The LEAN Math Accessible MathML Editor

John A. Gardner

ViewPlus Technologies, Inc., Corvallis, OR, USA
john.gardner@viewplus.com

Abstract. This article describes the new LEAN Math application. LEAN Math will input MathML and convert it to an internal representation from which any number of accessible formats can be generated. It is useful for reading math, but its real importance is that it fills a void for blind people who need an efficient, usable tool to create, edit, and manipulate math equations in braille and/or audio. The first application of LEAN Math is as an editor for MathType equations in MS Word, the most popular scientific authoring system today. The editor can open and edit existing equations or create new ones. It also puts a word description or braille translation of the equation into the MathType alt text property. This alt text is read by any screen reader, making MathType equations in MS Word fully accessible. This paper gives a brief overview of its features.

Keywords: Accessible Math, Reading Math, Writing Math, Manipulating Math, MS Word, MathType.

1 Introduction

1.1 Accessible Methods for Reading Math

Math in scientific web and e-book documents can be directly accessible to people with print disabilities provided the math is expressed in the MathML[1] markup language. Some web browsers, including older versions of Internet Explorer with the MathPlayer[2] plugin and Chrome with the ChromeVox[3] speech display provide audio-access to MathML. Safari on iOS systems with VoiceOver[4] provides both audio and braille access to MathML. Specialized applications such as the EASYReader[5] and GH ReadHear[6] provide access to electronic books in formats adhering to accessibility standards set by the International Digital Publishing Forum[7]. There is hope that future electronic books and web documents will adhere to such standards, making math in all web and e-books accessible.

[1] http://w3.org/math
[2] http://www.dessci.com/en/products/mathplayer/
[3] http://www.chromevox.com/
[4] http://www.apple.com/accessibility/osx/voiceover/
[5] http://www.yourdolphin.com/productdetail.asp?id=9
[6] http://www.gh-accessibility.com/software/readhear-pc/
[7] http://idpf.org/

K. Miesenberger et al. (Eds.): ICCHP 2014, Part I, LNCS 8547, pp. 580–587, 2014.

Math in PDF documents is not directly accessible, but such documents can be indirectly accessible if the author's manuscript is available. Most modern authors use MS Word with the MathType math editor to write scientific documents, though a substantial number still use LaTeX and similar variations of the TeX family of markup languages. LaTeX source files are directly readable by any screen reader, and generations of blind people have had good access to scientific documents by becoming experts in reading LaTeX[1].

MS Word+MathType documents can also be accessible to blind readers, be-cause MathType permits one to display equations in LaTeX. The user must develop sufficient knowledge of LaTeX to read the equations, but it is only the math that is expressed in LaTeX. It is much easier to read MS Word with LaTeX equations than to read a corresponding LaTeX document, because the latter generally has pages of text markup that must be read past. This slows the reading process and interferes with comprehension. Blind people who know math braille have a better option for reading MS Word documents. Several translators are available to convert MS Word+MathType documents into braille.

1.2 Accessible Methods for Writing and Manipulating Math

Blind people who know math braille can write math equations compactly in braille. Braille is not as flexible as a pencil – one cannot easily cross off terms, trans-pose them to the other side of the equation, etc. One can only write equation after equation with appropriate changes. Braille is also not easily converted to a main-stream form. Computer translation from any conventional math code to a mainstream representation is notoriously unreliable. So if the math is intended for mainstream use (eg for a sighted teacher), the translation must be done by a human math braille expert, and there are not many of these.

For several decades, LaTeX was the only accessible route by which a blind person could create a mainstream document with math. LaTeX is a complex lan-guage, and compiling it to the final document is a non-trivial task. It is unreasonable to expect that any student needing to write math equations must become a LaTeX expert, particularly if the student has no intention of becoming a professional scien-tist. Learning enough LaTeX to write equations in MS Word+MathType is a less onerous task. Unfortunately, there is no feedback when those equations are converted to standard form. It is very easy to make mistakes, so the user is never sure that the equation is actually what is intended.

The ChattyInfty[8] editor was developed originally to provide access to documents recognized by the Infty Reader[9], the only Optical Character Recognition (OCR) application that recognizes math expressions. Chatty Infty can export in several mainstream formats, including MS Word, LaTeX, and XHTML, but it does not import these formats. It is somewhat expensive but does offer several nice features, including an image of the equation in standard visual form during the creation/editing process.

---

[8] http://www.sciaccess.net/en/ChattyInfty/

[9] http://www.inftyreader.org/