este problema para LaTeX.

Também LaTeX trata o texto somente como texto puro, sem parafernálias envolvendo o arquivo. Assim, o texto em LaTeX é simples, leve, ágil, eficiente e eficaz. Porque texto é texto, não há necessidade de ser mais do que isso.

4 Conclusão

Da perspectiva da Tecnologia da Informação, realizar a documentação é fator crítico para o sucesso. Então, documentação é o centro dos componentes para suportar a gerência de mudança com sucesso. A importância do artigo é sim demostrar a ferramenta em um caso aplicado a ITIL para que os Gerentes de TI tenham mais uma opção para desenvolver as documentações necessárias sugeridas pela ITIL.

Assim, LaTeX apresenta muitas vantagens em questão de tempo de execução de abertura do programa, tamanho de seu processo em execução e tamanho de arquivo armazenado.

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Avoid eqnarray!

Lars Madsen

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Abstract: Whenever the `eqnarray` environment appears in a question or example of a problem on `comp.text.tex`, `tex.stackexchange.com` or other forums there is a high probability that someone will tell the poster not to use `eqnarray`. This article will provide some examples of why many of us consider `eqnarray` to be harmful and why it should not be used.

The article is an updated edition, first published in PracTeX Journal 2006-4.

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Lars is a regular on `comp.text.tex`, `tex.stackexchange.com` plus the Danish TeX User Group's mailing list. As he witnesses a lot of normal LaTeX users, Lars is a bit concerned on how new users learn LaTeX. As a result of this, he is currently (still) working on the third edition of his Danish LaTeX introduction, now spanning almost 500 pages.

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Avoid eqnarray!

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Abstract Whenever the eqnarray environment appears in a question or example of a problem on comp.text.tex, tex.stackexchange.com or other fora there is a high probability that someone will tell the poster not to use eqnarray. This article will provide some examples of why many of us consider eqnarray to be harmful and why it should not be used.

Introduction

When someone asks a question on comp.text.tex, tex.stackexchange.com or other fora about the eqnarray environment or shows an example using it, there will always be someone that instructs the poster to stop using eqnarray and use something better instead. This article provides an example-based overview of some of the reasons why many people consider eqnarray to be obsolete. Thus, this article can be used as a reference when a poster asks for an explanation.

The prerequisites for this article are a basic knowledge of LaTeX and knowledge of the syntax used by eqnarray. Experience with the environments from the amsmath package is a plus but not mandatory.

1 The basics

In plain LaTeX, the eqnarray environment is basically the only construction available for numbered multi-line equations. The eqnarray environment is similar to

```
\begin{array}{rcl}
  ...
\end{array}
```

with the difference being that the first and last cell in each row are automatically typeset as display style mathematics, and not as text style math as it would be in the `array` environment; also, `eqnarray` supports automatic equation numbers.

The principal `eqnarray` usage is similar to this example:

```
\begin{eqnarray}
  y &=& (x+1)^2 \\  &=& x^2+2x+1
\end{eqnarray}
```

which results in (without the box):

$$\begin{array}{rcl} y & = & (x+1)^2 \qquad (1) \\ & = & x^2+2x+1 \qquad (2) \end{array}$$

In the examples that follow, we use the command `\dbx` instead of writing some meaningless arbitrary mathematical formula. `\dbx` is a simple macro, defined by the author, that writes a box to simulate some random mathematical material. Using an optional argument we can adjust the width of the box created by `\dbx`.

The reason for using simulated math instead of actually writing something is that removing the actual text makes the reader more aware of the actual problem, which is not the text but rather the construction/surroundings themselves. The example above will be shown like this instead:

```
\begin{eqnarray*}
  \dbx &=& \dbx[5cm] \\  &=& \dbx
\end{eqnarray*}
```

which results in:

$$\begin{array}{rcl} \boxed{} & = & \boxed{} \\ & = & \boxed{} \end{array}$$

2 Behold the problems

2.1 The primary problem: Spacing inconsistency

Most commonly, `eqnarray`-users write their displayed equations by mixing `eqnarray` and `eqnarray*` with `equation`, `\[...\]`, or `$$...$$` constructions. Some even mix it with environments from the `amsmath` package (though this is mostly seen when a document has been written by more than one author).

This mixing results in the primary problem with `eqnarray`—*spacing inconsistency*. In the following example we consider a single line equation versus a multi-line `eqnarray` equation.

```
\[ \dbx = \dbx \]
whereas
\begin{eqnarray*}
  \dbx &=& \dbx[3cm] \\  &=& \dbx
\end{eqnarray*}
```

which results in

$$\boxed{} = \boxed{}$$

whereas

$$\begin{aligned} \boxed{} &= \boxed{} \\ &= \boxed{} \end{aligned}$$

Can you spot the problem?

It is even more obvious when we place the same code using `eqnarray` and `equation` next to each other:

```
\begin{eqnarray} \dbx &=& \dbx[3cm]
\end{eqnarray}
  versus
\begin{equation} \dbx = \dbx[3cm]
\end{equation}
```

which results in

$$\boxed{} = \boxed{} \tag{3}$$

versus

$$\boxed{} = \boxed{} \tag{4}$$

Can you see the difference?

We notice how the spacings around the ='s are inconsistent, i.e., not equal. Consistency being one of the key values in any good document design, the spacing around the = signs should be equal on both sides (not counting stretch), no matter which construction is used.

Since `eqnarray` is (naively) built on top of the `array` environment we still have the `\arraycolsep` space between columns, which then affects the spacing around the ='s in our case. We could change the value of `\arraycolsep`:

```
\setlength\arraycolsep{1.4pt}% some length
\[ \dbx = \dbx \]
\begin{eqnarray*}
  \dbx & = & \dbx  \\  &= & \dbx
\end{eqnarray*}
```

Resulting in:

$$\boxed{} = \boxed{}$$

$$\begin{aligned}\boxed{} &= \boxed{}\\ &= \boxed{}\end{aligned}$$

Changing the value of `\arraycolsep`, however, will also change the appearance of any other construction that might be using `array`, so this does not suffice; see the following example.

```
Before the change:
\begin{eqnarray*}
  A &=& \left(\begin{array}{cc}\dbx&\dbx\\
              \dbx&\dbx\end{array}\right)
```

```
\end{eqnarray*}
after the change:
\setlength\arraycolsep{1.4pt}% some length
\begin{eqnarray*}
  A &=& \left(\begin{array}{cc}\dbx&\dbx\\
              \dbx&\dbx\end{array}\right)
\end{eqnarray*}
```

Resulting in:

Before the change:

$$A \quad = \quad \left(\begin{array}{cc}\dbx&\dbx\\ \dbx&\dbx\end{array}\right)$$

after the change:

$$A = \left(\begin{array}{cc}\dbx&\dbx\\ \dbx&\dbx\end{array}\right)$$

Some people argue that this larger spacing is a good thing, that it helps understanding the equations in question. For that to be true the author should do this with every single equation, whether the equation was written using `eqnarray` or not. Consistency above all. We can plainly see that `eqnarray` does not follow the spacing conventions Knuth set out in TEX, whereas both `equation` and `\[...\]` do.

Here is another example from a set of notes I have been editing (actual code from the original unedited notes).

```
\begin{eqnarray*}
 {\cal C}_{0} &\subseteq& {\cal C}\subseteq
 \sigma ({\cal  C}_{0},{\cal N}) ,
\end{eqnarray*}
```

$$\mathcal{C}_0 \quad \subseteq \quad \mathcal{C} \subseteq \sigma(\mathcal{C}_0, \mathcal{N}),$$

Which makes one wonder if LaTeX authors even notice the difference in spacing, or do they just accept it as a fact of life?

Even though `eqnarray` might not be recommended for one-liners, they do still appear quite a lot in the 'wild'.

As `eqnarray` is the only multi-line construction for plain LaTeX, what should be used instead? Short answer: Use the environments from the `amsmath` package, in particular the `align` environment.

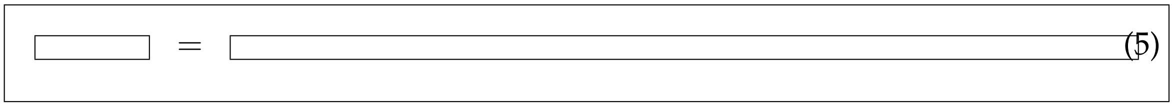
Longer answer: There are a few packages that can help including `nath`, `mathenv` and `amsmath`. Using `amsmath` is highly recommended since it is already included as part of every LaTeX installation.

For those not familiar with the `amsmath` package we present a few useful constructions in Appendix A.

2.2 Problem #2: eqnarray can overwrite equation numbers

Given a long formula which happens to fit within one line were it not for the equation number, `eqnarray` will happily just ignore the equation number, without any warnings.

```
\begin{eqnarray}
  \dbx &=& \dbx[12cm]
\end{eqnarray}
```

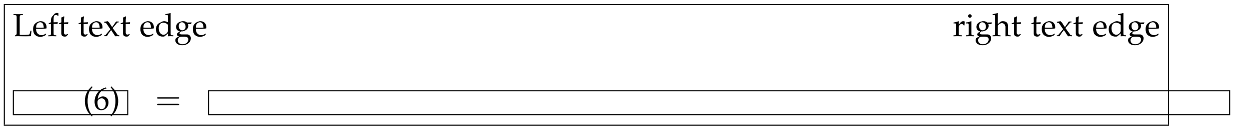


It can get even worse. Assume we are using the `leqno` class option, i.e. equation numbers on the left. Then assume we have a math line that is slightly longer than the text width:[1]

```
Left text edge \hfill right text edge%
\begin{eqnarray}
  \dbx &=& \dbx[13.5cm]
\end{eqnarray}
```

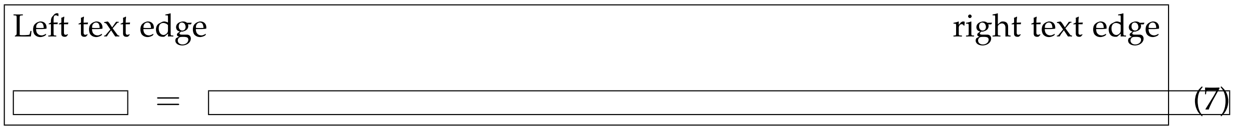
---

[1] Example provided by Barbara Beeton.



No offence, but why on earth is `eqnarray` moving the equation number? Let us see what happens if we take the same example and switch back to equation numbers on the right:

```
Left text edge \hfill right text edge%
\begin{eqnarray}
  \dbx &=& \dbx[13.5cm]
\end{eqnarray}
```

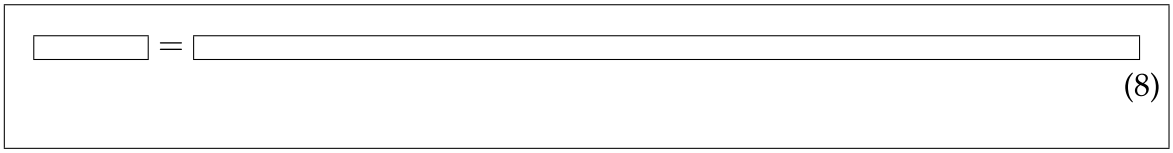


Sigh. . .

Well, at least that will teach authors to remember to break their equations properly.

At least the environments from the `amsmath` bundle take the equation number into consideration. Here is an example using `align`:

```
\begin{align}
  \dbx &= \dbx[12.5cm]
\end{align}
```



2.3 Problem #3: Silence of the labels

Part of my job is to process a preprint series published by my department. This brings me into contact with many different styles of LaTeX writing and usage. One thing that I frequently do (as part of my visual improvement procedures)

is convert `eqnarray` environments into `align` environments (or similar). This is where one starts to find the hidden label errors. Most often these occur when two or more people have been writing/editing the same file.

Here is the first example:

```
\begin{eqnarray}
  \dbx & = & \dbx \\
  \dbx & = & \dbx \label{eq:2} \nonumber
\end{eqnarray}
From equation (\ref{eq:2}) we conclude
\begin{equation}
  \dbx=42.
\end{equation}
```

So the author had an equation which he or she no longer wanted to have numbered (`\nonumber`). Which is perfectly reasonable, but the author neglected to check whether the now-dead label (`eq:2`) was referred to. The result is as follows:

$$\boxed{} = \boxed{} \tag{9}$$
$$\boxed{} = \boxed{}$$

From equation (10) we conclude

$$\boxed{} = 42. \tag{10}$$

Huh? This might end up as an interesting form of argumentation. It seems as if `eqnarray` actually steps up the equation counter at the start of every line (hence `\label` catches something) and when it encounters `\nonumber` it does not write any equation number and steps the equation counter one down again. On a side note, `equation` has the same problem if one mixes it with `\nonumber` (something which is *not* fixed by using `amsmath`).

The worst thing here is that `eqnarray` does this silently, without warnings, so if you do not know that this might happen you will never notice it unless someone carefully reads the article.

As it happens, I recently received an article which showed exactly the same problem in `eqnarray*`. Here one only has to place a label inside a non-numbering

`eqnarray*` (we use `\theequation` to show the current value of the equation number):

```
Equation number before the equation: \theequation
\begin{eqnarray*}
  \label{eq:4}
  \text{Inside the equation \theequation} & = & \dbx
\end{eqnarray*}
The reference is \eqref{eq:4}.
Equation number after the equation: \theequation
```

Resulting in:

Equation number before the equation: 10

$$\text{Inside the equation 11} \quad = \quad \boxed{}$$

The reference is (11). Equation number after the equation: 10

Who smells a rat? So, even in `eqnarray*` the equation counter is stepped up, and later stepped down at the end of each line. As we have seen, this is a problematic approach.

2.4 Problem #4: The amsthm package vs. the eqnarray environment

If one uses the `amsthm` package, and its `proof` environment, then you will get automatic placement of an "*end of proof*" marker. Sometimes one ends a proof with a displayed formula and may want to place the end marker near the equation number. This may be achieved by simply issuing `\qedhere` on the last line of the formula.

```
\begin{proof}
  \dots
  \begin{equation*}
    a=0. \qedhere
  \end{equation*}
\end{proof}
```

Proof. ...

$$a = 0.$$ □

This handy little feature, as one might guess by now, does *not* work with `eqnarray`!

3 Solution

The best solution is to *not* use the `eqnarray` environment at all. Use the environments from `amsmath` instead. If in some case that will not do, the `mathenv` package reimplements `eqnarray` to work more rationally. It also removes the restraint on the number of columns in an `eqnarray`. (Unfortunately, `mathenv` is not compatible with certain useful modern packages, notably `siunitx`.)

Sadly we see many journals and publishers who still recommend (or at least mention) the use of `eqnarray` in their guides for authors.

A The `amsmath` package

For more information about `amsmath` see [2], [1] and [4] (in order of recommended reading). This appendix gives a few interesting constructions, mainly showing replacements for common `eqnarray` usage.

All of the following examples require `amsmath`, hence the document preamble must include:

```
\usepackage{amsmath}
```

One thing to note about `amsmath` is that *every* environment from `amsmath` that provides equation numbers also has a `*`-version which does not. The package also includes an `equation*` environment which is missing from plain LaTeX.

Now the first thing we need is a replacement for `eqnarray`. We choose `align`, which has a slightly different syntax than `eqnarray`:

```
\begin{eqnarray*}
\dbx &=& \dbx[1.5cm]\\
     &=& \dbx
\end{eqnarray*}
```

```
\begin{align*}
\dbx &= \dbx[1.5cm]\\
     &= \dbx
\end{align*}
```

Note the reduced number of `&`'s.

Here is another common `eqnarray` construction and its `align` counterpart:

```
\begin{eqnarray*}
\dbx &=& \dbx[1cm]\\
     & & + \dbx   \\
     &=& \dbx
\end{eqnarray*}
```

```
\begin{align*}
\dbx = {} & \dbx[1cm]\\
          & + \dbx   \\
     = {} & \dbx
\end{align*}
```

Notice the use of `{}` when the `&` is placed to the *right* of a relational symbol. Also note that the spacing around the `+` is correct in the `align` case but not when using `eqnarray`.

One construction not easily achieved with base LaTeX is a formula spread over several lines but with only one equation number for the entire formula. Again, this is easy using constructions from the `amsmath` package:

```
\begin{equation}
  \begin{split}
    \dbx & =\dbx[3cm] \\
         & =\dbx
  \end{split}
\end{equation}
```

$$\begin{aligned} \boxed{} &= \boxed{} \\ &= \boxed{} \end{aligned} \tag{11}$$

Notice how the equation number is vertically centred. The syntax for `split` is otherwise more or less the same as for `align*`.

The `amsmath` package also provides the `aligned` (and `alignedat`) environment, which is basically the full `align` environment, but for *inner* use. (Like `eqnarray`, `split` can only have one so-called alignment column, while `align` and `aligned` can have several.)

```
\begin{equation}
  \begin{aligned}

    \dbx & =\dbx &\qquad  \dbx & =\dbx \\
         & =\dbx &              & =\dbx
  \end{aligned}
\end{equation}
```

$$\begin{aligned} \boxed{} &= \boxed{} \qquad & \boxed{} &= \boxed{} \\ &= \boxed{} & &= \boxed{} \end{aligned} \tag{12}$$

A.1 What about `\lefteqn`?

`amsmath` has no direct equivalent to `\lefteqn`, but the idea is still useful. To recap, using the `\lefteqn` macro inside `eqnarray`, one can force that particular line to be moved to the left:

```
\begin{eqnarray*}
  \lefteqn{\dbx[2cm] = \dbx[2cm]} \\
  && = \dbx[2cm] \\
  && = \dbx[2cm]
\end{eqnarray*}
```

$$\begin{aligned}\boxed{} &= \boxed{} \\ &= \boxed{} \\ &= \boxed{}\end{aligned}$$

One usually uses this to mark the first line, and then give the impression of the rest of the lines being indented.

The `mathtools` package does provide an alternative, namely `\MoveEqLeft`:

```
\begin{align*}
  \MoveEqLeft \dbx[3cm] = \dbx[2cm] \\
       & = \dbx[3cm] \\
       & = \dbx[3cm]
\end{align*}
```

$$\begin{aligned}\boxed{} &= \boxed{} \\ &= \boxed{} \\ &= \boxed{}\end{aligned}$$

The idea is that the `\MoveEqLeft` marks an alignment point (which is what the ampersands follow), and then pulls the line backwards in a suitable fashion. It does *not* take any required arguments, unlike `\lefteqn`.

Acknowledgements

Special thanks to Barbara Beeton from the AMS for comments and suggestions for this revised version. Also many thanks to the various people who provided examples for the original version of the article.

References

[1] American Mathematical Society, *User's Guide for the* `amsmath` *Package*, 2002. Normally included in every LaTeX installation as `amsldoc`; also available via http://mirror.ctan.org/macros/latex/required/amslatex/math.

[2] Michael Downes, *Short Math Guide*, 2002. Short introduction to the `amsmath` and `amssymb` packages. ftp://ftp.ams.org/pub/tex/doc/amsmath/short-math-guide.pdf

[3] Morten Høgholm, Lars Madsen, Will Robertson and Joseph Wright (maintainers), *The mathtools package*, 2011. Various extensions to `amsmath` and others. http://mirror.ctan.org/macros/latex/contrib/mh.

[4] Herbert Voß, *Math mode*, 2006. Extensive summary describing various mathematical constructions, both with and without the `amsmath` package. http://mirror.ctan.org/info/math/voss/mathmode/Mathmode.pdf.

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Issue 2012, Number 1 [Published 2012-10-22]

Ask Nelly

Comment on this article

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1 Ask Nelly
1.1 Customizing lists
1.2 Producing logos

Customizing lists

Dear Nelly,

In my document I often use the main three list environments of LaTeX: `enumerate`, `description` and `itemize`. Unfortunately, I'm not always pleased with the results I get, especially the spacing. Is there a way to customize these lists?

Sincerely,

Alex

Dear Alex,

Actually, there is. LaTeX has a built-in system of parameters that can be adjusted by the user. Not all LaTeX books discuss these fine-tuning issues. A place where you can find a complete discussion is, of course, the *LaTeX Companion*.

I would recommend, however, another way. I think you should use the package `enumitem`, by Javier Bezos, available from CTAN. You simply have to load the package with a

```
\usepackage{enumitem}
```

command. The parameters of the lists become optional parameters of the corresponding environment. See the package documentation for the list of parameters. For instance, if you want to adjust the separation of items and the left margin of an `itemize` list, you just begin the environment with a command of the form:

```
\begin{itemize}[itemsep=0.5ex,leftmargin=1.2cm]
```

Best regards,

Paul (on behalf of Nelly)

The above question was answered by **Paul Blaga**, a member of the editorial board of this journal. He can be reached at `pracjourn at tug dot org`.

Producing logos

Dear Nelly,

```
I've seen documents and books with logos for different "components" of LaTeX, for example Metafont, BibTeX, AMS-LaTeX. How are they produced?
```

Sincerely,

John

Dear John,

It depends. Some of them are built-in. For instance, we use

```
\LaTeX
```

for producing the LaTeX logo or

```
\AmS-\LaTeX
```

to produce the AMS-Latex logo. For other logos, however, you have to load various packages. A package that contains many logos is `texlogos`, by Jacek Ruzyczka, available from CTAN. It has no documentation, so you will have to look into the style file to figure out what's in it. It includes redefinition of some of the logos of the LaTeX world, but also, for instance, logos for some international currencies. Other sources of useful logos are the files `ltugboat.cls` and `ltugcomm.sty`, also available from CTAN. These two files also include a logo for XeTeX, which is not present in `texlogos`.

Best regards,

Paul (on behalf of Nelly)

The above question was answered by **Paul Blaga**, a member of the editorial board of this journal. He can be reached at `pracjourn at tug dot org`.

THE PracTEX Journal

Issue 2012, Number 1 [Published 2012-10-22]

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1.1 Writing guitar chords with LaTeX
1.2 Font quizzes
1.2.1 Typography terms
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Distraction

Writing guitar chords with LaTeX

We selected to illustrate a very recent package, gtrcrd, by Riccardo Bresciani, allowing the guitar players to add chords on top of the text. For exemplification, we chose the well known Beatles song *And I Love Her*. Here is the pdf and the source .

Font quizzes

Below are some font-related curiosities. Try your hand at some **quizzes on typography terms**, and a **kerning test**.

Typography terms

- Play *Cheese or font* http://cheeseorfont.com/
- Can you tell whether these are *fontography terms or just pretentious blather?* http://blogs.msdn.com/b/oldnewthing/archive/2011/11/15/10237051.aspx

A reader comment from this blog:

```
Q: "Which of them are terms used in fontography, and which are just pretentious blather?"

A: Is this a trick question?
```

Kerning test

- We look at typeset material daily, but can you position the letters like a type designer? http://type.method.ac

THE PracTEX Journal

Issue 2012, Number 1 [Published 2012-10-22]

Book Review: *LaTeX and Friends*

Editors
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Comment on this article

This new feature of the PracTeX Journal includes, from time to time, short reviews of newly published textbooks or reference books on LaTeX and friends. For this issue, we selected a Springer book, *LaTeX and Friends* by Marc R.C. van Dongen

Book Review

Marc van Dongen – *LaTeX and Friends*, Springer-Verlag (X. Media Publishing Series), 2012, Hardback, 324 pp., ISBN-10: 3642238157, ISBN-13: 978-3642238154

In the last quarter of the century since its creation, and especially in the past ten years, a large number of books have been devoted to LaTeX, some of them extremely well written. Every time a new one is published (or is about to published) it is natural to ask whether it was, indeed, necessary or at least useful.

Although I was initially a little skeptical, after reading Marc van Dongen's book I discovered that it covers many topics that are not usually touched on in textbooks.

Most LaTeX books (and this one is no exception) start with a list of Pros and Cons: "Why should I switch to LaTeX?" or "Why should I not?". The first argument the author mentions against LaTeX is its complexity: "It may take one to several months to learn." Is this really true? Not in the opinion of some of my students in mathematics and computer science who usually think they can learn LaTeX in a day or two. The problem with LaTeXis exactly this: it is very easy to learn enough to be able to produce a not very complicated document. But what happens next? Unfortunately, in most cases, you need a considerable amount of effort to become a decent user of LaTeX. Not all users are willing to make this effort. One of the reasons for this is the lack of intermediate textbooks, and van Dongen's intention is to fill this gap.

The "philosophy" of the book is quite different from that of your "usual" textbook. The aim of the author is, as I see it, to teach you how to produce BEAUTIFUL documents, not just functional ones. The structure of the book reflects directly the philosophy I was mentioning previously. What I want to say is that the most important thing is *the result*, what we want to achieve, rather than the tools we use.

The first two parts cover the basic stuff: how LaTeX works, and how to typeset text and lists. The third part deals with *Tables, Diagrams and Data Plots*. A good title for this part would have been *Graphics*, and it is, probably, the most useful of the entire book.

There are only a few sources where tables are looked at from a graphical point of view. Van Dongen first describes briefly how to include graphics produced with other programs in a LaTeX document. In the remaining chapters of this "graphics" part, the author's aim is to explain how to *present* the information using LaTeX.

The *Diagrams* are described by using the `tikZ` package, a favorite of the author. A short introduction to the package is provided, enough to acquire a working knowledge (and, of course, to produce diagrams). The chapter about tables is about *presenting data in tables*, rather than just the mechanics of making a table. While the approach is far from being exhaustive, there is enough so that the reader can produce a presentable result. In

particular, I noted the care he used to produce beautiful tables, and not just to present data in a suitable tabular manner. Finally, he again shows how to use `tikZ` to describe the presentation of data using different kinds of plots.

The fourth part (*Mathematics and Algorithms*) is fairly standard. I particularly liked the part about Algorithms, and the author's style: he focuses on a very small number of packages and describes each in detail. He shows how these packages can be used to achieve the goal, in this particular case to present an algorithm.

The fifth part is, again, a little bit more advanced and covers both standard material (defining commands, counters, etc.) and material that is usually avoided in elementary textbooks, but which is essential in many situations (for instance, the use of keys).

In the sixth part, I was impressed by the chapter on the use of OpenType fonts, although this material is for more advanced users.

The book covers everything a beginner needs to know as well as a significant number of topics not present in elementary textbooks. Van Dongen's style is easy to read and never dull. The author avoids the temptation of covering entire areas or describing all the packages dealing with a particular subject. He prefers instead to focus on the subject and on a small number of appropriate packages.

What I particularly like is his attention to detail. You can find many small things which are usually skipped, but which contribute to the effectiveness of the book.

In fact, this is one of the very few books on LaTeX that really takes into consideration the beauty of the document as a whole, and not just particular constructions: You can have beautiful fonts or beautiful equations (and LaTeX is famous for them) but it is rare that a LaTeX user knows how to arrange them esthetically on the page. Van Dongen's book itself is a good example of its principles. I liked very much the book's page design, as well as the appearance of figure and table captions.

There is, however, a notable absence in the book: a listing of van Dongen's page layout. It would be useful for readers, and I'm sure my LaTeX students would have liked to see this. Perhaps Dr. van Dongen could post this online, for example on the PracTeX Journal site?

In conclusion, this is an excellent introduction to LaTeX and some of the associated software, suitable both for self-study and as a reference. It is written in a very innovative manner and can be used both by newcomers and more advanced users.

Paul A. Blaga
July 2012