mathpen: exploring handwriting recognition technology for online mathematics education

Mandy Lo, Julie-Ann Edwards, Christian Bokhove and Hugh Davis

University of Southampton, UK

Mathematical language is more than a means of communication and pooling of information; it is an active process by which people think, learn and work towards joint understanding (Mercer, 1995). Although collaborative learning is increasingly a research focus in mathematics education, most of these studies are conducted offline (e.g. Swan, 2006). Since the online use of mathematical notations is said to be a barrier to mathematical communication, this study aimed to a) investigate this claim through empirical evidence, b) explore the feasibility of using mathematics handwriting recognition technology to overcome the mathematical challenges, and c) propose a potential solution to the perceived problem.

Of the 4819 mathematical statements studied from the most recent 500 threads of mathematical discussions on an online help forum, 50% were entered using Latex and 44% using plain text, though the choice between the two is topic dependent (ρ<0.001). Case studies also demonstrated the lack of clarity of plain text and the cumbersome nature of Latex. An expert helper, despite his more than 11,000 posts, stated: “*I wasn’t about to Latex it all*” and communicated through scanned handwritten mathematics work instead. These limitations were further confirmed by 80 participants through an online questionnaire, in which 72% believed that handwriting recognition technology will prove to be useful for communicating mathematics.

MathPen (an online mathematics handwriting recognition system) was conceptualised to address current issues and provide an interface for spontaneous and effective mathematical communication online. A short demonstration video was produced and sent to seven experts who a) have been teaching mathematics for the last 10 years, b) have some experience of handwriting recognition technology and c) were not previously known to the researcher. They unanimously agreed that, if MathPen materialised, it is a strong candidate for overcoming present challenges and opening the way for online collaborative learning in mathematics education. MathPen is currently being developed. This presentation will offer further details of the study from which MathPen was conceptualised and report on early use of MathPen with students.

References

Mercer, N. (1995). *The guided construction of knowledge: Talk amongst teachers and learners*. Multilingual Matters Limited.

Swan, M. (2006). *Collaborative Learning in Mathematics: A Challenge to our Beliefs and Practices*. London: NIACE/ NRDC.