Profile of Eitan Gurari (1947–2009)

Eitan Gurari died unexpectedly on June 22, 2009. The TEX community mourns the loss of this important contributor.

Eitan Gurari was born in March 1947 in Haifa, Israel, and grew up in Tivon, a small town near Haifa. He met his wife, Shaula, who was born and raised in Haifa, at a dance. They had five children: A daughter Inbal, sons Itai and Erez, and twin daughters Netta and Danna. Eitan's son, Itai, says, "My father's sole hobbies were his work and family. He enjoyed both immensely. Also, in recent years he and my mother began traveling a lot." The children had all grown to adulthood at the time of Eitan's death. Eitan's 1989 book, *An Introduction to the Theory of Computation*, was dedicated,

To Shaula, Inbal, Itai, Erez, Netta, and Danna

Eitan was educated at Technion – Israel Institute of Technology where, in 1971, he received a Bachelor of Science degree in physics. He continued his studies there, but changed his focus to computer science, receiving a Masters degree in 1974. At that point he, his wife, and their then only child, a daughter, moved to the United States where Eitan studied at the University of Minnesota, which granted him a PhD degree in computer science in 1978. Eitan's faculty advisor at the University of Minnesota was Oscar Ibarra.

After graduation from the University of Minnesota, Eitan moved to the University of Wisconsin – Milwaukee, where until 1980 he was an assistant professor in the Department of Electrical Engineering and Computer Science. He next moved to the State University of New York at Buffalo, Department of Computer Science, where he served as an assistant professor until 1982. In 1982, Eitan moved to the Ohio State University, where he was an associate professor teaching computer science and doing research until his death.

At Ohio State, Eitan taught a wide variety of courses, suggesting that he pitched in to teach whatever needed teaching and that he used the need to teach a course in a new area as a way of broadening his own knowledge. His website at the time of his death listed the following courses that he had taught (we don't know if this is a complete list): Introduction to Computer Graphics, 1993; Introduction to Computer Networks, 1998; Introduction to Data Structures, 1999; Introduction to Automata and Formal Languages, 1999; Introduction to Programming with Java, 2003; Advanced Technologies with Java, 2004; Programming Challenges, 2004; XML Technologies, 2005; Compiler Design and Implementation, 2008; Introduction to Programming with C++, 2008; Data Structures for Information Systems, 2008; Introduction to Database Systems, 2009.

Early in his career, Eitan's interest was in the theory of computation, and between 1978 and 1987 he had 18 papers in this field published in refereed journals, many of them co-authored with Oscar Ibarra. Two typical titles are, "Two-Way Counter Machines and Diophantine Equations" and "Some Decision Problems Concerning Sequential Transducers and Checking Automata." During this period Eitan also had six papers published in conference or symposium proceedings. The culmination of this work appears to have been his already mentioned 1989 book on the theory of computation.

Eitan's obituary notice on the website of the Computer Science and Engineering Department of Ohio State University said the following:

> Dr. Gurari started his career as a theoretician. He made fundamental contributions to automata and complexity theory. His textbook, *An Introduction to the Theory of Computation*, was highly praised, and he published frequently in JACM, SIAM Computing, ACM STOC, and IEEE FOCS.

The obituary notice continued,

> After joining OSU, Gurari switched his research focus, starting to build software systems.

We can see this transition from his writings and presentations in the succeeding years.

1991 "A WYSIWYG Literate Programming System" (Preliminary Report), with J. Wu, Nineteenth ACM Computer Science Conference.

1994 *TEX and LATEX: Drawing and Literate Programming*, A manual for DraTEX, AlDraTEX, ProTEX, and AlProTEX, McGraw-Hill

Writing with TEX, McGraw-Hill.

1997 "A Demonstration of TEX4ht", TUG '97 presentation

"Drawing with DraTEX", TUG '97 presentation

1999 "LATEX to XML/MathML", with S. Rahtz, TUG '99 workshop and abstract in *TUGboat*

The LATEX Web Companion, by M. Goossens and S. Rahtz, with contributions by E. Gurari, R. Moore, and R. Sutor, Addison-Wesley

2000 "From LATEX to MathML and Back with TEX4ht and PassiveTEX", with S. Rahtz, The first MathML International Conference, Urbana-Champaign, Illinois.

2003 "From LATEX to MathML and Beyond", TUG '03 presentation

2004 "TEX4ht: HTML production", PracTEX 2004 presentation and abstract in *TUGboat*

"XML and MathML production through LATEX", keynote presentation at the Second European Workshop on MathML & Scientific e-Contents, Kuopio, Finland

2005 "SwiExr: Spatial math exercises and worksheets, in Braille and print", TUG '05 presentation and *TUGboat*

"MathML via TEX4ht and other tools", PracTEX 2005 presentation and *TUGboat*

2007 "LATEX conversion into normalized forms and speech", TUG '07 presentation and *TUGboat*

Sebastian Rahtz remembers becoming aware of Eitan's work in the world of TEX as follows:

> I first came across Eitan Gurari when I was looking at LATEX to SGML conversion in the late '90s. I had worked on a system at Elsevier in which we took apart a DVI file decorated with `\special` commands, and I was rather pleased with it. Then I saw a reference to Eitan's TEX4ht system, and realized that he had gone down the same road, but with a much more sophisticated setup. Michel Goossens and I had earlier tried to document Eitan's clever DraTEX drawing macros, so when we were about to start on the *LATEX Web Companion*, we decided to ask Eitan to contribute a chapter about his system. I like to think that this helped bring even more people's notice to Eitan's remarkably ingenious work in this fascinating side road of TEX.
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> I did not meet Eitan in person until the TUG 1999 meeting, at which we did a joint session. He turned out as I expected — quiet, humble, and seemingly quite surprised (but pleased) to find out that people appreciated his work. That set the tone for our communication over the following years as the *LATEX Web Companion* was completed, and he continued to improve TEX4ht. He was always apparently pleased to be told of errors, and quickly fixed them, and was pleased with feedback on his writing. I don't remember a cross word or a disagreement.
>
> I shall remember Eitan with pleasure and gratitude for his careful and innovative contribution to TEX.

Obviously Eitan's TEX4ht had big impact on the TEX world, as a number of notes since his death to the `comp.text.tex` list and to TUG president Karl Berry have testified.

Karl Berry himself remembers,

> I had two kinds of dealings with Eitan over the years: *TUGboat* papers and TEX4ht software. There was nothing remarkable about the *TUGboat* interactions; they were all completely cordial and straightforward. He got his stuff in on time and was perfectly happy to accept all editing changes. If only all authors were so accommodating :).
>
> With TEX4ht, things were a bit more extensive. The TEX Live guide (`http://tug.org/texlive/doc.html`) is written in LATEX, and exists in several translations. All are converted to HTML using TEX4ht. Sebastian did it this way back in the first days, and we stayed with the same procedure when I took over. Both of us would always find problems with the HTML output at the last minute (the doc is always the last thing to be done), especially given the plethora of translations. Eitan logged in to `tug.org` many times to debug the problems; he invariably found solutions within a day or two, usually sooner. It was pretty amazing to me, given how complex and huge TEX4ht is.
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> The TEX Live doc has always had this paragraph in the list of thanks:
>
> - Eitan Gurari, whose TEX4ht was used to create the HTML version of this documentation, and who worked tirelessly to improve it at short notice.

While many people in the TEX community have used TEX4ht at one time or another to convert a TEX file to HTML (some with considerable regularity as Karl Berry described), TEX4ht was also used by some as a key component in their business workflow. CV Radhakrishnan of River Valley Technologies describes their use as follows:

> We use TEX4ht on a daily basis; in short, the existence of River Valley is wholly dependent on the TEX4ht system. It is one of the brilliant pieces of software written in the TEX language.

> TeX4ht can digest any LaTeX document and output appropriate XML or HTML depending on users' requirements. We use it for generating different kinds of XML from LaTeX documents based on different client DTDs, without human intervention. The main point is that TeX4ht permits command line invocation (in fact, there is no graphical interface) and, therefore, integrates well into our fully automated work flow. Many people see TeX4ht as a monster which defies taming. Our experience is different; TeX4ht is a highly configurable and scalable system which can effectively be used to derive different kinds of formats from LaTeX sources including html, xml, open office documents, braille, etc. with remarkable ease. I have even used TeX4ht to convert an author-macro-ridden LaTeX document into standard LaTeX by degrading all the complex author macros into corresponding TeX/LaTeX primitives!

To this, CVR's partner in River Valley, Kaveh Bazargan, adds:

> Eitan's death is a great loss to our community, greater than most realise. I echo CVR's comments. It is no exaggeration that our company is based around TeX4ht which is an order of magnitude more capable of doing the complex tasks we undertake than any other software.

A common thread among comments about Eitan was his quick responsiveness when problems were found with his software. A quote from Kapil Hari Paranjape, who maintains the "downstream" packaging of TeX4ht for Debian, illustrates the extent to which Eitan went to be responsive:

> I always found [Eitan to be] a responsive upstream who was willing to be patient and explain his way of maintaining the package to the Debian developer community. As soon as I mentioned that it was possible for him to obtain Debian bug reports directly by subscribing to the Package Tracking System, he did so and started responding to such reports with fixes.
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> The major request which Debian made was that the literate sources of TeX4ht be made available in order to comply with the Debian Free Software Guidelines. This was a big task for him as he described his system as "put together in the basement/garage." However, he took up this task and did it and we are all grateful for it.

As this profile is being written, plans are being made within the TeX community for the continued support of TeX4ht.

Dr. Susan Jolly, a computational scientist now retired from Los Alamos National Laboratory, was instrumental in Eitan becoming involved with braille. Susan, who is not blind, has a deep interest and commitment in improving the efficiency of transcription of books and journals, especially math books and journals, into braille (`www.dotlessbraille.org`). She recalls,

> I first wrote to Eitan on July 26, 2001, to ask him about TeX4ht (which I'd found via Google) and to tell him that it should be possible to use TeX4ht as the basis for a project that would mean "that a huge legacy of mathematics could be made available in braille."
>
> Eitan wrote back two hours and eight minutes later to say, "I would love to be involved in such a project." And we were off and running. Of course, at that point, neither of us appreciated how difficult the project would turn out to be nor how long it would take nor how much fun we'd have.
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> By the end of September 2001, Eitan had drafted a proposal to the NSF. This first proposal was not funded but the similar second one was.

The issue, as described by Susan, is roughly as follows. Braille involves "cells" of six embossed (raised) dots (in a 2-wide 3-high arrangement) allowing 63 different configurations of dots. What these dot configurations mean depends on the "braille code" that is being used: there is a basic code for novice learners, a more advanced code, a literary code, codes for math, music, and different languages, etc. The various codes involve context dependent meanings and contractions, signals for changing among codes, etc.; with the exception of the most basic code for new learners, things are not nearly as simple as just spelling out every printed word, which is impossible in any case for mathematics. All in all, it is far from straightforward to transcribe from print to braille. In many cases the transcription process begins with optical character recognition of a printed page, which must be corrected by transcribers as they also convert the sequence of characters and words into appropriate plain text representations of each of the 63 different cell configurations, typically with the aid of commercial print-to-braille software. Software and hardware can then convert these plain text files into pages of embossed braille. The reverse conversion is also sometimes used as a way of checking the initial transcription. The entire process is time consuming and expensive with not nearly enough people available to do the transcriptions to braille, especially transcriptions involving math (which is also an area of weakness for print-to-braille software).

The reasons why Eitan's work was valuable are as follows:

- There has not been much math (or science more generally) in braille because of the effort required to convert to braille. There is a particular shortage of transcribers familiar with the Nemeth code used for transcribing technical material.
- There is a large legacy of math, etc., already in journals which accept TeX (by which we also mean LaTeX, AMS-LaTeX, etc.) input and books written using TeX, and new TeX-based books and journals are being produced all the time. Increasingly these are available in machine readable form, e.g., at `arXiv.org` and an initiative of the American Physical Society to make the source files of its publications available which hopefully will spread to other organizations.
- However, source TeX has all sorts of stuff about how to make it look on the printed page which is uninteresting to someone just trying to transcribe it to another format (i.e., Nemeth braille). But TeX4ht already does the job of throwing away all that finicky detail about actual printing and converts the output of a TeX system to a much simpler HTML format. Also, the source TeX code has the math in a form that maintains its meaning (not just combinations of characters on a printed page), and TeX4ht already knows how to convert that format into something else, i.e., MathML.
- Thus, a good place to add braille conversion is as an optional output of TeX4ht.

But, of course, there were lots of unsolved details plus the actual prototyping effort which thus made it a plausible academic project requiring grant funding. For instance, some spatial or planar (2-D) items, i.e., elementary arithmetic, tables and matrices, have prescribed planar renderings in braille. Eitan was especially interested in automating the associated complex formatting problems.

Eitan was scheduled to make a presentation on his work with braille at TUG '09 (held a month after his death) entitled, "SuBrl: A LaTeX to braille converter: A first look at a forthcoming system". His pre-conference abstract said,

> SuBrl is a system under development for translating LaTeX and XML data into braille. The presentation will demonstrate the translation of LaTeX and XML into braille, describe the architecture of the system, discuss issues that require special attention in LaTeX and XML sources, and argue the benefit of a LaTeX front end for braille production.

Regarding the name of Eitan's system, he wrote to Susan Jolly in an email dated 3/19/2009:

> I was asked to give a talk at the end of July to the annual TeX Users Group meeting. I decided to give a talk about some insight into LaTeX translation to braille (with the hope that at that time I'll have some core system nearly ready to release). I'm going to call the system SuBrl. I would like to publicly dedicate the "su" component to your suggesting the project and generously introducing me [to the world of] braille. I hope you'll permit me to do so.

Eitan's children are working with his university to get access to his files for his work with braille with the hope that someone can be found to continue his work.

Compiled by David Walden, July 2009