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Senior Design Project

Individual Capstone Assessment

03-27-2024

<center>Assessment</center>

My senior design project is a Python program that generates a Sudoku board on a graphic user interface and takes user-inputs to solve the board based on a series of human-solvable algorithms. The program is designed to have a front-end implementation where the user will input values from a board that they want to solve. The back-end implementation will take these inputs and run a series of algorithms on them to solve the board, which will then be reflected on the user interface. The Sudoku Solver's GUI will be constructed using TkInter and the backend will consist of a board class and a square class. This project is the culmination of the knowledge I obtained from taking courses such as Python Programming, Design and Analysis of Algorithms, and Data Structures. The project management techniques we will use for this project are skills that I have learned from my previous co-ops – more specifically, practicing system change management through Git.

I will be employing many skills that I had obtained from courses such as: Python Programming (CS-2021), Design and Analysis of Algorithms (CS-4071), and Data Structures (CS2028). From the Python Programming course, I learned strong Object Oriented Programming techniques such as creating classes and objects in Python. From the Design and Analysis of Algorithms course, I learned how different algorithms worked and the best situations in which to use a certain algorithm. This knowledge will help my team with designing and developing code that lacks redundancy and reduces computation time. Finally, from the Data Structures course, I

learned how to manipulate data structures to most efficiently represent data the way I wanted it to be represented. For example, when trying to make a board for a game, I learned that I could make a list of lists to represent this board and its data.

Alongside the skills that I learned from my coursework at the University of Cincinnati, I will also be applying skills that I learned from my co-op experience as a Software Developer Intern at Resurgent Capital Services. A lot of the skills that I will be applying to this project from my co-ops revolve around project management and system change management. I intended on approaching this project with the Agile methodology in mind, which I practiced daily while at Resurgent. I plan on using the Agile methodology to make progress on this project more adaptive, since my partner and I will be focusing on two different aspects of the project – that being the front-end and the back-end. I also plan on applying my skills with Git, which I gained a lot of experience with when working with a team of software developers at Resurgent. Using Git will ensure security and efficient collaboration while working with my teammate on the Sudoku Solver.

One of my main motivations for this project is to demonstrate my proficiency using Python while tying in a puzzle-based game such as Sudoku. In my Python Programming class, we worked extensively with programming games such as Tic-Tac-Toe, and I wanted to challenge myself by designing a program to solve a more complex game like Sudoku. With current Sudoku solver implementations, I've found that a lot of these implementations utilize algorithms only a computer would be able to solve. For our Sudoku Solver implementation, we are excited to present a program that uses human-solvable algorithms – that is, algorithms that a human can follow and use. I also wanted to challenge myself and work on a Graphic User Interface, something that I am not entirely experienced in. Ultimately, I want to be able to synthesize

everything that I've learned from Python Programming, Design and Analysis of Algorithms, and Data Structures to demonstrate my proficiency with these subjects while also pushing myself out of my comfort zone by working on something mostly unknown to me. With the way that this project is designed, all of my motivations will be satisfied.

For this project, my partner and I will be splitting up work between the front-end implementation and the back-end implementation of our program. The front-end will consist of the GUI while the back-end handles all of the logic and puzzle solving. The user will be able to traverse the board represented by the GUI; input, delete, and replace numbers to the board; clear the board; and solve the board given an input. The back-end will contain the logic to algorithmically solve the board based on the inputs passed from the front-end implementation. In order to make sure that our final product is as refined as possible, we will constantly be introducing test cases and checking with random Sudoku boards to make sure there are little to no bugs in our code. We will also be relying on peer review to help improve our GUI to make sure that our final product is as accessible to users as possible. Ultimately, the final product should be a program that has an accessible GUI and can solve any Sudoku puzzle of varying complexity.