

# *Experiments in Translating and Navigating Digital Formats for Mathematics*

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# Overview

## / Goals of the Project

- / Make electronic mathematics accessible to the visually impaired
- / Without unduly constraining existing workflow
- / Thus, translate between existing standard formats
- / Provide more accessible format for using mathematics.

# Mathematic formats

## / LaTeX

- / Most popular format in math and CS
- / Based on TeX, a macro-based typesetting language
- / Emphasis is on writeability and appearance
- / Very few mathematic semantics involved
- / Distinguished by emphasis on minimal resources

# Mathematic formats

- / OpenMath
  - / Standard from the OpenMath Consortium
  - / Emphasis is on interchange between Computer Algebra Systems
  - / Strong ontologies, support for extension
  - / Not particularly well-used outside the CAS community

# Mathematic formats

- / MathML

- / Standardized by the [WWW](#) Consortium

- / Strong overlap between standard writers and OpenMath

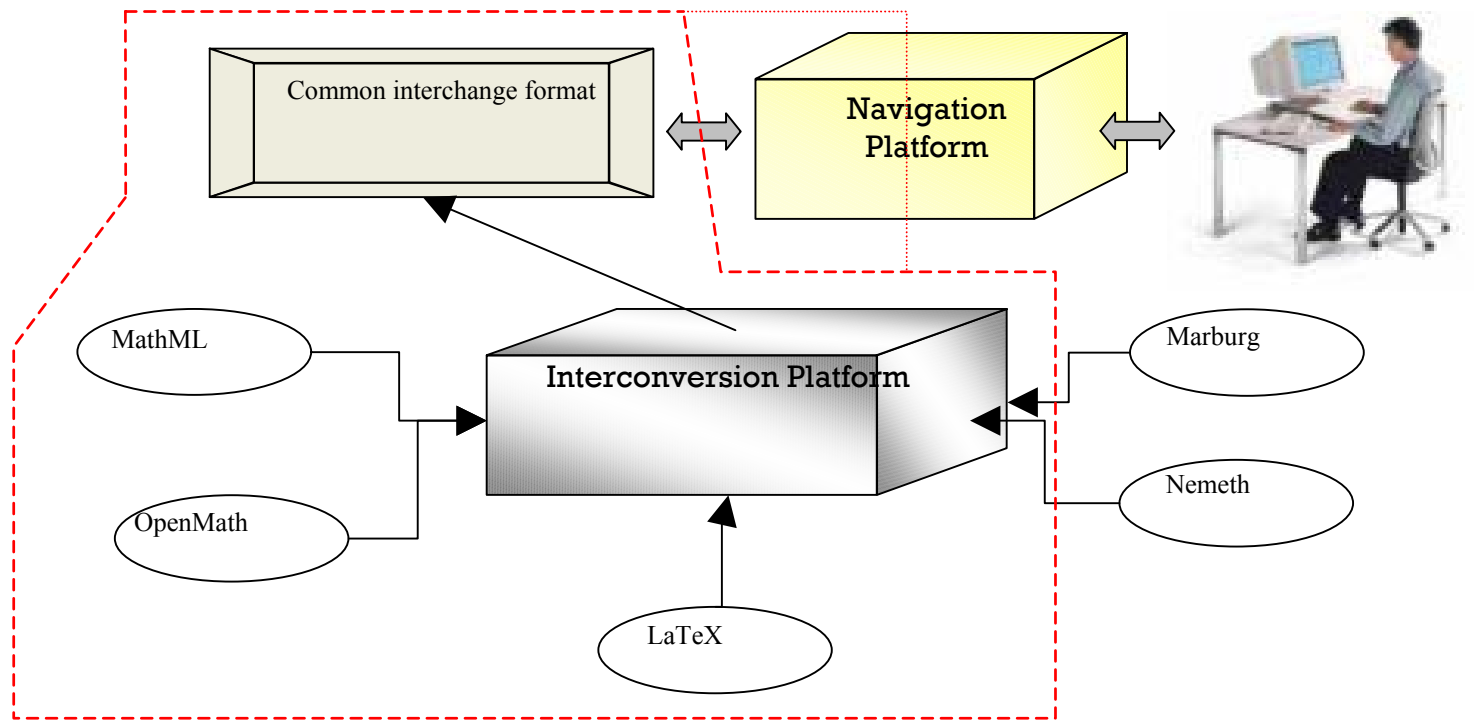
- / Focus is on presentation

- / Used in web browsers (e.g., Mozilla, Netscape)

- / Designed to handle math used in K-12 situations

- / Some support for content and extension

# Converting



# Converting

- / Java based converter
  - / Cross-platform
  - / Robust library
  - / Easy modularity
- / Hooks to integrate with Braille input

# Common Interchange Format

- / MathML is the base
  - / Makes it easy to present
  - / Close ties with OpenMath'
  - / Widespread support while still preserving mathematical semantics
  - / XML-based syntax for interoperability

# Transformation process

- / LaTeX
  - / Custom LaTeX parser.
  - / Ignores macros and syntax modifications
  - / Two-step process: one to convert to intermediate tree structure, one to convert tree to XML
- / XSLT used to convert between MathML and OpenMath
  - / Limited introspection, string handling mean limited semantic mappings (e.g., OpenMath type declarations)

# Voice Presentation

- / FreeTTS Speech Engine
  - / <http://freetts.sf.net>
  - / Java based
  - / Mbrola voice support, CMU diphone lexicon
- / Presenting math
  - / Separate stylesheet written to convert mathematical objects to spoken math
  - / Support for user-defined language translations

# Navigation

- / Java applet with Mozilla support
- / Present the MathML document as text is spoken aloud
- / Provide user ability to select regions to be spoken
- / Skipping around in the document?

# Future work

- / Braille integration
  - / University of Florida is another part of the project, working with braille mathematic formats
  - / Designed to work modularly with this system
- / Better navigation
  - / Bookmarking
  - / Auditory cues