Turing Machine Language

Pete Gautam

2481471G

Proposal

Motivation

Turing Machines are normally taught to undergraduate CS students after some years of programming experience. This project aims to introduce the concept of Turing Machines as a programming language and compare its efficiency with the standard approach of teaching Turing Machines.

Aims

- Define the Turing Machine Language (TML) and show its equivalence to Turing Machines (TM).
- Create a converter for TML program to TM, and an executor a TML program on a TM tape.
- Create a website that allows the user to type a TML program, convert it into a TM and execute it on a tape.
- Compare how students learn TMs the standard way and using TML programs.

Progress

- Defined the Turing Machine Language (TML) and showed its equivalence to Turing Machines (TM).
- Created a converter for TML program to TM, and an executor a TML program on a TM tape.
- Started creating the website- have added a code editor and a prototype for converting a TML program to a TM.

Problems and risks

Problems

- Currently unable to well-position the arrows when the TM is rendered on the website- will probably need to use some geometric property to ensure the arrow looks "nice".

Risks

- Issues with presenting the TM- it might be challenging to show the TM so that they are positioned in an aesthetically pleasing way. If this isn't possible, the user will still be able to drag the TM states so that they are placed in a way that the user finds acceptable.

Plan

- Next week: Experiment with showing a tape execution
- Weeks 1-4: Finish the website- group the three parts together and add any extra features (e.g. change code editor theme, speed of tape execution, initial positioning of TM states, add documentation webpages, etc.)
- Week 5: Evaluate the website with those familiar with TM
- Weeks 5-8: Compare teaching TMs with TML programs to those not familiar with TM- many possibilites; currently considering how teaching a group of students TMs and TML programs and seeing how confident they feel about the topic (via a questionnaire/writing down some TMs/TML programs to check their understanding and see who is able to learn faster/has a deeper understanding/etc.).
- Week 8-10: Complete the dissertation