Table 1: Revision History

Date	Developer(s)	Change
October 19th	All	Initial Draft
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Hazard Analysis for SE 4G06
An AI-based Approach to Designing Board Games

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1 Introduction and Purpose of Hazard Analysis

This document aims to analyze, assess, and find ways to eliminate or mitigate potential safety and security hazards that are applicable to our project. Hazard analysis will highlight the various types of hazards, the likelihood of encountering these hazards, and their severity and will try to outline potential actions upon encountering those hazards. The analysis will further help us specify new, and update existing safety and security requirements for our project.

2 Scope and Definition of Hazard

A hazard for our AI-based game simulation engine will be any threat, vulnerability, system failure, or potential errors that our system is susceptible to. Hazards and risks related to the environment, society and user error will be considered out of the scope for this document. Risks and hazards associated with our project will be based on ones that can be discovered during the development of our project and of similar existing systems. Safety and security requirements that arise from the hazard analysis will be listed at the end of the document. These requirements will be an addition to the requirements presented in our SRS document.

3 System Boundary and Components

Hazard analysis will be conducted on the following components of our project:

- AI Agent

- Game Engine

- Data Visualization

- Physical Computer

The physical computer being used to run our system and the reliability of the AI agent are not controlled by Board Gamers. They are an essential part of our system which is why they are included in the hazard analysis.

4 Critical Assumptions

There are no critical assumptions being made.

5 Failure Modes and Effects Analysis

The failure modes and effect analysis (FMEA) was the chosen hazard analysis tool to help identify, analyze, and find solutions to the hazards and risks pertaining to our project.

5.1 Hazards Out of Scope

- Failures of the external AI libraries being used

- Game Rules

- Physical Computer

Board Gamers will not be responsible for the hazards listed above as they are either controlled by 3rd party developers or the external user. We will attempt to minimize the effect of these hazards, however, complete mitigation is not guaranteed.

5.2 Failure Modes and Effects Analysis Table

Table 2: Failure Modes

Component	Failure Modes	Effects of Failure	Causes of Failure	Recommended Action	Requirements
Training Model	Training data is deleted	Valuable training model is lost and model training cannot progress effectively	Destination folder is not found by the system, Deletion by user	Validate folder destination before training model is saved	AR4
Simulation Logs	Simulation logs are deleted	Valuable simulation data that is needed for game balancing is lost	Logs deleted by users or errors in the system	Automatically save simulation logs after every completed iteration	IR4
Simulation Runtime	Bad state in simulation causing infinite loop	Computer resources will be heavily used for incorrect output	Errors in code in Simulation, AI Game Agents, or Game Engine Rules	Adjust a capped number of simulation moves and time for simulation runtime	IR5
	Simulation is not compatible on the computer cluster	Cannot run the simulation for a long period of time on an efficient computer	Mismatch in versioning or compatibility on the computer cluster	Ensure versions are compatible or create a standalone executable	IR5
General	Simulation closes unexpectedly	Lost data on that simulation	Runtime errors, OS errors or User accidents (Can be many different causes)	Write logs as simulation progresses, if simulation crashes, there is an event log up until the crash	IR1 & IR4
Data Visualization	Visualization does not render properly	Game designer and other users cannot understand the data	Errors in logs or errors in visualization system. Edge cases that are not properly checked	Check each log on the visualization system to see if the system renders or crashes, if so check what edge case caused it	IR4

6 Safety and Security Requirements

6.1 Access Requirements

AR1: Only admins can access and modify the product's source code.

AR2: Users will be able to install and access the software in the required systems

AR3: Only the admins will be able to release a new version of the product.

AR4: The system should be able to check if a file location exists.

6.2   Integrity Requirements

IR1: The execution of the product will not damage the users' operating systems.

IR2: The game engine will not modify the game state data unnecessarily.

IR3: The AI agent will not make changes to game engine data unrelated to its execution.

IR4: The data visualization chart will only be able to create if the game engine and AI agent successfully output the information log.

IR5: The system will not harm the device it runs on nor it will cause any resource locks for more than 10 minutes per simulation.

6.3   Privacy Requirements

PR1: The software will not expose users' confidential information.

PR2: Only authorized users can obtain the installer to install the product in their systems.

6.4   Audit Requirements

N/A

6.5   Immunity Requirements

N/A

7   Roadmap

The hazard analysis has concluded a number of new safety and security requirements. Sufficient crucial requirements will be implemented in the finished application. However, some of them with low priority may not be implemented due to the hard project deadline constraints. The hazard analysis will efficiently help us keep track and find out what risks need to be solved during the development process.