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Thai Students Who are Blind or Visually Impaired Can Use an Automatic Math Reader

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Introduction

i-Math is the name of our system for automatically reading mathematical expressions. i-Math is an educational tool that makes math materials more accessible to blind and visually impaired (VI) students. Although a variety of channels, such as a human reader, math Braille codes, and audio (talking) books, allow blind and visually impaired students to access math documents and materials, their availability is limited. i-Math was created as a tool for automatic reading assistance as well as for teaching and learning math to students and teachers alike. Using a screen reader, i-Math generated voice output on a computer. Math documents can be read aloud by i-Math. With i-Math, students can enjoy their newfound ability to read and practice math anywhere, anytime, and teachers can easily prepare audio versions of classroom handouts, assignments, and exercises. Six teachers and 78 blind and VI students participated in the i-Math evaluation. According to the findings of the evaluation, i-Math makes math resources accessible to blind and visually impaired students, allowing them to study and practice mathematics independently and comfortably.

Description

Students at all levels need to learn mathematics. An alternative activity that has been suggested for improving one's mathematical abilities is solving math problems. Unfortunately, due to their limited ability to write and read mathematical formulas, blind and visually impaired (VI) students face difficulties at the very beginning. Even though there are a lot of math problems in both printed and digital documents, blind and visually impaired students barely benefit from them. They miss out on opportunities to practice independently, which ultimately means they miss out on opportunities to improve their math skills.

With the assistance of human readers, blind and visually impaired students typically have access to math course materials and documents; However, due to the high cost and limited availability of trained personnel, having human readers by their side at all times is impractical. Students who are blind or visually impaired can access the documents more easily through braille. Unfortunately, not many documents are available in Braille due to the difficulty and complexity of producing math documents in Braille [1,2].

In addition, even for some students who are accustomed to reading literary Braille transcriptions, reading Braille math code proved to be tedious and ambiguous for the majority of blind and VI students. For students who are blind or visually impaired, the sound-based representation is an important means of gaining access to information. Teachers can provide students with alternative audio materials in the form of talking books and DAISY books, for instance. These books, on the other hand, are not as well prepared for mathematical and scientific expressions. A text-to-speech (TTS) engine with a hearing channel has been widely used by blind and visually impaired students to read electronic text on computers. A system that can turn digital text into computer-generated speech is known as a TTS engine. TTS are now more tailored to meet individual requirements. The technologies of screen readers and TTS have made it possible to create reading aids for blind and visually impaired readers. Sadly, the majority of TTS systems on the market can only read plain text. When it comes to mathematical and scientific e-books, such as those in physics, chemistry, and engineering, which are packed with equations and formulas containing mathematical symbols, they are of no use. [3-5].

Conclusion

To complete the reading, the words and phrases in italics are added. The rendered audio is very long, and if the listener listens for a long time, they might miss the main idea of the expression. MathTalk and AudioMath introduced prosody, such as pitch change and duration, to convey the expressions' meaning. However, due to the fact that Thai is a tonal language, the pitch change on its own is insufficient to help understand the math expression in Thai. There are five distinct tones available for each syllable: low, middle, rise, high, and decreasing Words with different meanings are produced when different tones are used. For instance, the five distinct tones /see/, /sèe/, /sêe/, /sée/, and /se e/ each represent a letter of the English alphabet (c), a number (four), a classifier1 for the verb (die), a noun (color), and a verb (rib or tooth).

Additionally, these automatic math reader systems accept Latex or other markup languages as inputs. Sadly, unlike Microsoft Word, the majority of blind and visually impaired Thai teachers and students found these document preparation systems difficult to use. Some systems limit their capabilities to algebraic expressions, while others only cover Thai secondary school math expressions. We focused on secondary mathematics and covered a wide range of topics at the high school level, including vectors, exponential and logarithmic functions, sequences and series, and more.

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