1 Introduction

Problem: It is hard to make a good-looking mathematics book for display in a browser.

Opportunity: There are lots of great things you can put on a web page (think Sage Cell Server).

Solution: very structured source, amenable to translation to a variety of outputs — traditional, new and unimagined

2 Philosophy

- Structure of a text = hierarchical tree (chapter/section/subsection)
- Markup to clearly reflect structure, no presentation allowed
- Powerful and flexible processing tools, designed for the job

Conclusion:
- XML (eXtensible Markup Language) – simple syntax
- XSL (eXtensible Stylesheet Language) – declarative, complex and powerful
- An “XML application” – design of the elements (“tags”)

3 Goals

- Simple markup: sensible names, abbreviations, few attributes
- Excellent support for authors
- Knowledge embedded in system (think MathJax configuration)
- Flexibility through processing switches (e.g. numbering depth)
- XSLT converters to \LaTeX and HTML (reference design)
- Low-level routines modularized
- Readable \LaTeX output (insurance for the cautious)

All of this is possible with few compromises
4 Status

Primary (only) product: the XML application, the elements and their possible arrangements

Converters are to aid design and demonstrate potential (besides being useful)

- Specification is close to complete, seeing very few changes
- Converters are progressing – usable, but more to do
- Writing to a shared HTML specification:
  - David Farmer (AIM) is converting straight from \LaTeX
  - Mike DuBois (UPS student, UTMOST) is creating CSS and Javascript
- About five book-length projects with about five authors involved

5 Examples I

One Sage worksheet, multiple output formats –LU decomposition for mathematics majors

- \LaTeX \rightarrow PDF
- HTML, with Sage Cell Server
- Sage Notebook (*.sws packaged via a Python script)
- SageMathCloud (small Python script to inject UUID's)
- iPython Notebook (HTML in JSON)
- MathBook XML source

6 Examples II

- Tyler Ueltschi's semester research project
- RAB & Godsil, *Explorations in Algebraic Graph Theory with Sage*
- RAB, *A Second Course in Linear Algebra*
- Hitchman and Judson, *The Ordinary Differential Equations Project*, in-progress
- William Trench, *Introduction to Real Analysis*, to be converted by Albert Schueller
- RAB, *A First Course in Linear Algebra*, conversion from one-off XML to MathBook XML
- *sample-article.xml* from project documentation
7 Sage

Plans for further Sage integration

- `<sageplot>` element to produce graphics
- `doctest=""` attribute
- Larger works into worksheets by chapters or sections
- Improvements to CSS for SMC output (refactor existing)
- `$\%mathbook` magic for SMC

8 To Do

Development priority: user requests

- Restructure front matter: preface, acknowledgement, copyright, etc
- Generate back matter automatically: index, notation list, list of . . .
- Further widget support: audio, video (FlowPlayer), GeoGebra, WeBWork
- Further graphics support: tikz, Asymptote
- Conversion to ? (perhaps EPUB 3 EDUPUB Profile)
- Formulate a DTD (Document Type Definition) and/or schema
- Skulpt: browser widget to execute Python code
- WebRTC (real time communications API)
- Suggestions welcome!

9 Conclusion

- MathBook XML is fairly stable now
- Ready for authoring, if . . . you are prepared for some changes
- Converters are catching up, and provide modular base for other formats
- Main site: http://mathbook.pugetsound.edu
- Announcements and discussion at the mathbook-xml-support Google Group