



Departamento de
Informática

Tablet PC tool for handwriting recognition Project Proposal

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Objectives

The goal of this project is to develop a software tool that uses and extends existing recognisers of handwritten symbols to recognise a specific mathematical notation, namely the notation used in the Calculational Method (see work done in [4]). The work developed within this project has the potential to support research projects that aim to create tools to improve the reliability of software systems.

There are many existing tools and packages that recognise handwritten mathematics (e.g. SESHAT[1]) and some even allow its manipulation (e.g. Windows OneNote Maths Assistant [2] and Graspable Math [3]). In this project, you will explore the existing solutions, adapt, and possibly extend them to support the calculational method.

Project Artefact: A software prototype that accepts handwritten input and uses/extends existing handwritten recognisers to identify and create structure for the handwritten input.

Relevance of this project: By doing this project, you will gain knowledge in software development for Tablet PCs, in particular in handwriting recognition. You will be able to demonstrate and improve your software engineering and programming skills. There is scope to use machine learning techniques to allow training and improvement of recognition results. However, this will be an extra activity should time allow. The final product can be used in your portfolio to demonstrate to potential employers in-demand technical skills and knowledge.

Is this project for you? Although this project is for recognition of handwritten mathematics, it does not require strong mathematical skills nor any special interest in mathematical subjects. This project is ideal for students that love programming and want to improve/acquire knowledge in Tablet PC programming, handwriting recognition, and potentially machine learning techniques. Good programming skills are a must. It is likely that one or a combination of the following languages will be used: Java, C#, C++. However, the decision will be made after the initial review of the state of the art (to be carried out by the student) and may require the use of other programming languages.

Work plan and expected timeline

- T1** Literature review and initial familiarisation with the calculational method
(week 1 -> week 3)
- T2** Choose technologies to be used and prepare work environment
(week 2 -> week 4)
- T3** Gather requirements and define design for the tool
(week 2 -> week 5)
- T4** Implement and test the software tool
(week 5 -> week 13)
- T5** Evaluation
(week 13)
- T6** Report writing
(ongoing throughout the project with the final 2 weeks fully dedicated to report writing)

Expected Output

1. Project report
2. Software tool that accepts handwritten input and uses/extends existing handwritten recognisers to identify and create structure for the input
3. Conference Paper (depending on results and time available)

Bibliography

- [1] SESHAT, <https://github.com/falvaro/seshat>
- [2] Windows OneNote Maths Assistant, <https://www.onenote.com/ink>
- [3] Graspable Math, <https://graspablemath.com/>
- [4] Mendes, A., Backhouse, R., Ferreira, J. F. (2014) 'Structure Editing of Handwritten Mathematics: Improving the Computer Support for the Calculational Method', Ninth ACM International Conference on Interactive Tabletops and Surfaces (ITS '14), (available at <https://tees.openrepository.com/tees/bitstream/10149/604208/2/604208.pdf>)