Software Requirements Specification

for

A Game of Connect 4

Version 1.5 approved

Prepared by Taylor Cano, Angel Burgos Casanova, Ian Eslinger, Cody Mims, and Landon Peterson

3398.251

February 13, 2019

Table of Contents

Revision History

Name	Date	Reason For Changes	Version
Ian Eslinger	2/12	Finished Section 2	1.1
Landon Peterson	2/13	Finished Section 4	1.2
Angel Casanova	2/13	Finished Section 1	1.3
Cody Mims	2/13	Finished Section 3	1.4
Angel Casanova	2/13	Editing & Review	1.5

1. Introduction

The aim of this document is to inform and analyze the implementation of the common household game of Connect 4 as a web application. The detailed requirements and product features are all included in this document. This document also serves as an agreement that the specifications uphold the requirements of the project.

1.1 Purpose

The purpose of this project is to design and implement a game of Connect 4 using the waterfall method to create an interactive web application to play Connect 4 either against an AI or another user. Overall, the goal of this project is to fully understand the process of delivering software to a customer's specifications.

1.2 Document Conventions

This document is written in Times New Roman in 12-point font. Main sections have been divided by 18-point bold font and subsections use 14-point bold font. Bullet points are used to separate parts of a list.

1.3 Intended Audience and Reading Suggestions

This document is intended for:
- Developers that want to understand the project's functions and where they can aide the development of the project. Suggested reading includes Section 2, Section 3, and Section 4, so that they understand the project features.
- Project testers that want to use this document to base their testing strategy in order to organize testing so that bugs are found more easily. Suggested reading includes Section 2, Section 4, and Section 5.
- Users of this product that wish to understand what this project is capable of.

This project is being produced under the guidance of Texas State college professor Dr. Jason Diaz.

1.4 Product Scope

The completed implementation of Connect 4 will be a finished product that can be realistically played by any user with access to the web application. The goal is to create an application that is convenient and easy-to-use that provides a comfortable user experience. The application shall allow the user to play and complete a game of Connect 4 once a winner is declared. The game will maintain traditional Connect 4 rules and the system shall respond in real-time.

1.5 References

Connect 4 rules: *http://www.boardgamecapital.com/connect-four-rules.htm*
Style guide: *https://google.github.io/styleguide/jsguide.html*

2. Overall Description

2.1 Product Perspective

This product is a web application that is intended to virtually recreate the rules and gameplay of Connect 4. Primarily, it shall implement the option for users to play against AI. Additionally, multiple difficulties shall be implemented alongside a multiplayer component in order to give users more ways to play.

2.2 Product Functions

There are several major requirements that the product must meet as well as let the user perform in this project.

This product shall implement these primary functions:
- Provide a Graphical User Interface
- Offer at least one form of AI implementation to play against the user
- Provide a functional game of Connect 4 that follows the basic rules and requirements detailed in Section 4

The System shall allow the user to:
- Perform a complete start to finish game of Connect 4 without encountering compromising issues

Additionally, the program shall be able to:
- *Offer an implementation of multiplayer to allow the user to play against other users*
- *Offer a demonstration of how to play the game i.e. (legal moves and basic rules)*
- *Provide a selection tool for at least 2 other difficulties of AI implementation to play against the user.*
- *Provide the user with the option to save the state of an AI game and resume it anytime.*
- *Provide the user with the option to enable a turn timer.*
- *Offer the user the ability to customize the colors of the game using a color wheel.*

2.3 User Classes and Characteristics

The system shall have one user known as a Player. The system shall respond to the user requests and construct a game of Connect 4 according to their requests. The multiplayer mode will have two users, the program shall have a turn system to avoid a multiple user issue.

2.4 Operating Environment

The program will be produced in JavaScript which is widely supported by most internet browsers, excluding text-based ones. Thus, it should be able to run in a Windows environment, Mac OSX, and Linux operating systems. Since it will be a JavaScript web application the project should not have any compatibility issues.

2.5 User Documentation

We will be following the JavaScript Google Style documentation guidelines and use JSDoc to provide basic comments. The JSDoc comments will be available for each class and every method except setter-getter methods.

Each classes' JSDoc will include a description for the purpose of the class, the author(s), version, and date. The JSDoc for each method will explain the specific function of it, as well as any of the method's parameters or return variables that require further explaining.

2.6 Assumptions and Dependencies

This product assumes that the user understands the fundamentals behind the game Connect 4, and that the user has access to the internet.

3. External Interface Requirements

3.1 User Interfaces

The board will be displayed graphically on the screen. The columns on the board, when clicked on, will drop a piece in the next available spot in that column. A button to restart the game will always be present to the side of the board. When a player wins the game, text will be displayed above the board.

3.2 Hardware Interfaces

Desktop computers controlled with a mouse are officially supported.

3.3 Communications Interfaces

This product will run in all modern browsers, including:
- Chrome 72
- Firefox 65
- Safari 12
- Opera 59
- Edge 44

No communication protocol is required as it will be run from the users' hard drive.

4. System Features

4.1 Play against AI

4.1.1 Description

The game shall provide an AI opponent of varying difficulties to play against.

4.1.2   Functional Requirements

REQ-1: If the user chooses to play against AI on the main menu (figure 3.1) and starts the game, the game shall be played between one human player and one AI player.

REQ-2: The game shall alternate turns between the human player and AI player. An on-screen dialog box will indicate the current player's turn.

REQ-3: After the human player has made a correct move by clicking the location of the user wishes to place a piece, the game shall automatically switch to the AI's turn.

REQ-4: The game shall end when one player has four game pieces in a row. A dialog box shall indicate the winner of the game.

4.2 AI Difficulty Selection

4.2.1 Description
The game shall allow the player to select AI of different difficulties on the main menu (figure 3.1) before the game begins.

4.2.2 Functional Requirements
REQ-1: If the user selects AI on the main menu, an option shall be present to select the difficulty of the AI player. The game shall change difficulties when the user clicks on the desired difficulty button. The next game started will have the AI set to the selected. difficulty

REQ-2: After AI difficulty is selected and the start game button is clicked, the game shall proceed in the same manner as 4.1.

4.3 Play Against Human

4.3.1 Description
Before the game is started, the game shall allow players to play against another human player instead of an AI.

4.3.2 Functional Requirements
REQ-1: If the user selects to play against a human on the main menu (figure 3.1) and begins the game, the game shall be played between two human players.

REQ-2: The game shall alternate turns between the two human players. An on-screen dialog box will indicate the current player's turn.

REQ-3: After the first human player has made a correct move by clicking the location of the user wishes to place a piece, the game shall automatically switch to the second human player's turn. Both players will share control of the mouse to click locations to place the game pieces.

REQ-4: The game shall end when one player has four game pieces in a row. A dialog box shall indicate the winner of the game.

4.4 Save and Resume Game

4.4.1 Description
The game shall allow you to suspend progress of a game and save to a file. The main menu (figure 3.1) of the game shall provide an option to resume a saved game.

4.4.2 Functional Requirements
REQ-1: A save game button shall be present on-screen during the game. At any point a human player can click this button to save the game.

REQ-2: If the user chooses to save a game, a file shall be generated on the user's machine with the suspended game's contents. A dialog box shall inform the player that the game was successfully saved.

REQ-3: If the user chooses to click the option button on the main menu, the resume button can be clicked, and the save file shall be loaded, and the game shall resume. If no save file is present, a dialog box shall be displayed notifying the user, and no game shall resume.

REQ-4: The save file shall contain the location of all pieces on the board, the current player's turn, and the difficulty of AI if selected.

4.5 Color Selection

4.5.1 Description

The main menu (figure 3.1) shall provide an option to select different colors for the game board, background, and game pieces.

4.5.2 Functional Requirements
REQ-1: If the user clicks the option button on the main menu, the customize colors button can be clicked, and options for different colors shall be presented.

REQ-2: If the user clicks a certain color, the game shall use it next time a game is started.

4.6 Demonstration

4.6.1 Description

The main menu (figure 3.1) shall provide a demo section, showing a scripted AI vs. AI match with explanations for moves and gameplay rules.

4.6.2 Functional Requirements
REQ-1: If the user clicks the demo button on the main menu, the game shall show a play by play demonstration by two AI players with a scripted outcome. Text on screen shall explain the rules as the demo is played out.

REQ-2: The demo's dialog boxes shall prompt the user to click "next" in order to see the next explanation of the game.

REQ-3: After the demo is completed, the game shall return the user to the main menu

4.7 In Game Timer

4.7.1 Description
The main menu shall provide an option to set time limits for player's moves

4.3.2 Functional Requirements

REQ-1: If the user clicks the options button on the main menu (figure 3.1), a menu shall appear prompting the user if they wish to use a timer, and the amount of time per turn.

REQ-2: If the user clicks the buttons to change the amount of time per turn, the game shall display the desired time, and the next game started will use that time.

REQ-3: If the user clicks the return to main menu button on the timer options screen, the game shall return them to the main menu.

Appendix A: Glossary

- AI – Artificial intelligence
- JSDoc – Markup language used to annotate JavaScript files