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# Software Engineering Project

Title – Wandering in the Woods Game - Design and User's Guide

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## TABLE OF CONTENTS

1	INTRODUCTION.....	3
2	Software Requirements Specifications (SRS) .....	3
2.1	Purpose .....	3
2.2	Scope.....	3
2.3	System Overview.....	3
2.4	Functional Requirements .....	3
2.5	Non-Functional Requirements .....	4
2.6	Assumptions and Constraints .....	4
3	Software Design .....	4
3.1	System Architecture .....	4
3.2	Modules.....	4
3.3	User Interface Design.....	5
3.4	Algorithm for Wandering.....	5
4	User's Guide.....	5
4.1	Installation.....	5
4.2	Game Configuration.....	6
4.3	Gameplay Instructions .....	6
4.4	Experimentation and Analysis .....	6
5	CONCLUSION .....	6

## 1 INTRODUCTION

The "Wandering in the Woods" game is an interactive educational tool designed to engage students from kindergarten to eighth grade. This software imparts a fundamental understanding of spatial concepts through an entertaining grid-based exploration. Tailored to different grade levels, it offers varying levels of complexity, ensuring that students of all ages can participate and benefit.

The game allows users to customize grid dimensions and participant numbers, encouraging experimentation and critical thinking. Navigating through the virtual forest teaches players about coordinates, spatial relations, and random motion. Additionally, the software provides insightful statistics, allowing for data-driven analysis and in-depth comprehension.

"Wandering in the Woods" promises an engaging learning experience through a user-friendly interface and intuitive design. Teachers and students can use this tool to dynamically and interactively reinforce classroom concepts. Whether fostering teamwork or honing individual problem-solving skills, this game offers a versatile platform for educational exploration.

## 2 Software Requirements Specifications (SRS)

### 2.1 Purpose

The purpose of this section is to delineate the comprehensive specifications of the "Wandering in the Woods" game. It outlines the software's functionalities, features, and constraints, providing a clear roadmap for its development and usage.

### 2.2 Scope

This software is designed for educational use, targeting kindergarten to eighth-grade students. It aims to elucidate spatial concepts and encourage critical thinking through an interactive grid-based exploration. "Wandering in the Woods" offers varying levels of complexity, ensuring adaptability for different age groups. Users can customize grid dimensions, alter the number of participants, and set initial positions, allowing for a tailored learning experience.

### 2.3 System Overview

The game is centered around a virtual grid-based environment, representing a wooded area. Participants move randomly within this grid, navigating through the woods until they encounter each other. The system monitors movements, calculates statistics, and displays game outcomes. It provides a dynamic and interactive learning platform for students, enhancing their understanding of coordinates and spatial relationships.

### 2.4 Functional Requirements

The software encompasses several essential functionalities:

- Grid Customization: Users can configure the size and shape of the grid.
- Participant Management: The number of participants (2-4) can be specified.
- Starting Positions: Users can define the initial positions of participants.
- Game Session Statistics: The system generates and displays statistics after each game session.
- Multi-Game Support: Users can engage in multiple game sessions consecutively.

## 2.5 Non-Functional Requirements

The software adheres to several non-functional requirements to ensure a seamless user experience:

- User-Friendly Interface: The interface is designed to be intuitive and easy to navigate.
- Performance: The game runs efficiently on various hardware configurations, providing a smooth user experience.
- Data Management: Game statistics are stored for future analysis, contributing to an enhanced educational experience.

## 2.6 Assumptions and Constraints

The game operates assuming that users possess a basic understanding of grid concepts. It is primarily intended for educational purposes and may not be suitable for professional or commercial applications. Additionally, it requires Python to be installed on the user's system for execution.

By delineating these specifications, the software development process gains a clear direction, ensuring that the final product effectively meets the intended educational objectives.

# 3 Software Design

## 3.1 System Architecture

The "Wandering in the Woods" game is built on a modular and flexible architecture, allowing for scalability and ease of maintenance. It follows a client-server model, where the client interacts with the game engine to navigate the virtual forest. The game engine manages core functionalities, including grid management, player movement, and result calculation. It communicates with the user interface for user input and displays game information. This architecture ensures a clear separation of concerns, enabling efficient development and extensibility.

## 3.2 Modules

Here are as follows:

- Grid Module: Responsible for creating and managing the grid environment. It handles grid customization, including size and shape adjustments.

- **Player Module:** Manages player positions and movements within the grid. It ensures that players move randomly while avoiding collisions with walls and other players.
- **User Interface Module:** Facilitates user interaction with the game. It prompts users for input, displays game information, and provides feedback on game outcomes.
- **Data Analysis Module:** Stores game statistics for later analysis. It allows users, particularly in grades 6-8, to conduct experiments and analyze how average run times vary with grid configurations.

### 3.3 User Interface Design

The user interface is designed with simplicity and clarity in mind. It presents a series of prompts that guide users through the configuration process, allowing them to customize grid dimensions, set participant numbers, and define initial positions. The interface also provides real-time updates on game progress, displaying the grid and player movements. This intuitive design ensures that users, including teachers and students, can easily navigate and interact with the game.

### 3.4 Algorithm for Wandering

The wandering algorithm is fundamental to the game's functionality. It employs a random motion strategy, where players move in four directions (up, down, left, and right) with equal probability. Each player iteratively attempts to move in a random direction until a valid move is made. Valid moves ensure players remain within the grid boundaries and do not collide with walls or other players. This algorithm guarantees a dynamic and unpredictable game experience, where players explore the grid until they converge. It encourages experimentation and critical thinking, making it an effective educational tool for spatial understanding.

## 4 User's Guide

The User's Guide for the "Wandering in the Woods" game provides step-by-step instructions for installation, configuration, gameplay, and experimentation.

### 4.1 Installation

To install the "Wandering in the Woods" game, follow these steps:

- **Ensure Python is Installed:** Make sure you have Python installed on your computer. If not, download and install Python from the official website (<https://www.python.org/>).
- **Download the Game:** Download the game source code from the provided source.
- **Open a Command Prompt or Terminal:** Navigate to the directory where you downloaded the game using the command prompt or terminal.
- **Run the Game:** Execute the game by running the command `python part_a.py, part_b.py, and part_c.py`.

## 4.2 Game Configuration

Once the game is running, you will be prompted to configure the game settings:

- **Grid Size and Shape:** Specify the grid's number of rows and columns. The grid can be rectangular or square, depending on your preference.
- **Number of Participants:** Choose the number of participants (2, 3, or 4) wandering in the woods.
- **Starting Positions:** For each participant, enter the initial coordinates (row and column) where they will begin their journey.

## 4.3 Gameplay Instructions

Players will move randomly within the grid.

- The game continues until all players meet at the same grid cell.
- After the game session concludes, statistics, including total moves, will be displayed.

## 4.4 Experimentation and Analysis

For students in grades 6-8 interested in experimentation:

- **Vary Grid Sizes and Shapes:** Adjust the grid dimensions to observe how it affects the average run time.
- **Explore Different Wandering Protocols:** Experiment with different strategies for player movements to determine the most efficient way to meet up.
- **Analyze Game Statistics:** After each game session, take note of the statistics provided, including shortest run, longest run, and average run. Compare results to conclude optimal wandering strategies.

Following these instructions, users can effectively utilize the "Wandering in the Woods" game for educational exploration and experimentation.

## 5 CONCLUSION

The "Wandering in the Woods" game offers an engaging and interactive platform for students to explore spatial concepts through grid-based exploration. With varying levels of complexity tailored to different grade levels, this educational tool caters to a wide range of learners. From kindergarteners to eighth graders, users can customize grid sizes, participant numbers, and starting positions, providing a tailored learning experience.

The game's modular architecture ensures scalability and flexibility, allowing for future enhancements and extensions. Teachers and students can easily navigate and interact with the game through a user-friendly interface and intuitive design. The random motion algorithm guarantees dynamic and unpredictable gameplay, encouraging experimentation and critical thinking.

For students in grades 6-8, the game provides a unique opportunity for experimentation and analysis. They can vary grid sizes and shapes, explore wandering protocols, and analyze game statistics to draw insightful conclusions about optimal strategies.

Overall, "Wandering in the Woods" is a valuable educational tool, fostering teamwork, problem-solving skills, and a deeper understanding of spatial concepts. By utilizing this game, educators can enhance classroom learning dynamically and engagingly. Whether used for group activities or individual exploration, this software promises an enriching educational experience for students of all ages.