Natural Detective: A Gamified Tutorial on Natural Deduction in Propositional Logic

Project Proposal

Helena Josol [1]

1 Problem Description

Proposal will be similar to the dissertation intro. Write in future tense.

1. What will I do?
   - To build an educational game that teaches introductory natural deduction in propositional logic.

   (a) Why is it meaningful / relevant?

   (b) Why is it interesting?

   (c) An outstanding problem

   (d) Aims: *. . . identify, at a high level, what you hope to achieve*

   (e) Objectives: *. . . quantitative and qualitative measures by which the completion of your project will be judged (How to know that my project is a success? Setting my own assessment criteria.)*
      - Objective 1: Design and build a system that does. . .
      - Objective 2: Evaluate its performance in terms of. . .
      - Objective 3: Present guidelines for future systems that do. . .

2. Why will I do it?
   - Games are good for education and are very suitable to make mathematical concepts more accessible. Features:
     - Accessibility: games are easy to pick up (unlike, say, a textbook). One reason is that they can restrain the things you can do: they will not allow you to make "illegal" moves, and they can limit the available moves to those relevant to the problem. In contrast, with exercises in a textbook nobody tells you how to get started, and whether what you're doing makes sense.

- Engagement: similarly, games are hard to put down. That is because they're fun (at least, that's the intention). The consequence is that you can spend a long time learning something without even noticing.
- Instant feedback: a game will tell you immediately when your answer is wrong. Every theory of learning will tell you that that's very important, since the sequence of thoughts leading you to a wrong answer should still be fresh, if you want to find out where you went wrong. This is why tutorials are so good, compared to (most) lectures, and why good tutors are essential.

3. How will I do it?: (Have a rudimentary game idea already. Ask Willem for feedback and input.)
   (a) Learning objective: What do you want the player to learn? (e.g. Learn to construct a finite automaton)
   (b) Player goals (e.g. Construct a finite automaton corresponding to a given regular expression)
   (c) Player moves (e.g. Add states; add transitions; make final states; change transition labels; validate answer)
   (d) Interface: The challenge is in making a good interface.
   (e) Feedback & rewards
   (f) Level design (Collaborate with Willem on this.)
   (g) Platform: It will be a web application to keep it accessible (e.g. removes the need for building, installing and setting the software up, no lengthy documentation and manuals), making use of the Phaser game framework on NodeJS.

2 Requirements Specification

Limit scope: answering these in advance:

- Why didn't you...?
- Why did you focus on...?

3 Project Plan

- Make a Gantt chart
- Plan waypoints and endpoints

4 Resources

Consider resources and their availability

References

[1] Adei Josol. *A Deviant Just Living: Notes to a Future Self*. 14th Oct. 2016. URL: `https://adjl.github.io`.