What Is New in LaTeX?
VII. The STIX Math Symbols

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We are like children, "I want more…" Except that we don't want more candy but more math symbols. Donald Knuth provided a number of them, Leslie Lamport some more, and the AMS hundreds more. In addition, we are given tools to put together new symbols from given ones, and scale, rotate, and raise them. But we are still not satisfied.

Now finally, the spoiled children of mathematics will be happy. We got an incredible number of new symbols, over 2,000 of them! And best of all, unbeknownst to you, you already have them. This article is the brief story of the STIX fonts and why we should all rejoice.

Swinging It

In a recent paper of mine (arXiv:1312.2537), I introduce the concept of a *swing*: a prime interval $\mathfrak{p}$ swings to another one, $\mathfrak{q}$, as exemplified by this diagram:
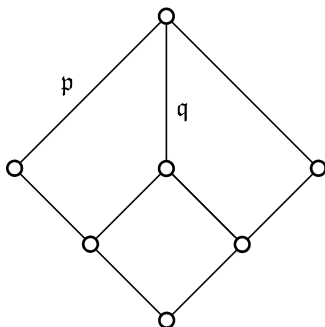
The AMS provides a nice curved arrow, `\curvearrowright`, typeset as ⌢; unfortunately, it is upside down (you don't swing that way).

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I solved my problem, utilizing the `graphicx` package, by defining

```
\newcommand{\swing}
   {\mathbin{{\rotatebox{180}
       {$\curvearrowleft$}}}}
```

which turns `\curvearrowleft`, ⌢, 180 degrees: $\mathfrak{p} \smile \mathfrak{q}$. (Raise it with `\raisebox`: $\mathfrak{p} \smile \mathfrak{q}$.)

A better way to solve the problem is by utilizing the 2,000 or so new math symbols offered by STIX.

The STIX Project

"The mission of the Scientific and Technical Information Exchange (STIX) font creation project is the preparation of a comprehensive set of fonts that serve the scientific and engineering community in the process from manuscript creation through final publication, both in electronic and print formats."

This is the mission statement of the STIX project. It all started in 1995. The project was proposed by Arie de Ruiter of Elsevier, a scientific publisher. In collaboration with four other scientific publishers/associations (AIP, ACS, IEEE, APS), the STI Pub consortium was formed. The AMS joined in 1997. For an outline of the project timeline, visit the site

`www.stixfonts.org/proj_timeline.html`

For the timeline of the AMS participation (up to 2006), go to `www.ams.org/STIX/`. The symbols were completed by 2006.

The LaTeX Version 2.0 was released for my birthday last year. I guess this momentous event needs some publicity. It received some in the *New York Times* back in 2002.

Installation and Usage

"Regularity is good," advised Maharishi Mahesh Yogi. I hope you are taking his advice, and you

have a TeX installation from 2014 (for instance, TeX Live, MacTeX, MiKTeX, proTeXt 2014). If you do, then you already have the STIX fonts installed.

Try to typeset the following tiny article:

```
\documentclass{article}
\usepackage{stix}
\begin{document}
Some text, and a math formula
    $\ccwundercurvearrow$.
\end{document}
```

This will typeset as

Some text, and a math formula ↶.

Once installed, using the STIX fonts with LaTeX is as simple as loading the STIX package, as in the example. There is only one catch. The STIX package has to be loaded *ahead of* the AMS packages. Easier said than done. If you use the amsart document class, it loads all the AMS packages. So use the unusual construct:

```
\RequirePackage{stix}
\documentclass{amsart}
\begin{document}
Some text, and a math formula
    $\ccwundercurvearrow$.
\end{document}
```

This typesets the same as the previous example.

If your installation is not up to date, it is simpler to update it than to try to install the STIX fonts yourself. However, if you insist, you can find the STIX fonts at

https://sourceforge.net/projects/stixfonts

Download the package; you get the folder STIXv2 (if you get STIXv2.zip, unzip it). In STIXv2, you find the folder Fonts. It contains:

(1) the fonts (inside the Fonts folder, there is a subfolder fonts, which contains a subfolder opentype, which contains a subfolder public; this contains a subfolder stix, containing the five font files);

(2) the style file stix.sty (inside the Fonts folder, there is a subfolder tex, which contains a subfolder latex; this contains a subfolder stix, containing a lot of files, including the style file);

(3) the documentation stix.pdf (inside the Fonts folder, there is a subfolder doc, which contains a subfolder fonts; this contains a subfolder stix, containing several files, including the document file).

Installing fonts to be used with LaTeX is so complicated that related questions take up a substantial portion of any TeX discussion group. This installation is no exception. Follow the steps appropriate for your operating system. Believe me, updating your LaTeX installation is simpler.

All the math symbols are listed in nineteen pages of stix.pdf (we located this document in the third item above). The second of these nineteen pages is reproduced as the last page of this article (an * indicates that there is no bold version). These pages show all the symbols and the commands necessary to produce them. So \varcarriagereturn typesets as ⏎.

How to Find a Symbol?

With perseverance. The symbols are divided into twelve parts; the longest is Relations, about seven pages! Within a part, they are listed by their hexadecimal number.

"With so many symbols, however, the STIX fonts could be cumbersome to use. The developers are working to come up with a method that will make it relatively easy for users to find the symbols they want. Symbols will probably be organized by type or subject, with the user selecting a category (and possibly a subcategory) from drop-down menus. A grid of symbols in that category will then appear, from which the user can choose the appropriate one." So promised Tim Ingoldsby, speaking to the NYT in 2002 for the American Institute of Physics. Unfortunately, this promise went unfulfilled.

With sufficient resources, the task of finding the appropriate symbol can be made much easier. One approach can be found at detexify.kirelabs.org and at shapecatcher.com. Draw the symbol on the screen and they try to find the most similar symbols. Neither site supports the STIX fonts, but it would be nice to have such a tool available for them.

A different approach, a big table with links, is promised by Johannes Küster for his Minion Math font. He intends to make this available online.

There is a cheaper way to go: group the symbols and list related ones together. For instance, Relations could have Arrows as a subsection, with Straight Arrows, Curved Arrows, and Miscellaneous Arrows as further subsections.

Conclusion

I gave only two examples of the STIX math symbols; there are about 2,000. There are lots of arrows, for instance, ⇨ (\rightwhitearrow) is new, and here it is in bold ⇨ (\boldsymbol\rightwhitearrow). And if you want the old ≤ with =, you can have it; here are some variants: ≦, ≨, ⊊ (\leqq, \lneqq,\lvertneqq).

We conclude this article with page 5 of stix.pdf, a broader list of STIX math symbols. Browse the list; find some symbols that you may want to use for your math.

⅏	U+2037	\backtrprime
⁀	U+2038	\caretinsert
‼	U+203C	\Exclam
⁃	U+2043	\hyphenbullet*
⁇	U+2047	\Question
⁗	U+2057	\qprime
◯	U+20DD	\enclosecircle
▢	U+20DE	\enclosesquare*
◇	U+20DF	\enclosediamond*
△	U+20E4	\enclosetriangle
Ɛ	U+2107	\Eulerconst
ℏ	U+210F	\hbar*
ℏ	U+210F	\hslash
ℑ	U+2111	\Im
ℓ	U+2113	\ell
℘	U+2118	\wp
ℜ	U+211C	\Re
℧	U+2127	\mho
℩	U+2129	\turnediota
Å	U+212B	\Angstrom
Ⅎ	U+2132	\Finv
ℵ	U+2135	\aleph
ℶ	U+2136	\beth
ℷ	U+2137	\gimel
ℸ	U+2138	\daleth
⅁	U+2141	\Game*
⅂	U+2142	\sansLturned*
⅃	U+2143	\sansLmirrored*
⅄	U+2144	\Yup*
℔	U+214A	\PropertyLine*
↨	U+21A8	\updownarrowbar
↴	U+21B4	\linefeed
↵	U+21B5	\carriagereturn
↸	U+21B8	\barovernorthwestarrow
↹	U+21B9	\barleftarrowrightarrowbar
↺	U+21BA	\acwopencirclearrow
↻	U+21BB	\cwopencirclearrow
⇞	U+21DE	\nHuparrow*
⇟	U+21DF	\nHdownarrow*
⇠	U+21E0	\leftdasharrow*
⇡	U+21E1	\updasharrow*
⇢	U+21E2	\rightdasharrow*
⇣	U+21E3	\downdasharrow*
⇦	U+21E6	\leftwhitearrow
⇧	U+21E7	\upwhitearrow
⇨	U+21E8	\rightwhitearrow
⇩	U+21E9	\downwhitearrow
⇪	U+21EA	\whitearrowupfrombar
∀	U+2200	\forall
∁	U+2201	\complement
∃	U+2203	\exists
∄	U+2204	\nexists
∅	U+2205	\varnothing
∅	U+2205	\emptyset
∆	U+2206	\increment
∎	U+220E	\QED*
∞	U+221E	\infty
∟	U+221F	\rightangle
∠	U+2220	\angle
∡	U+2221	\measuredangle
∢	U+2222	\sphericalangle
∴	U+2234	\therefore
∵	U+2235	\because
∿	U+223F	\sinewave
⊤	U+22A4	\top
⊥	U+22A5	\bot
∻	U+22B9	\hermitmatrix
∾	U+22BE	\measuredrightangle
⊿	U+22BF	\varlrtriangle
⋯	U+22EF	\cdots
⌀	U+2300	\diameter*
⌂	U+2302	\house
⌐	U+2310	\invnot
⌑	U+2311	\sqlozenge*
⌒	U+2312	\profline*
⌓	U+2313	\profsurf*
⌗	U+2317	\viewdata*
⌙	U+2319	\turnednot
⌬	U+232C	\varhexagonlrbonds*
⌲	U+2332	\conictaper*
⌶	U+2336	\topbot
⍀	U+2340	\APLnotbackslash*
⍓	U+2353	\APLboxupcaret*
⍰	U+2370	\APLboxquestion*
⍼	U+237C	\rangledownzigzagarrow*
⎔	U+2394	\hexagon*
⎶	U+23B6	\bbrktbrk
⏎	U+23CE	\varcarriagereturn*
⏠	U+23E0	\obrbrak
⏡	U+23E1	\ubrbrak
⏢	U+23E2	\trapezium*
⏣	U+23E3	\benzenr*