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by Vera Karakoleva

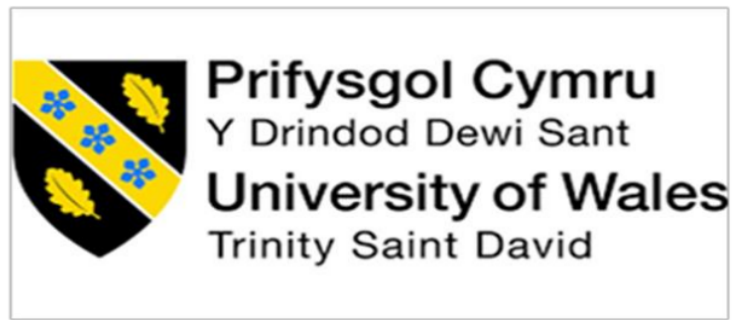
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Computing Skills for the Workplace

Assessment 2

Scrabble Algorithm

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Student number:2232348

**Analysing and Solving Problems
(ACCA4019_ BIRM)**

Charles Nimoh

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Introduction

Every day, millions of people around the world use the Internet for various activities such as searching data, uploading documents and playing games. As a result, the Internet seamlessly integrates into our daily lives. Nowadays, people from all walks of life have access to the Internet, making it an important source of entertainment for people of all ages. Online games, including chess, sudoku and scrabble, stand out as some of the most popular sources of entertainment on the internet.

The purpose of this report is to analyse the game of Scrabble and create a computer-based solution. Scrabble is a very popular crossword puzzle game that is played by a huge number of people on the Internet. Scrabble game rules, features and requirements will be covered, implementation under Must category, variables, flowchart and pseudocode.

Scrabble Algorithm



(Wikipedia, 2023)

Requirements

Scrabble rules

The primary goal of Scrabble is to create words by placing tiles with letters on the game board. Once the first word is played, players continue to take turns and expand upon existing words by adding new words using the existing letters on the board (Findler, 2008).

10 Scrabble, the game is designed for minimum two players. At the beginning of the game, each player draws seven tiles and arranges them on their personal rack.

5 Player number 1 combines letters to create a word and positions it on the board to form it across or down one letter in the center square. (Diagonal words are not allowed.) After placing a word, the player is given some placeholder letters, one for each letter played. (Findler, 2008).

The scoring process begins by tallying the points for double and triple letter squares, which contribute to the initial word score. Subsequently, any double or triple word score squares are factored in to determine the final word score (Nations, 2020).

Following the first turn, players alternate. Each plays a series of tiles forming a word.

¹ Each new word must connect to the existing words.

When playing Scrabble, a ¹ new word must either utilize one of the letters already on the game board or add a letter to an existing word. Additionally, players have the option to place a complete word in a parallel fashion to an already played word, ensuring that the adjacent letters also form complete words (Findler, 2008).

During the game, there may arise instances where a player plays a word that another player believes to be invalid. In such situations, it becomes necessary to consult a dictionary to verify the word's legitimacy (Flamiano, 2023).

There are two ¹² blank tiles that can be used as substitutes for any letter. Players are required to verbally declare which specific letter it represents. Once declared, the blank tile retains that assigned letter for the remainder of the game.

During a turn in Scrabble, players have the option to exchange any number of their letters, including all of them, some of them, or none.

After exchanging letters player must draw the same number of replacement letters from the pool of remaining letters. This action concludes their turn.

The game ends when

- When all the letters are either held by the players or placed on the game board, and one player exhausts their supply of letters by using their last letter.
- When both players engage in tile exchanges twice consecutively, resulting in a total of four exchanges (Findler, 2008).

Requirement features list

While all requirements hold significance, prioritizing them becomes essential to achieve maximum and immediate business benefits. Initially, developers will strive to fulfil all the Must-have, Should-have, and Could-have requirements. However, if the delivery timeline is at risk, the Should and Could requirements will be the first to be omitted or deferred (Wikipedia, *Moscow method* 2023).

Must Have	Should Have
1 Board 2 Scoring 3 Tile placement 4 Dictionary 5 Saving and loading game progress	1 Algorithm for various levels 2 Timer 3 Bonus tiles (double letter, triple word) 4 Help system for new players
Could Have	Will Not Have
1 Customizable tile sets or themes 2 Support for playing with friends that are on distance	1 Voice recognition for tile placement or word input

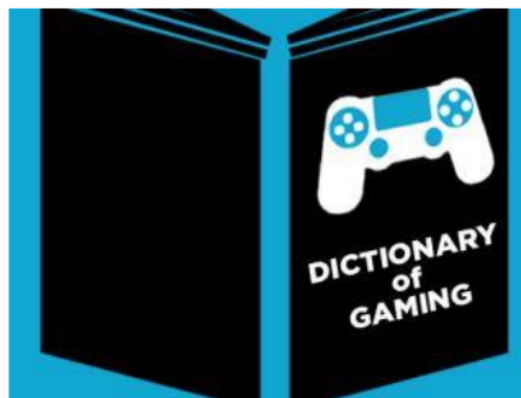
Three options from Must Have

Board: The game board is an essential component of Scrabble, even in computer versions, for several reasons:

- **Spatial Arrangement:** Scrabble is not just about forming words but also strategically placing them on the board. The board provides a grid where players can position their letter tiles to maximize their score. It adds a spatial element to the game and allows players to interact with each other's words.
- **Score Calculation:** The board layout determines the scoring system in Scrabble. Different squares on the board, such as double letter score (DL), triple letter score (TL), double word score (DW), and triple word score (TW), affect the value of the placed tiles. The board's arrangement and scoring system impact the players' decisions on where to play their words to earn the most points.
- **Visual Representation:** The board serves as a visual representation of the game state, allowing players to see the overall progress, word formations, and available spaces for placing tiles. It helps players strategize by considering the current state of the board and planning their next moves accordingly.

In summary, the game board in computerized versions of Scrabble enhances the gameplay experience by providing a spatial framework for word placement, enabling strategic decisions, facilitating fair competition, and ensuring the integrity of the game's rules.

Dictionary: In computer games like Scrabble, a dictionary is a fundamental component for several important reasons:



(Staff, 2014)

Validating Word Plays: In Scrabble, players form words using letter tiles on a game board. To ensure fair play and prevent cheating, the game needs a reliable source to verify the legitimacy of the words played. The dictionary acts as the authoritative reference to confirm whether a word is valid or not. It ensures that the rules are followed, words are correctly spelled, and all players are on equal footing.

Regenerate response

Saving and loading game progress: Saving and loading game progress in computer games like Scrabble is essential for several reasons:

- Longevity and Continuity: Scrabble is a game that can take a significant amount of time to complete, especially in multiplayer matches. Saving game progress allows players to take breaks and resume their games later without losing their progress. This feature promotes longer play sessions and ensures continuity in the gameplay experience.
- Flexibility: Saving progress allows players to accommodate their schedules and responsibilities without feeling pressured to complete a game in one sitting.
- Strategic Decision-Making: Scrabble is a strategic game where players need to carefully plan their word placements to maximize their scores. Being able to save the game allows players to analyse the current board state, consider potential moves, and strategize their next play without feeling rushed.

Implementation

Identify the variables you need to use in your solution for scrabble game

Variables is:

Observable characteristics or features of the world that can have diverse values, meaning they can vary. Categories of a variable are the different options or possibilities that it can take on. For example, in the variable "gender," "male" and "female" represent the different categories or values that the variable can have (Epstein & Martin, 1970).

List of variables

Board

Player 1

Player 2

BagOfTiles

Turn

Dictionary

LastMove

GameOver

WinningPlayer

Descriptions of the variables

Board-representing the game board

Player 1- representing the player participating in the game, include the name, score, and their set of letters tiles.

Player 2- representing the player participating in the game, include the name, score, and their set of letters tiles

BagOfTiles-list with letter tiles available for players to draw from during their turns.

Turn-variable indicating whose turn it is, typically represented by the player number.

Dictionary- list of valid words that can be played in the game.

LastMove-no more tiles left.

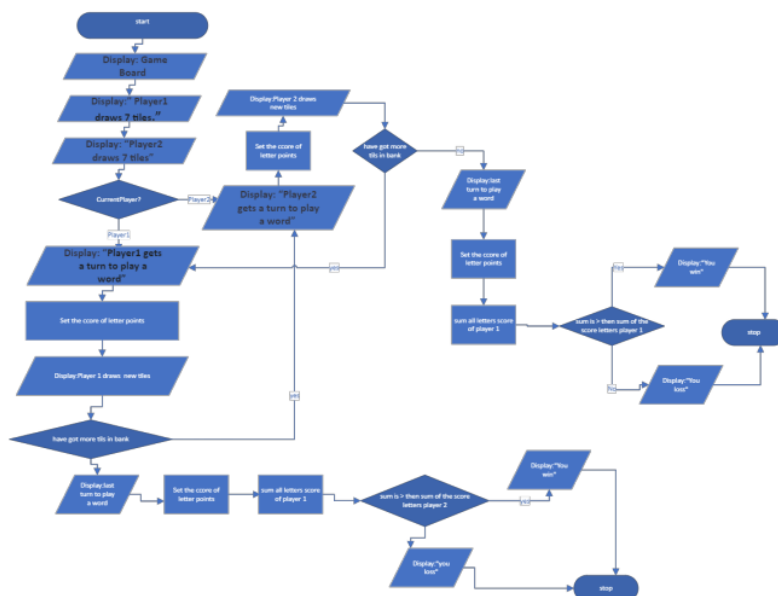
GameOver- variable indicating whether the game has ended or is still in progress.

WinningPlayer- storing the player number of the player who won the game (if the game is over)

Flowchart

In the typical development process of computer programs, various stages involve formulation and definition. At one of these stages, a flowchart is often created to depict the program's logic at a level of abstraction that lies between the initial problem statement and the final code of the completed program. The programmer designs the flowchart with the goal of making it easily translatable into the chosen programming language, ensuring convenience during the coding phase (Nassi & Shneiderman, 1973).

Flowchart to represent an algorithm solution



Pseudo code

Pseudocode serves as an excellent tool for planning and designing the logical flow of programs and computational algorithms. However, before creating pseudocode, the designer must have a clear understanding of the algorithm or procedure, which can be obtained from direct observation, existing documentation, or the problem definition and analysis stages of the system development life cycle (Davis & Yen, 2019).

Pseudocode allows explicit coding of certain details like file handling, initializing counters, and setting flags while abstracting away language-specific details. Though there is no standard format for pseudocode, many versions capitalize key words and operations and utilize indentation to showcase the logical relationships between different code blocks. It can be produced using word processors or text editors since few specialized software tools are specifically designed for generating pseudocode (Davis & Yen, 2019).

Pseudo code of game “Scrabble”

Display: Game Board

Display:” Player1 draws 7 tiles.”

Display: “Player2 draws 7 tiles”

Decision: Current player

Display: “which tiles draws player2”

If its Player 1

Display: “Player1 gets a turn to play a word”

Set the score of letters points: Set=points letter1+points letter2+...points letter ”n”

Display: “Player1 draws new tiles”

Decision: Have got more Tiles in the bank?

If answer is “no”

Display: “Last turn to play a word”

Set the score of letters points: Set=points letter1+points Letter 2 +...points letter “n”

Set total score ofplayer1: Set=Score1+Score2+....Score “n”

Decision: If total score of Player1 is > then total score of Player2

Display: "You win”

Display: “Game over”

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