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FACULTY
OF INFORMATION
TECHNOLOGY
CTU IN PRAGUE

Bachelor's thesis

Finite Automata iPad Editor

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Supervisor: Your Supervisor's Name (SPECIFY)

November 4, 2020

Acknowledgements

THANKS (remove entirely in case you do not with to thank anyone)

Declaration

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Abstrakt

V několika větách shrňte obsah a přínos této práce v českém jazyce.

Klíčová slova Replace with comma-separated list of keywords in Czech.

Abstract

Summarize the contents and contribution of your work in a few sentences in English language.

Keywords Replace with comma-separated list of keywords in English.

Contents

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Chapter 1

Introduction

1.1 Motivation, Focus of Thesis

Finite automata have been first described by Warren McCulloch and Walter Pitts in 1943 and since then they have become one of the cornerstones of computer science. While finite automata research is limited nowadays, it is still something that we build upon today and every student of computer science needs to understand its concepts.

And although there is a lot of resources one can learn from, there is a lack of those that utilize modern tools. One of such modern tools is iPad (and touch devices in general). I'd like to fill in this gap and build a finite automata editor native application for iPad in this thesis.

Furthermore, I'd like to expand on the recent work done at FIT CTU concerning development of algorithms library and, more importantly for this thesis, finite automata algorithms including simulating input. This library is named Algorithms Library Toolkit and it has been open sourced.

Last but not least, in this thesis I will try out the new iOS programming declarative paradigm which has been introduced by Apple with the new SwiftUI framework with the combination of a functional architecture, called Composable Architecture.

The main motivation of this thesis is to improve how students learn finite automata and more specifically, enhance the current course BI-AAG that is taught at FIT CTU. It's also an opportunity to try out algorithms library in practice and create a concrete example of how it can be leveraged.

1.2 Thesis Goals

Goals of this thesis are the folowing:

- prepare and explore how to create interface for automata library

- find possible solutions of how to detect automata elements from shapes made by hand on the touch screen
- implement a prototype of an automata editor for iPad
- assess the usability of SwiftUI and Composable Architecture
- perform user testing of the implemented automata editor prototype

1.3 Thesis Structure

Let me now introduce you to the structure of the rest of the thesis:

- In **Chapter 2** I will go over the theoretical concepts to properly explain terms and concepts on which it will be built upon later.
- **Chapter 3** is concerned with analysis of already existing solutions of creating automata editor.
- **Chapter 4** is about the design of the editor itself.
- In **Chapter 5** I will write about the implementation.
- **Chapter 6** will go into the specifics of user testing and its outcomes.
- In **Chapter 7** I will assess the usability of the new SwiftUI framework alongside with a functional Composable Architecture.
- **Conclusion** is the last chapter of this thesis.

Chapter 2

Theory

Chapter 3

Analysis

Chapter 4

Automata Editor Design

Chapter 5

Implementation

Chapter 6

User testing

Chapter 7

SwiftUI and Composable Architecture Assessment

Chapter 8

Conclusion

8.1 Goals Assessment

One of the goals of this thesis was to assess the usability of new iOS programming paradigm of SwiftUI with the new functional architecture pattern Composable Architecture. This combination has proven to be beneficial and it is a good option for new iOS applications.

The main goal of this project was to create a prototype of automata editor for iPad while showcasing the Algorithms Library Toolkit that is being continuously developed at FIT CTU.

I have successfully implemented editing and simulating input for finite automata and Algorithms Library Toolkit to the editor if someone wants to see its capabilities.

One of the other requirements of the automata editor has been to discern automata elements from shapes drawn by hand on the device. The solution chosen during the analysis made this possible as has been described in more detail in chapter 5.

8.2 Thesis Contribution

The contribution of this thesis is testing Algorithms Library Toolkit in practice and can now be pointed to for users who want to see its capabilities. The editor can now also be recommended in the course of BI-AAG at FIT CTU (and other universities) - for students and teachers alike.

8.3 Future Work

Algorithms Library Toolkit is an extensive library and there are still capabilites that are not implemented in the editor.

The choice of developing a native iOS application has resulted in good UX, but in the future it would be beneficial to broaden the possible audience and either developer a similar Android app or create a ubiquituous web interface.

Appendix A

Acronyms

GUI Graphical user interface

UX User experience

Appendix B

Contents of enclosed CD

- `readme.txt` ..... the file with CD contents description
- `src` ..... the directory of source codes
  - `editor` ..... implementation sources
  - `thesis` ..... the directory of LaTeX source codes of the thesis
- `text` ..... the thesis text directory
  - `thesis.pdf` ..... the thesis text in PDF format
- `usertesting.pdf` ..... the directory of source codes
- `editor` ..... directory of screenshots from the editor