AI Puzzle Solving

Report Name	Project Outline
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Module	CS39440
Degree Scheme	G450 (Computer Graphics, Vision and Games)
Date	February 9, 2023
Revision	1.1
Status	Release

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1 Project description

AI Puzzle Solving project will develop a mobile app that will help potential users to better understand the implemented algorithms through maze-solving visualisation.

Algorithm understanding is a very important topic in Computer Science. Students need to make sense of the process to be able to later realise the potential use cases as well as the upsides and downsides that each possible solution provides. Although for many people theoretical lectures are enough to grasp the idea and put it into practice, there is sometimes a need for additional resources. Modules in the Aberystwyth University Computer Science department like CSM6120 (Fundamentals of Intelligent Systems) or CS26520 (Artificial Intelligence), might benefit significantly from using tools like this project to familiarise students with them.

This project will aim to provide a mobile application to users that might be interested in seeing the practical implementation of popular algorithms in an easy-to-understand scenario, namely solving mazes. It will provide a clear visualization of how the algorithms work and perform under different levels of labyrinth complexity. The aims of the projects are set on creating and providing a complete and robust Android application. Depending on the speed of the works there are also considered implementations of more complex algorithms as well as random maze generator.

The project will use the waterfall model to plan the tasks for the project. All the actions that need to be done are separate and clearly distinguishable, which makes for a perfect fit for this methodology. The earlier part of the project will require to make a set of requirements to meet.

2 Proposed tasks

The following tasks are planned as part of the project:

- **Investigation of the details of maze implementation and testing techniques.** Implementing the maze correctly is a crucial point of the project so there is time expected to investigate the possibilities as it will make an impact on all the following work including algorithms and UI interactions.
- **Setting up the project and repository.** The project will use the GitHub repository [1] on which all the relevant items will be stored. It includes all the documentation, code implementation and the UI prototype.
- **Creating the prototype UI.** One of the more important tasks when creating mobile applications is making sure that its design is accessible and has a correct flow. Making this part of the project will be an important step to setting the correct direction for the development decisions that are in line with the Material Design 3 [2] principles as it is the official point of reference.

- **Development.** The project will be split into three main sections:
  - **Creating the UI base.** It will be created in line with the previously created prototype, which will be discussed and accepted by the supervisor. It will serve as the foundation for the next steps.
  - **Implementation of the selected maze-solving techniques.** There will be a set of scripts selected and discussed with a supervisor. They will be coded to match the design decisions to later be combined with the base. Breadth-first Search and Depth-first Search algorithms are definitive to be implemented, but there is also a consideration for Uniform Cost Search or A* to be done depending on the time left for the project.
  - **Connecting the program and testing.** This step will require linking the previously implemented pieces of software as well as creating tests to make sure that all the software works according to the expectations.
- **Project diary.** There will be a list of tasks done that will be kept in the repository. It will come in the form of weekly blogs that will summarise the work done and will serve as a good point of reference for discussion in the weekly meeting with the supervisor and managing the content of final report.

3 Project deliverables

These deliverables will be expected as parts of the project:

- **Application UI prototype** - The prototype of a mobile application created in the UI designing tool (Figma [3] is considered). This will be discussed and reviewed with the supervisor. It will be provided as a part of the technical submission.
- **Final software** - This will be a complete and robust application with the included tests. It will be written in Kotlin language [4] with Jetpack Compose UI framework [5]. It will be the second part of the project's technical submission.
- **Final report** - This document is a report of the work and technical aspects of the projects with acknowledgement of any tools or frameworks used throughout the work.
- **Final presentation** - This part will not be considered a documented piece of work, but it should be considered when planning time allocation.

Initial Annotated Bibliography

[1] GitHub, Inc., “GitHub website,” 2023, last accessed 7 February 2023. [Online]. Available: https://github.com

This website will serve as a project repository. It is free, open source and can be easily accessed by anyone interested in the content of the project.

[2] Google Inc., “Material Design 3 webiste,” 2023, last accessed 7 February 2023. [Online]. Available: https://m3.material.io

It will be a point of reference for Material Design 3 principles for creating both prototype as well as the final application.

[3] Figma, Inc., “Figma design tool,” 2023, last accessed 7 February 2023. [Online]. Available: https://www.figma.com

It will serve as a tool to create the initial prototype of the UI.

[4] JetBrains s.r.o., “Kotlin webiste,” 2023, last accessed 7 February 2023. [Online]. Available: https://kotlinlang.org

Point of reference for all the Kotlin-related information. It contains links to the relevant documentation of the language.

[5] Google Inc., “Jetpack Compose information website,” 2023, last accessed 7 February 2023. [Online]. Available: https://developer.android.com/jetpack

This website contains information about Jetpack Compose development and good practices. It will serve as a point of reference during the development part of the project.