Green University of Bangladesh
Department of Computer Science and Engineering (CSE)
Faculty of Sciences and Engineering
Semester: (Fall, Year:2022), B.Sc. in CSE (Day)

LAB PROJECT PROPOSAL

Course title: **Artificial intelligence**

Course Code: CSE316   Section: 201D1

Tic-Tac-Toe

Student Details

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1 Problem Statement

Tic-Tac-Toe is a classic two-player game that can be played on a 3x3 grid. The objective is to be the first player to place three of their pieces (X's or O's) in a horizontal, vertical, or diagonal row. Despite its simple rules, Tic-Tac-Toe can be difficult to win, and it is often a game of luck.

2 Objectives

- To develop a game of Tic-Tac-Toe that can be played by two people.

- To create a game board with nine squares.

- To allow players to take turns placing Xs and Os on the game board.

- To determine when a player has won, lost, or tied.

- To implement all logic necessary for the game to run.

3 Functional Requirements

- The program should be able to recognize valid input from the user.

- The program should be able to recognize when the game has been won by either player.

- The program should be able to generate a valid move for itself.

- The program should be able to recognize when the game has ended in a draw.

4 AI Elements

A Tic-Tac-Toe AI could have the following elements:

1. **Heuristic Evaluation Function:** This is a function that evaluates the current state of the game board and assigns a score for each possible move. The AI then uses this score to decide which move is the best one to make.

2. **Minimax Algorithm:** This algorithm is used to search through the possible moves and determine which move is the best one to make. It looks at the current state of the game board and then evaluates all possible future states and their associated scores. The AI then makes the move that maximizes its chances of winning.

3. **Alpha-Beta Pruning:** This is an optimization technique used to reduce the number of nodes in the search tree and improve the search speed. The AI uses it to prune branches of the search tree that it knows it won't need to explore.

4. **Knowledge Representation:** The AI needs to store information about the game state and how it should respond to different moves. This can be done using a representation language or a symbolic system.

5. **Adaptive Learning:** The AI needs to be able to adjust its strategy as the game progresses and new information is revealed. It needs to be able to learn from its mistakes and adapt its strategy accordingly.

5 Contribution of Existing Field/Newly Created

5.1 Existing field

The existing field for the Tic-Tac-Toe project would include the game logic and rules, the interface for the game, and the algorithms for determining a winner.

5.2 Newly created field

The newly created field for the Tic-Tac-Toe project would include artificial intelligence algorithms that would allow the game to "learn" from its mistakes and become better at playing the game, as well as a network-based multiplayer mode that would allow users to play against each other over the internet. Additionally, new graphics and animations could be created to improve the game's visual appeal.

6 Future Scope

1. **Developing an AI-based version of the game:** The AI-based version of the game can be developed using machine learning and deep learning algorithms to make the game more challenging for the players.

2. **Adding an online multiplayer mode:** The game can be developed to include an online multiplayer mode, allowing players to compete against each other over the internet.

3. **Developing a mobile version of the game:** A mobile version of the game can be developed to allow players to play the game on their smartphones or tablets.

4. **Implementing a leaderboard system:** The game can be developed to include a leaderboard system, allowing players to compete against each other to gain the highest score.

5. **Adding more levels of difficulty:** The game can be developed to include more levels of difficulty, making it more interesting for experienced players.

7 Conclusion

In conclusion, this project will develop a Tic-Tac-Toe game application that can be played by two players as well as against an AI opponent. The AI will be based on the minimax algorithm and will use complex strategies to increase the challenge. The application will also include features such as a scoring system and a leaderboard. This project has the potential to be extended in the future to include more complex algorithms and additional features.