

An Inclusive and Accessible LaTeX Editor

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L^AT_EX

$$\int_0^{\infty} \sum_{l=0}^{\infty} \frac{A_l(\mathbf{x})}{2\pi}$$

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\int^{\infty}_{0}\sum^{\infty}_{l=0}\frac{A_l(x)}{2\pi}
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Motivation

- Education in mathematics is important at all school levels
- Mathematical notation for the visually impaired students is a challenge which has not been completely solved
 - Large set of different symbols used in math
 - Large use of subscripts, superscripts, and multi-line notation

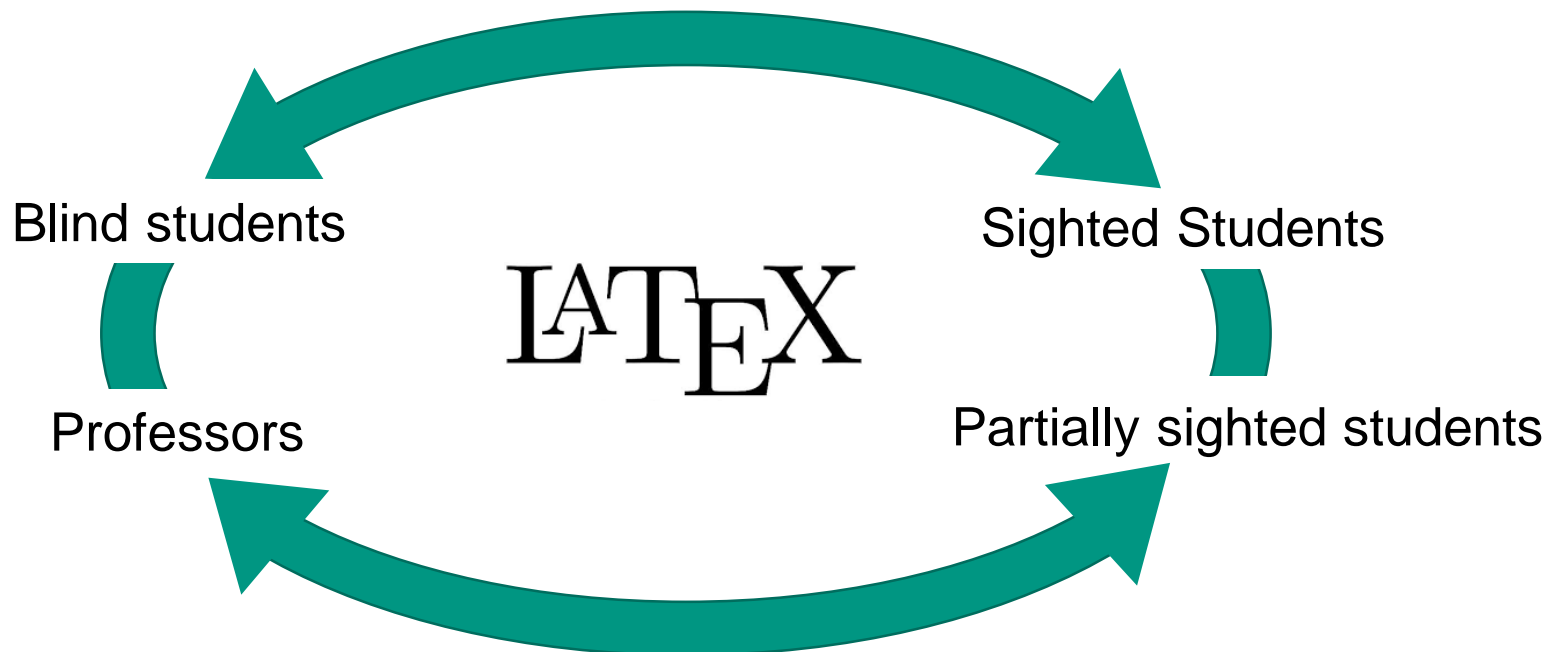
$$x \lim_{x \rightarrow \infty} \frac{\pi(x)}{x / \ln(x)} = 1$$

$$\sum_{k=0}^n \binom{n}{k} = 2^n$$

$$\oint_C \frac{f'(z)}{f(z)} dz = 2 \pi i (N - P)$$

Our needs

- A method for writing homework and exams
- A mathematical notation for tactile learning material
- An inclusive solution



Why we chose LaTeX

- Does not affect inclusive education
 - It is not a symbolic notation specifically developed for visually impaired users
- Not necessary to learn a large set of new symbols
- Many lecture materials and scripts are available in LaTeX

Main disadvantage

- In some situations, the notation is verbose and cumbersome
 - Long formulas

Accessibility Tests for three LaTeX Editors

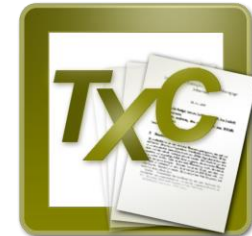
■ Texmaker

- free
- cross-platform



■ TeXnicCenter

- only for Windows
- considered a good editor for blind students [1]



■ BlindMath [2]

- purposely developed as Assistive Technology



Accessibility Tests for three LaTeX Editors

- NVDA, JAWS, ZoomText, Windows magnifier
- GUI accessible with screen-readers
- Magnifiers able to follow the text cursor
- Magnifiers able to follow the focus in the main menu
- Clarity and definition of the magnified text

In total nine different tests

More details at:

<https://services.szs.kit.edu/szslatex/>

Accessibility Tests for three LaTeX Editors

	T1	T2	T3	T4	T5	T6	T7	T8	T9	Tot
Texmaker	0	0	0	0	0	0	0	0	0	0
TeXnicCenter	+1	+1	0	0	+1	0	0	+1	+1	5
BlindMath	+1	+1	0	0	+1	+1	+1	+1	+1	7

- Texmaker
 - Fails all the tests

- TeXnicCenter
 - It is an option only for screen-reader users

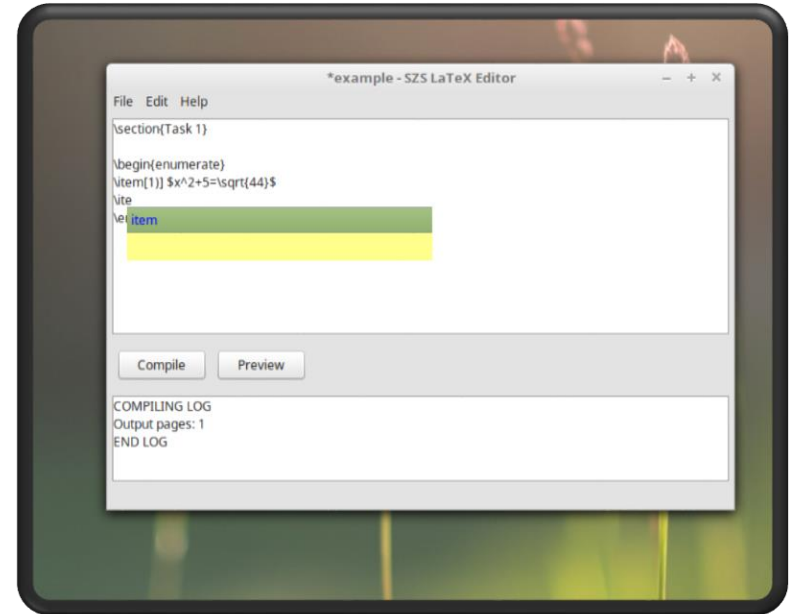
- BlindMath
 - received the best score in our tests
 - No output as PDF
 - No compiler output (techexplorer hypermedia plug-in)

SZS-Editor for LaTeX

- cross-platform
- handle standard LaTeX input files
- essential UI for beginners in LaTeX
- wxWidgets library

Main features:

- Hidden LaTeX header
- Simplified compiling log
- Go-to-line functionality
- Auto-completion LaTeX-code
- Code folding
- Focus manager
- Personalization via XML files
- Multilanguage interface (EN, DE, IT)



Evaluation of the First Version

Usability test

- 3 participants
 - 2 blind students
 - 1 partially sighted student
- All the participants had a basic knowledge of LaTeX
- Two had already used an editor before (TeXnicCenter)
- 4 Tasks
 - Find an error into an arranged document
 - Navigate a document with go-to-line functionality
 - Explore a long formula using the code-folding functionality
 - Make a new document with some suggested mathematical expressions using the Auto-completion functionality

Results of Evaluation

■ Single feature usability

Feature	Average score
Go-to-line	4
Code folding	3.3
Auto-completion	3
Focus manager	3

range from 0 (not useful) to 4 (very useful)

■ Global usability

System Usability Scale

96

Conclusion and Future Work

- Developing the first version of the SZS-Editor with the wxWidgets GUI library, we obtained a user interface fully accessible with the ATs used by our students.
- The current version is in use by two students, who used it for the development of written exams, a seminar report and a presentation.
- The satisfying ranking achieved in the user-tests, and the interest of the students, encourage further development of the software. In particular, our work focuses on:
 - the improvement of the PDF preview
 - a direct interaction with other ATs like Braille-display

SZS-Editor for LaTeX

For more info and to download the editor:

<https://services.szs.kit.edu/szslatex/>

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Sources

[1] Maneki, A., Jeans, A.: LaTeX: What Is It and Why Do We Need It? In: Future Reflections - A Magazine for Parents and Teachers of Blind Children, vol. 31 Number 2 (2012).

<https://nfb.org/images/nfb/publications/fr/fr31/2/fr310212.htm>

[2] Pepino, A., Freda, C., Ferraro, F., Pagliara, S., Zanfardino, F.: "BlindMath" a New Scientific Editor for Blind Students. In: K. Miesenberger et al. (eds.): ICCHP 2006, LNCS, vol. 4061, pp. 1171-1174. Springer, Heidelberg (2006)

Backup slides

SZS-Editor for LaTeX

Main features:

- ...
- Code folding

$$y = \left(\frac{\sqrt{a}}{b} \right)^{\frac{1 + \omega}{z}}$$
