

analysing and solving

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CertHE Computing Skills for the Workplace

Analysing and Solving Problems

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Introduction

Scrabble is a popular word game that challenges players to create words using letter tiles on a game board. The objective of the game is to score the highest number of points by strategically placing words on the board [1].

Abstract

The digital transformation has paved the way for the adaptation of traditional board games into online platforms, providing players with new avenues for interactive and engaging gameplay. This abstract explores the concept of an online Scrabble game, aimed at delivering an enhanced and immersive experience for players seeking to challenge their word-building skills in a digital environment. The game leverages modern technologies to recreate the essence of the classic Scrabble board game while incorporating features that capitalize on the advantages of online gameplay.

Here are the key rules of Scrabble:

Game Setup:

- Scrabble is played by two to four players.
- Each player starts with a set number of letter tiles, typically seven, drawn randomly from a tile bag.
- The game board consists of a grid of squares, with some squares marked as premium squares that multiply the word or letter scores.

Turn Sequence:

- The game begins with one player placing a word on the board, either horizontally or vertically, using their tiles. This word must intersect with at least one existing word on the board.
- On subsequent turns, players can create new words by adding letters to existing words or forming entirely new words.
- Each player's turn consists of two actions: exchanging tiles from their hand and/or playing one or more tiles on the board.
- Players replenish their tile racks at the end of their turn by drawing tiles from the bag to maintain a certain number of tiles on their rack.

Scoring:

- Each letter tile has a specific point value, and the score of a word is determined by adding up the points of all the letters in that word.
- Premium squares on the game board, such as Double Letter Score (DLS), Triple Letter Score (TLS), Double Word Score (DWS), and Triple Word Score (TWS), can increase the score of a word or letter placed on them.
- If a word covers two premium squares simultaneously (e.g., a word crossing a DLS and a TLS), the score is multiplied by both square values.

Valid Words and Challenges:

- All words played in Scrabble must be valid words found in an agreed-upon dictionary. Commonly used dictionaries for Scrabble include the Official Scrabble Players Dictionary (OSPD) or the Collins Scrabble Words (CSW) list.
- If a player places an invalid word, it is challenged by other players. If the word is found to be invalid, the player removes the word from the board and loses their turn.
- Challenged words that are deemed valid remain on the board, and the challenging player loses their turn.

Game End:

- One player uses all of their tiles, and no more tiles remain in the bag.
- All players consecutively pass their turn.
- When the game ends, players calculate their scores by subtracting the total value of the tiles remaining on their racks from their overall score. The player with the highest score wins [2].

Requirement Features List for Computer-Based Solution for Scrabble:

Must haves:

1. Basic Gameplay Features:

- 1.1. Enable players to start a new game.
- 1.2. Support two to four players.
- 1.3. Provide a visually appealing game board with a grid layout.
- 1.4. Allow players to draw initial letter tiles from a tile bag.

2. User Interface and Interaction:

- 2.1. Provide an intuitive and user-friendly interface for easy gameplay.
- 2.2. Display the player's letter rack and the remaining tiles.
- 2.3. Enable players to select and drag tiles onto the game board to form words.
- 2.4. Highlight valid word placements and show points earned for each word.

3. Word Validation and Dictionary:

- 3.1. Implement a word validation system to check the validity of words played.
- 3.2. Integrate an agreed-upon dictionary (e.g., ³Official Scrabble Players Dictionary or Collins Scrabble Words list).
- 3.3. Display error messages for invalid words and allow players to make corrections.

4. Scoring and Game Mechanics:

- 4.1. Automatically calculate and update scores based on the point values of letters and premium squares.
- 4.2. Implement the scoring system for double and triple letter/word scores.

4.3. Account for special cases such as consecutive word bonuses or using all tiles for extra points.

4.4. Handle tile exchanges during the game according to the rules.

5. Multiplayer and Online Features:

5.1. Support multiplayer functionality to enable remote gameplay.

5.2. Allow players to connect and play with friends or random opponents online.

5.3. Provide chat or messaging features for communication during gameplay.

5.4. Implement turn-based gameplay with notifications or reminders for pending moves.

Should have:

6. Game Management and Persistence:

6.1. Enable players to save and resume games at a later time.

6.2. Allow players to undo or redo moves during the game.

6.3. Provide an option to review the game history and replay previous moves.

6.4. Implement a game completion state and declare a winner at the end of the game.

7. Customization and Settings:

7.1. Allow players to customize game settings such as board appearance or tile design.

7.2. Provide options for selecting different language dictionaries.

7.3. Enable players to adjust sound and visual effects.

7.4. Offer adjustable difficulty levels or AI opponents for single-player mode.

8. Platform Compatibility:

8.1. Develop the solution as a cross-platform application, compatible with desktop, mobile, and web platforms.

8.2. Ensure compatibility with popular operating systems such as Windows, macOS, iOS, and Android.

Could have:

9. User Registration and Profiles:

9.1. Allow users to create accounts and log in to the online game platform.

9.2. Provide the option to create player profiles with customizable avatars or profile pictures.

10. Multiplayer Functionality:

10.1. Enable players to invite friends or find random opponents for online matches.

10.2. Implement a matchmaking system that pairs players based on skill level or preferences.

10.3. Support simultaneous or turn-based multiplayer gameplay.

11. Real-time Gameplay:

11.1. Create a live game environment where players can see each other's moves in real-time.

11.2. Implement a chat or messaging system for players to communicate during the game.

11.3. Ensure smooth and synchronized gameplay across multiple devices or platforms.

12. Game Board and Tiles:

12.1. Design a visually appealing and interactive game board with a grid layout.

12.2. Provide a set of letter tiles that players can drag and drop onto the board.

12.3. Implement touch or click functionality to allow easy tile placement and movement.

Won't haves:

13. In-Game Purchases

13.1. Excessive Advertisements

Priority Must-Have Features for a Computer-Based Scrabble Solution.

Basic Gameplay Features.

Explanation of Priority:

The features are essential for the core gameplay experience. Without them, the game cannot be initiated, and players cannot engage in the primary activity of creating words on the board. Enabling players to start a new game and supporting the appropriate number of players ensures that the application can cater to different game configurations [3]. The visually appealing game board with a grid layout enhances the user experience by providing a familiar and intuitive interface. Allowing players to draw initial letter tiles from a tile bag ensures that they have a starting set of tiles for word formation. These features should be prioritized as Must-haves to establish the foundation for a functional and engaging game

Word Validation and Dictionary.

Explanation of Priority:

Word validation is crucial to maintain the integrity and fairness of the game. Implementing a word validation system ensures that only valid words can be played on the board, adhering to the rules of Scrabble. Integrating an agreed-upon dictionary provides the reference for word validity, enabling the application to validate the words played against an authoritative source. Displaying error messages for invalid words and allowing players to make corrections helps them rectify any mistakes and ensures accurate gameplay.

Scoring and Game Mechanics.

Explanation of Priority:

The scoring and game mechanics features are essential for tracking progress, determining winners, and creating a competitive atmosphere. Automatically calculating and updating scores based on letter values and premium squares saves players from manual calculations and ensures accuracy. Implementing the scoring system for double and triple letter/word scores accurately reflects the value of words played on premium squares. Accounting for special cases such as consecutive word bonuses or using all tiles for extra points adds depth and strategy to the game. Handling tile exchanges according to the rules allows players to make strategic decisions during the game.

Implementation

Variables

GameBoard: ¹ A 2-dimensional array representing the Scrabble game board. Each cell of the array corresponds to a position on the board and holds information about the letter tile placed on that position, such as the letter value and any special modifiers. This variable is not a constant [4].

BoardSize: A constant variable representing the size of the game board. It specifies the number of rows and columns in the 2-dimensional array representing the game board.

LetterTiles: An array or collection that stores the pool of available letter tiles. Each tile object would contain properties such as the letter itself, its point value, and the number of remaining tiles of that letter in the pool. This variable is not a constant.

PassCount: A variable that keeps track of the number of consecutive passes made by players. It helps in determining when to end the game if no valid moves are possible.

PlayerNames: An array or collection that stores the names of the players participating in the game. This variable allows you to keep track of the players and can be modified as players join or leave the game. This variable is not a constant.

PlayerScores: An array or collection that stores the scores of each player. Each element in the array corresponds to a player's score and can be updated as the game progresses. This variable is not a constant.

CurrentPlayer: A variable that stores the index or reference of the current player taking their turn. This variable helps in managing turn-based gameplay and can be updated to switch to the next player. This variable is not a constant.

Dictionary: A collection or data structure containing a list of valid words. This variable is used to validate the words formed by players during the game. It acts as a reference for checking the validity of words played. This variable is not a constant.

MaxTiles: ¹ A constant variable representing the maximum number of letter tiles that a player can hold at any given time. This constant ensures that players cannot exceed the maximum limit of tiles. This variable is a constant.

GameRunning: A variable that tracks whether the game is currently in progress or has ended. It helps control the flow of the game and can be used to determine when to stop gameplay loops or trigger end-game conditions. This variable is not a constant.

TotalRounds: A variable that stores the total number of rounds to be played in the game. This variable helps manage the overall game structure and can be modified based on the desired number of rounds. This variable is not a constant.

CurrentRound: A variable that keeps track of the current round being played. It is updated as the game progresses and helps in managing round-specific actions or conditions. This variable is not a constant.

CurrentLetters: An array or collection that stores the letter tiles currently held by the current player. It keeps track of the tiles available for the player to form words during their turn.

ExchangeCount: A variable that stores the number of times a player has exchanged their letter tiles during their turn. It can be used to limit the number of tile exchanges allowed per player per round.

InvalidMoves: An array or collection that keeps track of any invalid moves made by players during the game. It can be used for error reporting or penalty purposes.

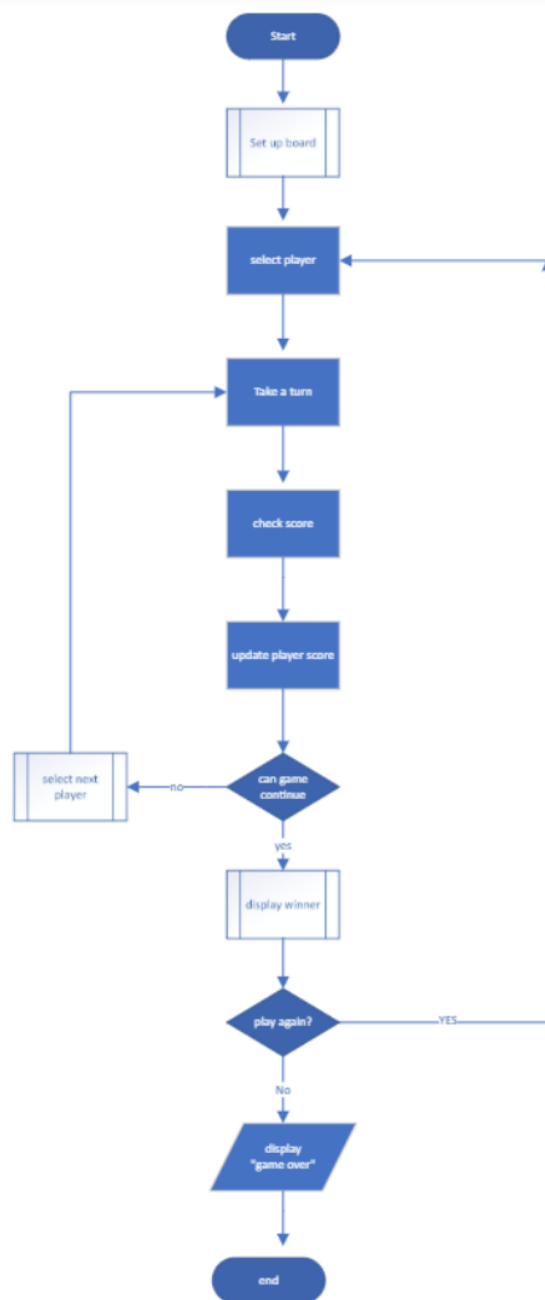
BlankTiles: An array or collection that stores the blank tiles (wildcards) held by each player. It keeps track of the number of blank tiles and their positions, allowing players to use them as any letter during their turn.

TurnTimer: A variable representing the duration of each player's turn. It can be used to enforce time limits for making moves and trigger automatic passes if a player exceeds the time limit.

ChallengeCount: A variable that tracks the number of times players have challenged a word played by another player. It can be used to limit the number of challenges allowed per round.

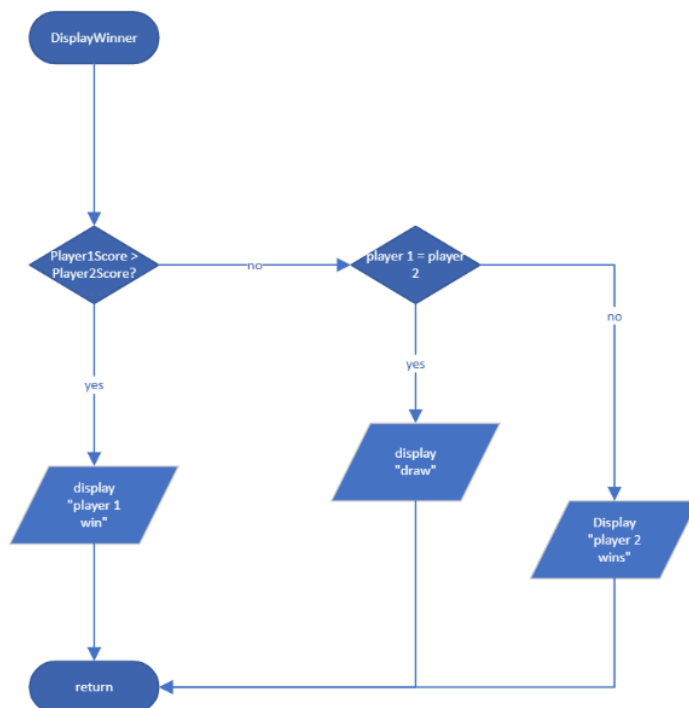
LastWord: A variable that stores the word formed by the most recent player's move. It allows for displaying or validating the last word played.

Flowchart



I used Microsoft Visio to create this flowchart about the scrabble game.

Sub process



Pseudo codes

1.

1. INPUT – **CurrentPlayer**
2. INPUT – **SetPosition**
3. Display “set tiles”

2.

4. INPUT – **Player1**
5. INPUT – **Player2**
6. Display “you win”
7. Display “draw”
8. Display “sorry you lose”

Sub processes

These sub-processes play essential roles in the game's logic. The first sub-process verifies and validates the players selection for first turn. The second sub process calculates the score for each word formed by the players, contributing to the overall gameplay and competition [5].

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