Software Requirement Specification

Intra-network Multiplayer Scrabble Application

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1. Introduction

This Section gives an overview of the Scrabble application, in addition to the scope description and intended audience of the project.

1.1 Purpose

The Purpose of this document is to build a multiplayer Scrabble game application to catch the attention of all ages. This document will illustrate a mock up representation of the user interfaces and describe the application constraints and failsafes. It will also explain the function capable of the application.

1.2 Scope

The Scrabble game application is a desktop based game application intended to connect 2 to 4 players at a time, with the host having multiple options to change how the game plays. This application is based on Hasbro's game of Scrabble and as such will include all the same rules. This application is targeted to the same audience, which is primarily intended for children, but with mass appeal.

1.3 Definitions

Term	Definition
Tile	Square containing both letter and letter value
User/Player	Player that is playing the game
Letter	The character centered on the Tile
Dictionary	List of acceptable words
User score	A players personal score
Blitz Mode	A game of scrabble that has a fast time control
DL/Double letter cell	A pink colored cell that doubles a letter value when tile is placed
TL/Triple letter	A red colored cell that triples a letter value when tile is placed
DW/Double Word	A light-blue colored cell that doubles a word value when tile is placed

TW/Triple Word	A dark-blue colored cell that triples a word value when tile is placed
Bingo	When a player uses all tiles on their rack
Letter value	Numeric value on the bottom right corner of a tile
Cell	A spot on the playable board
Word value	Total value of place and/or combined tiles
Host application	The application running on a party's host. This application will act as the "server" for the party.

2. Overall Description

The application will host up to four online players and simulate a game of Scrabble, adapting the traditional rules to a virtual setting where possible. Users will have the option to customize various game settings before starting, providing a more tailored experience compared to a local game.

2.2 Product Function

Our Software will be an online simulation of the game Scrabble that will allow players to customize their own game, or play with the default rules set by Hasbro. The software makes it impossible for players to break the rules which were set prior to the game. When the game ends, the software will announce a winner, and after a set period of time will disconnect all players from the network.

2.3 User Characteristics

There are two types of users for our Software, host and players. The host can choose the rule set that will be used throughout the round, as well as being given the ability to choose special rules to add to their game. Hosts are 1 of4 players that will be participating in a single game. They will set the rules for the game, prior to starting. Players are users who will be able to input their display name for the user interface and will play the game with the rules set by the host.

2.4 Constraints

1. In order for a game of Scrabble to be played, there must be at least 2 users connected to the same network using a laptop or other type of computer.
2. The user must have a basic understanding of the English language.
3. Users must have access to a computer mouse, touch screen, or touchpad.
4. If a user is disconnected from the game, they will be unable to rejoin the game.
5. If the host disconnects the game will end

2.5 Dependencies

In order for the software to be able to run, the host and users must be using a safe, stable network. Since the software is being constructed from scratch, there are no other dependencies besides the network.

3. Interfaces

The game will feature a starting menu with buttons to either “Play” or “Quit”. By selecting “Play”, players can either host a scrabble game or join an ongoing scrabble party. By selecting “Quit”, the application will close.

A possible extension on these options is to include a “Settings” button; this option would allow users to change the audio and visual components of the game. Note that in-game rules are a possible extension for the host of a scrabble party.

3.1 User Interface

1. Main Menu: The main menu provides options for “Play” and “Quit.”

2. Game Screen: The center of the screen displays a 15x15 Scrabble Board catered towards the settings implemented before the game. Player information, including name, score, and time remaining, will be visible in the corner assigned to each player.

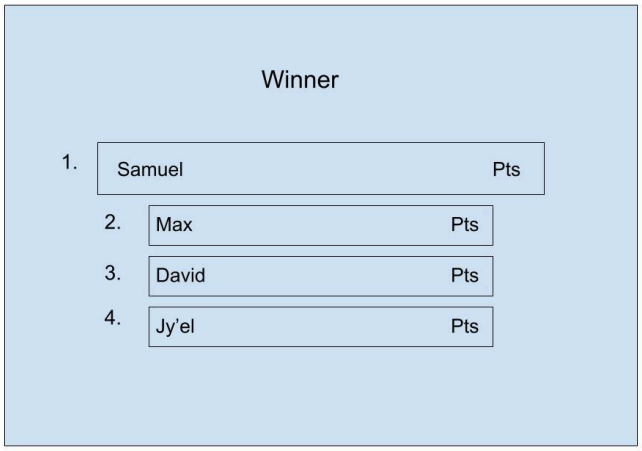
3. Board: The board is a 15x15 cell playing area. Each square is one of 6 options:

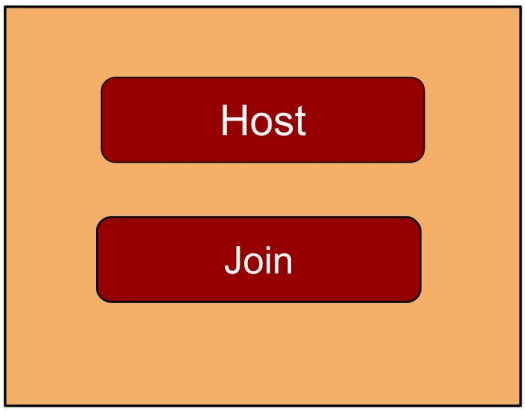
- Blank: value of letter is as displayed on tile.
- Start: Tile where first word must be placed over. This cell has a 2x word multiplier associated with it.
- 2x Letter: Doubles the value of the letter played over the cell (Light Blue colored).
- 2x Word: Doubles the value of the word played over the cell (Pink colored).
- 3x Letter: Triples the value of the letter played over the cell (Dark Blue colored).

- 3x Word: Triples the value of the word played over the cell (Red colored).

4. At the end of the game, the application will display the final winner, and scores, showing the total words and highest score shown in the game.

These figures are to demonstrate planned user interfaces in addition to extended features. They are not representative of the final product.

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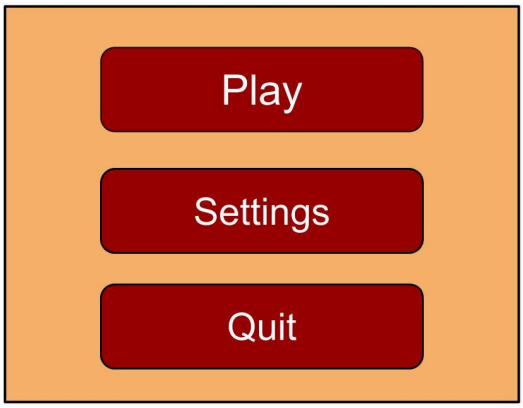
Join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Settings
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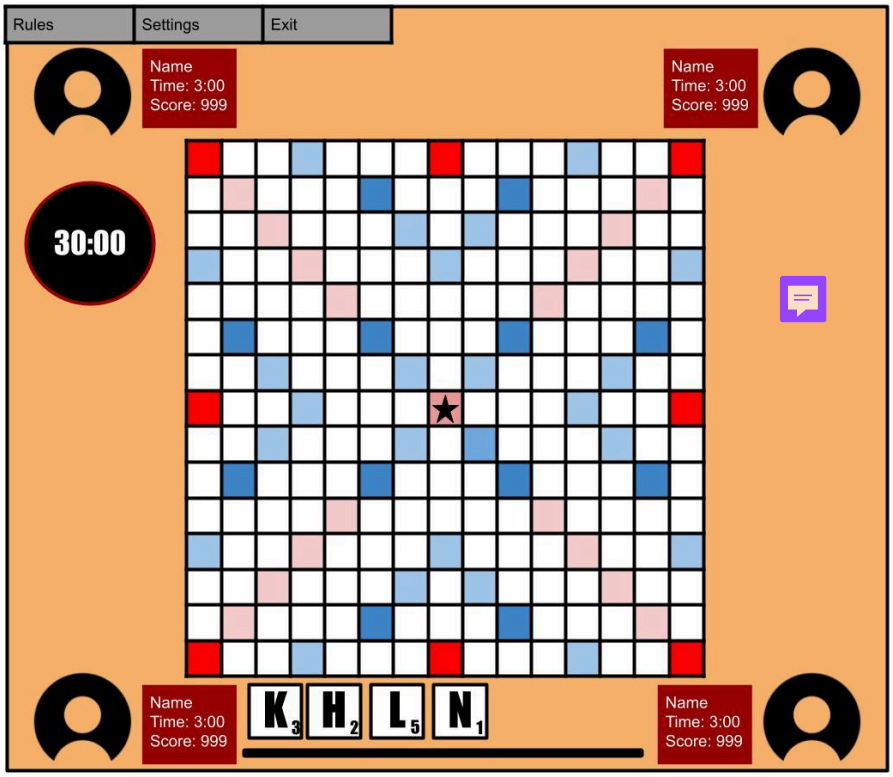
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Exit
Name
Time: 3:00
Score: 999
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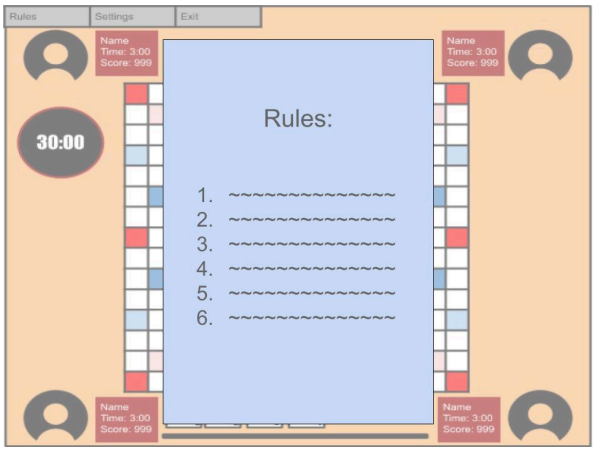

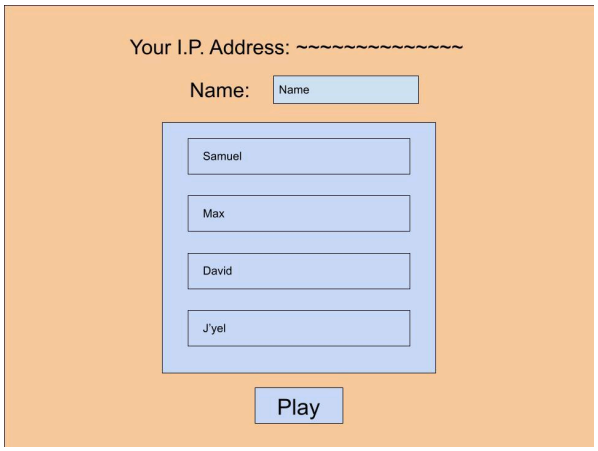

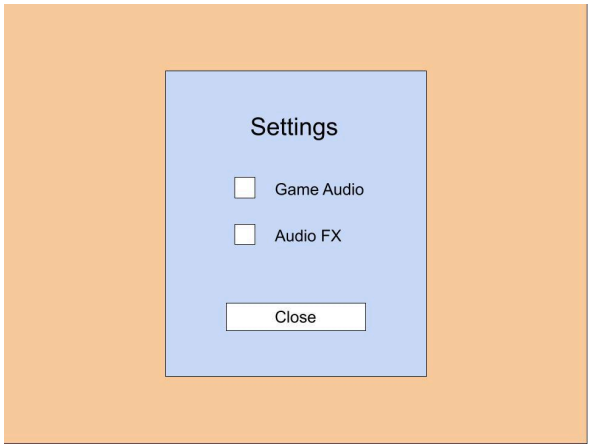

3.2 Hardware Interfaces

1. Use of a keyboard for entering names and settings.

2. Use of a mouse to interact with tiles and game interface.

3. Software should adapt to numerous resolutions to maintain stability and visibility.

3.3 Software Interfaces

1. Software will run on Windows

2. The application will utilize a local IP network to enable multiplayer gameplay. If a player disconnects, the game will reshuffle the player's tiles back into the tile bag.

3.4 Communication Interfaces

The application will use TCP/IP to send and receive messages between users' computers.

4. Functional Requirements

The application must be opened by running the executable file.

The application must display the options "Play" and "Quit" when it is opened.

The application must allow users to select between hosting a game and joining a game when the "Play" option is selected.

The application must display the user's IP address when the "hosting" option is selected.

The application must have a text box to enter the host's IP address when the "join a game" option is selected.

The game host must be able to kick out (a) player(s) once they have joined.

The game host must be able to start a game when at least one other player is present.

User's must be able to leave a game at any time.

The application must display the game's rule set immediately after the host has started the game.

Connection Requirements

The host application must ensure that players are still connected.

The host application must assure other players that they have not disconnected from other players.

The host application must inform other players if a player disconnects.

The Start of the Game

The host application must shuffle the letter bag at the start of the game.

The host application must reshuffle the letter bag only when a player disconnects or a player chooses to exchange a tile or all of their tiles from their hand (outlined below).

The host application must assign seven letters to each player from the letter bag.

The host application must randomly assign the order in which players take turns.

The application must enforce the order in which players take turns.

The application must require the first person to play a word on the star tile (near the center of the board).

Players must play in the predetermined order, starting from the top of the order once all players have taken their turns.

Player's total score must be displayed below their name.
Tile value must be displayed on the bottom right corner of the tile.
Word value must be doubled when one of its letters is placed on a pink cell.
Word value must be tripled when one of its letters is placed on a red cell.
Letter value must be doubled when it's placed on a light-blue cell.
Letter value must be tripled when it's placed on a dark blue cell.
Newly placed tiles must connect to old tiles.
A game must have a minimum of 2 players.
A game must have a maximum of 4 players.
The game board must be 15 by 15 cells.

Game Timer

The application must limit the length of time a player may use on their turn.

The in-game timer must countdown from the set time to zero seconds.

The player's turn must end in a "pass" if they run out of time. (The "pass" mechanic is described in the "A Player's Turn" section.)

The application must restart the timer for each player, for each turn.

A Player's Turn

A player must end their turn by a) placing letters on the scrabble board; b) passing their turn; or c) exchanging either one of their tiles or all of their tiles.

For option a:

- A player must place tiles on the board such that they create only valid words.
- A player must place only their own tiles on the board.
- Letters placed on a turn must have the same row value or column value. (Letters cannot be played diagonally, nor may a player place letters orthogonally.)
- The application must score the word(s) played on the turn.
- The application must score words using the applicable letter values and modifier cell(s).
- The application must add the player's turn score to that player's total score.

For option b:

- The application must allow a player to pass their turn without playing a word
- The application must disallow a player from placing letters if they pass two consecutive turns.

Option c is a possible extension to the application. If it is implemented, it must adhere to the following requirements:

- The player must choose to exchange one of their tiles or all of their tiles.
- The player must choose which tile to exchange if they choose to replace one tile.
- The application must notify the host of the player's choice.
- The host application must assign the appropriate number of tiles to the player, add their tiles to the bag, and shuffle the bag.

Scrabble Tiles

The application must include letter tiles in the appropriate distribution, outlined below.

- 2 blank tiles (scoring 0 points)
- *1 point*: **E** ×12, **A** ×9, **I** ×9, **O** ×8, **N** ×6, **R** ×6, **T** ×6, **L** ×4, **S** ×4, **U** ×4
- *2 points*: **D** ×4, **G** ×3
- *3 points*: **B** ×2, **C** ×2, **M** ×2, **P** ×2
- *4 points*: **F** ×2, **H** ×2, **V** ×2, **W** ×2, **Y** ×2
- *5 points*: **K** ×1
- *8 points*: **J** ×1, **X** ×1
- *10 points*: **Q** ×1, **Z** ×1

(from https://en.wikipedia.org/wiki/Scrabble_letter_distributions)

Blank Tiles

The application must allow blank tiles to be placed on the board.

The application must prompt a player to choose a letter for the blank tile when they place it.

The blank tile must have the selected letter displayed on it.

Valid Words

The application must contain the complete Scrabble dictionary of valid words.

The application must validate each word which is played against the Scrabble dictionary.

The application must notify a player if the tiles placed do not create a valid word.

The application must continue the player's timer while the validation is ongoing.

The application must not end a player's turn when a non-valid word is played.

By default, the application will allow only valid Scrabble words to be played on a turn. A possible extension to the application is to allow players to have a "challenge" option in-game. If this option is implemented, it must adhere to the following requirements:

- The application must include a "challenge words" option in the rules before the game.
- The application must allow any set of tiles to be placed on the board.

- The application must allow players to challenge placed words.
- Challenges must validate each word played on the previous turn.
- Challenges must be issued only for the most recent play; they may not be issued for turns which took place before any other turn.
- A challenge is failed when a player played an invalid word, or passed when each word played was valid.
- The application must subtract the turn score from a player who failed a challenge.
- The application must disallow a challenging player from playing their next turn if the challenge is passed.

End Conditions

The game ends if one of the following conditions is met:

1. The players use all scrabble tiles in the bag.
2. All players consecutively pass their turn
3. The host disconnects from the server

In the first and second case, the application must display the final total scores of each player.

In the third case, the application must notify all players that the host has disconnected.

5. Non-functional Requirements

5.1 Performance Requirements

The application should support up to four simultaneous online players with some performance degradation.

5.2 Safety Requirements

If a player disconnects in the middle of the game the application should alert the rest of the players, return the disconnected player tiles back to the “bag” of tiles and remove the player’s information from the board so the other players know they were disconnected and ensure data consistency.

5.3 Security Requirements

User data and game state should be protected from unauthorized access and tampering.

5.4 Software Quality Requirements

In-game interface should provide easy to read metrics on time remaining, score, names for each player. Each player should have only their own letters on screen, but should see how many letters there are for other players.

The application should be able to handle increased user load and additional features in the future.

Extensions:

- A setting screen accessible to users that will contain:
    1. Optional music toggle
- Transitions between screens for better user experience.