
TUG 2019 abstracts
Amine Anane

Arabic typesetting using a Metafont-based dynamic font

Arabic script is a cursive script where the shape and width of letters are not fixed but vary depending on the context and the justification needs. A typesetter must consider those dynamic properties of letters to achieve high-quality text comparable to Arabic calligraphy.

In this talk I will present a parametric font that has been designed as a first step towards such high-quality typesetting. The font is based on the Metafont language which can generate a glyph with a given width dynamically, respecting the curvilinear nature of Arabic letters. It uses an extended version of OpenType to support the varying width of the glyphs. I will demonstrate a graphical tool which has been developed specifically to facilitate the design of such dynamic fonts. As a case study, I will compare a handwritten Quranic text with one generated with this dynamic font. I will conclude by highlighting future work towards a complete high-quality Arabic typesetting.

Takuto Asakura

A T_EX-oriented research topic: Synthetic analysis on mathematical expressions and natural language

Since mathematical expressions play fundamental roles in Science, Technology, Engineering and Mathematics (STEM) documents, it is beneficial to extract meanings from formulae. Such extraction enables us to construct databases of mathematical knowledge, search for formulae, and develop a system that generates executable codes automatically.

T_EX is widely used to write STEM documents and provides us with a way to represent *meanings* of elements in formulae in T_EX by macros. As a simple example, we can define a macro such as

```
\def\inverse#1{#1-1}
```

and use it as $\text{\inverse{A}}$ in documents to make it clear that the expression means “the inverse of matrix A ” rather than “value A to the power of -1 ”. Using such meaningful representations is useful in practice for maintaining document sources, as well as converting T_EX sources to other formal formats such as first-order logic and content markup in MathML. However, this manner is optional and not forced by T_EX. As a result, many authors neglect it and write messy formulae in T_EX documents (even with wrong markup).

To make it possible to associate elements in formulae and their meanings automatically instead

of requiring it of authors, recently I began research on detecting or disambiguating the meaning for each element in formulae by conducting synthetic analyses on mathematical expressions and natural language text. In this presentation, I will show the goal of my research, the approach I'm taking, and the current status of the work.

An extended abstract is available at wtsnjp.com/talk/cicm2019/dc-abstract.pdf.

Erik Braun

Current state of CTAN

The “Comprehensive T_EX Archive Network” is the authoritative place where T_EX-related material is collected.

Developers can upload their packages, and the distributions use it to pick up their packages. The T_EX Catalogue's entries can be accessed via the website, and all the data can be accessed from mirror servers all over the world.

The talk will give an overview of the current state of CTAN, recent developments, and most common problems. In further discussion, feedback from users and developers is very welcome.

Jennifer Claudio, Sally Ha

A brief exploration of artistic elements in lettering

This non-technical talk explores the stylistic elements of letter forms as used in arts and culture through an examination of elongations and decorations with a focus on the letter E. Samples discussed are derived from the calligraphy of Don Knuth's *3:16*, in samples of street art, and in typographic branding.

David Fuchs

What six orders of magnitude of space-time buys you
T_EX and METAFONT were designed to run acceptably fast on computers with less than 1/1000th the memory and 1/1000th the processing power of modern devices. Many of the design trade-offs that were made are no longer required or even appropriate.

Federico Garcia-De Castro

An algorithm for music slurs in METAFONT

This paper describes an algorithm that draws beautiful slurs around given notes (or other points to avoid). I have been working on such an algorithm on and off since around 2004 — when commercial music typesetting software did not provide for automatic, let alone beautiful, slurs. Along the way I tried many kinds of approaches, some of them inspired by METAFONT routines such as **superellipse**, the **flex** macro, and the **transform** infrastructure (which, for example, is what slants the `\textsl` font out of a vertical design). The usual fate of these attempts was one of promise followed by interesting development

leading to collapse — there usually were too many independent variables interacting chaotically.

Earlier this year I finally found a robust, elegant algorithm. I will present all of the attempts and describe what makes the final algorithm unique, and compare it to the way commercial software does slurs today. This is a graphic presentation, rather than musical.

Shakthi Kannan

X_qT_EX Book Template

The X_qT_EX Book Template is a free software framework for authors to publish multilingual books using X_qT_EX. You can write the content in GNU Emacs Org-mode files along with T_EX, and the build scripts will generate the book in PDF. The Org-mode files are exported to T_EX files, and Emacs Lisp post-processing is done prior to PDF generation. Babel support with Org-mode T_EX blocks allows one to selectively export content as needed. The framework separates content from presentation.

A style file exists for specifying customized page titles, setting margins, font specification, chapter title and text formatting, page style, spacing etc. The framework has been used to publish books containing Tamil, Sanskrit and English. It is released under the MIT license and available at gitlab.com/shakthimaan/xetex-book-template.

In this talk, I will explain the salient features of the X_qT_EX Book Template, and also share my experience in creating and publishing books using the framework.

Doug McKenna

An interactive iOS math book using a new T_EX interpreter library

The current T_EX ecosystem is geared towards creating only static PDF or other output files. Using a re-implementation of a T_EX language interpreter as a library linked into an iOS client program that simulates a document on a device with a touch screen, the author will demonstrate a new PDF-free ebook, *Hilbert Curves*, that typesets itself each time the application launches. The library maintains all T_EX data structures for all pages in memory after the typesetting job is done, exporting pages as needed while the user reads the book and interacts with its dynamic illustrations. This design also allows text-searching the document's T_EX data structures while the ebook is “running”.

Frank Mittelbach

Taming UTF-8 in pdfT_EX

To understand the concepts in `pdflatex` for processing UTF-8 encoded files it is helpful to understand

the models used by the $\text{T}_{\text{E}}\text{X}$ engine and earlier models used by $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ on top of $\text{T}_{\text{E}}\text{X}$. This talk gives a short historical review of that area and explains — how it is possible in a $\text{T}_{\text{E}}\text{X}$ system that only understands 8-bit input to nevertheless interpret and process UTF-8 files successfully; — what the obstacles are that can be and have been overcome; — what restrictions remain if one doesn't switch to a Unicode-aware engine such as $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ or $\text{X}_{\text{E}}\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$. The talk will finish with an overview about the improvements with respect to UTF-8 that will be activated in $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ within 2019 and how they can already be tested right now.

Ross Moore

L^AT_EX 508 — creating accessible PDFs

Authoring documents that are accessible to people with disabilities is not only the morally correct thing to be doing, but is now required by law, at least for U.S. Government offices and agencies, through the revised Section 508 of the U.S. Disabilities Act (2017). It is likely to eventually become so also for any affiliated institutions, such as universities, colleges and many schools.

For mathematics and related scientific fields, it thus becomes imperative that we be able to produce documents using $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ that conform to the accessible standard ANSI/AIIM/ISO 14289-1:2016 (PDF/UA-1). This is far more rigorous than standard PDF, in terms of capturing document structure, as well as all content associated with each particular structural element.

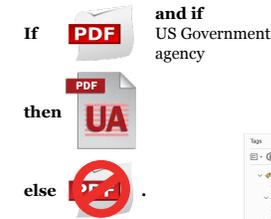
In this talk we show an example of a research report produced as PDF/UA for the U.S. National Parks Service. We illustrate several of the difficulties involved with creating such documents. This is due partly to the special handling required to encode the structure of the technical information such as appears on the title page, and inside-cover pages, as well as tabular material and images throughout the body of the document. But there are also difficulties that are due to the nature of $\text{T}_{\text{E}}\text{X}$ itself, and the intricacy of $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$'s internal programming.

Videos of this talk and another talk on accessibility, by Chris Rowley, are available at web.science.mq.edu.au/~ross/TaggedPDF/TUG2019-movies. The basic discussion slide follows:

$\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ 508 — creating accessible PDFs



US Rehabilitation Act, 2017 ruling:



Locating Data Collection Sites

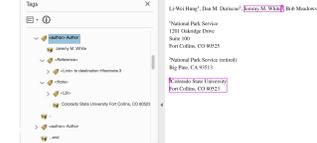
These observations were first made by the USGS and are carried out at specific sites to read the path. To prevent higher elevations sites from being affected by the wind because they provide a clear view of the site above the ground surface. The sites also need to be free from obstructions and must give a clear view of the site to the ground surface. Additional selection criteria include the accessibility and proximity of the site to existing roads, concrete construction, critical habitat, and forest developments. For a road path, one site is sufficient to capture the conditions represented across the entire path. For a large path, several placement in relation to other measurement sites is also considered to capture the range of its quality across the path. Each data collection site is listed in Table 2. See the end of the report for more information on the sites and methods used to collect data.

Table 2: Data collection sites at CHS

Site Name	Latitude	Longitude
Site 1	38.1234	-109.8765
Site 2	38.1234	-109.8765
Site 3	38.1234	-109.8765
Site 4	38.1234	-109.8765
Site 5	38.1234	-109.8765

How to Use

This report is intended to be used as a reference for the user when preparing for the user when preparing for an accessibility by road and is relatively good view of the north and southeast horizon. The



Dr Ross Moore, Department of Mathematics & Statistics, Macquarie University

Shreevatsa R

What I learned from trying to read the $\text{T}_{\text{E}}\text{X}$ program

As we know, $\text{T}_{\text{E}}\text{X}$ is written in a system called WEB that exemplifies the idea of literate programming (or programs as literature), and has been published as a book. Indeed, many good and experienced programmers have read the program with interest. But what if the reader is neither good nor experienced? Here we discuss some (more or less superficial) obstacles that stymie the novice modern programmer trying to make sense of the $\text{T}_{\text{E}}\text{X}$ program, and how they can be overcome. Further information is at <http://shreevatsa.net/tex/program>.

Yusuke Terada

Construction of a digital exam grading system using $\text{T}_{\text{E}}\text{X}$

At our school in Japan, large-scale paper exams are held on a regular basis. The number of examinees is enormous, and the grading must be finished within a short period of time. Improving efficiency was strongly needed. So I developed a digital exam grading system using $\text{T}_{\text{E}}\text{X}$. $\text{T}_{\text{E}}\text{X}$ and related software play a core role in the system, co-operating with iPad and Apple Pencil.

In this presentation, I would like to present how $\text{T}_{\text{E}}\text{X}$ can be effectively applied to constructing the digital exam grading system. I will also mention the unexpected difficulties that I faced in the actual large-scale operations and the way I have overcome them.