BRAILLE FROM PRETEXT

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1 PRETEXT

2 WHAT IS PRETEXT

- Software to translate source material into mul ple output formats
- A formal specifica on of allowable XML elements in source material
- A self-publishing system for scholarly documents, recognizing the publisher's role
- Advocate for accessible material, leading by example
- A community of authors, publishers, instructors, and developers

3 HISTORY

- Ini ated May 2013 with a Shuttleworth Flash Grant, outgrowth of Na onal Science Founda on CCLI grant, 2010-2014.

- Conversion to EPUB ini ated 2014, resurrected early 2016, completed 2020. (w/ Mitch Keller)

- May 2018, AIM Workshop Web accessibility of mathema cs . MathJax project, screen-reader developers, vast improvements in PreTeXt HTML.

- August 2018 Martha Siegel, Alexei Kolesnikov (Towson State) contact David Farmer. Telephone conversa on about text processing.

- January 2019, JMM Bal more Volker Sorge presents accessibility improvements for MathJax and Speech Rule engine, including braille produc on. RAB preview in hallway.

- January 2019, JMM Bal more Brian Conrey (AIM), David Farmer, Martha Siegel, Alexei Kolesnikov, Al Maneki, Karen Herstein

  Then RAB,

  Then Volker Sorge,

- Summer 2019 Beyond proof-of-concept with Na onal Federa on of the Blind support.

- January 2019, JMM Denver AIM issues press release, shows physical samples at exhibit area.

- August 2020 Here we are. Another AIM Workshop!

5 WHY PRETEXT?

- Clearly separate content, presenta on
- Similarly, clearly separates authoring from publishing

- Kay O'Halloran, Summer 2017 three languages

  - math, clearly iden fied, LaTeX syntax
  - literary text, with careful markup, such as for emphasis
  - structure via markup

  We capture the author's intent *at the instant they author*.

- With no necessity for assump ons, we can convert to *any* presenta on format
- Now braille seems easy

6 LIFE OF A THEOREM

PROPOSITION:

Let G be a cyclic group of order n and suppose that a is a generator for G. Then $a^k = e$ if and only if n divides k.

- Softcover $16.95 from Amazon, and others ($21 in UK)
- PDF electronic, free, maximally non-accessible
- HTML electronic, free, very accessible, math via screen-readers
- EPUB accessible, but maybe not the math bits
- Kindle hmmmm.
- Source PreTeXt using XML syntax

```
<proposition xml:id="proposition-cyclic-subgrp-order">
    <statement>
        <p>
        Let <m>G</m> be a cyclic group of order <m>n</m> and
        suppose that <m>a</m> is a generator for <m>G</m>.
        Then <m>a^k=e</m> if and only if <m>n</m> divides <m>k</m>.
        </p>
    </statement>
    <proof>
    ........
    </proof>
</proposition>
```

9 BRAILLE PIPELINE

- Isolate every mathema cal expression, found in <m>, <md>, etc elements, in LaTeX syntax. Lightly wrap each one with loca on informa on, make one huge web page.

- Run MathJax over this page, conver ng each LaTeX expression to MathML. (Can also convert to SVG for use in EPUB format.) Creates another webpage. [Show AATA SVG page.]

- Run Speech Rule Engine (SRE) over this second page, conver ng each MathML expression into Nemeth braille. (Can also convert to speech for audiobooks or DAISY format.) Now have a third web page of representa ons of the math bits.

- Start over, and convert original document to the usual HTML. However

  - Replace math bits with braille (via loca on informa on)
  - Adjust and/or enhance literary and structural parts for subsequent conversion.

- Run the `liblouis` converter over this enhanced HTML page to create a BRF file. (Braille ASCII representa ons of the 64 6-dot patterns, with some page forma   ng.) `liblouis` allows some CSS-like control.

  - Line breaks, page breaks
  - Page numbers, Table of Contents
  - Centering, emphasis, quotes, etc.
  - SRE Unicode braille converts to Braille ASCII

- All of the above accomplished with Python script at once

```
$ pretext -c all -f braille aim-braille.xml
```

12 BRAILLE EXAMPLES

Judson, Proposi on 4.12 source   `<m>a^k=e</m>`

MathML from MathJax

```
<math>
    <msup>
        <mi>a</mi>
        <mi>k</mi>
    </msup>
    <mo>=</mo>
    <mi>e</mi>
</math>
```

Unicode braille from SRE ⠈⠢⠅⠀⠨⠅⠀⠑

Braille ASCII (BRF) from `liblouis`, PreTeXt customiza on gives Nemeth indicators

`_% a~k" .k e _:`

Enhanced PreTeXt HTML (w/ braille, liblouis precursor)

```
<article class="proposition theorem-like" data-braille="theorem-like">
    <h6 class="heading">
        <span class="type">Proposition</span>
        <span class="space"> </span>
        <span class="codenumber">4.1.12</span>
        <span class="period">.</span>
    </h6>
    <p>Let <i class="one-letter">G</i> be a cyclic
    group of order <i class="one-letter">n</i> and suppose
    that <i class="one-letter">a</i> is a generator for
    <i class="one-letter">G</i>. Then
    <nemeth class="inline">⠁ ⠶ ⠁ ⠒ ⠅</nemeth> if and only if
    <i class="one-letter">n</i> divides <i class="one-letter">k</i>.</p>
</article>
```

Liblouis output, via (supported) PreTeXt customiza ons

```
77777777777777777777777777777777777777
,proposi;n  #d4a4ab 4
  ,let .2;,g 2 a cyclic gr|p ( ord} .2;n
& suppose t .2a is a g5}ator = .2;,g4
,!n _% a~k" .k e _: if & only if .2;n
divides .2;k4
GGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG
```

16 HORIZON

- Migrate to MathJax 3
- U lize SRE more directly and efficiently
- Iterate!
- Canonical print page numbers into BRF format
- Front matter, back matter (index)

18 CONCLUSION

`pretextbook.org`

Acknowledgements