Course Project Report

CS101 Project

Tic-Tac-Toe and its Variants

TEAM : 439

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1. Introduction:

Tic-tac-toe is a game for two players, *X* and *O*, who take turns marking the spaces in a 3×3 grid. The player who succeeds in placing three respective marks in a horizontal, vertical, or diagonal row wins the game. Tic-tac-toe is terminally dull. There's no room for creativity or insight. Good players always tie.

Ultimate Tic-tac-toe is a 2-player game comprising nine tic-tac-toe games set out in nine mini-squares within a 3x3 greater-square. Thus, there are 81 cells, arranged in nine 3x3 mini-squares within a greater square. In Ultimate Tic-Tac-Toe, you don't get to pick which of the nine boards to play on. That's determined by your opponent's previous move. Whichever square he picks, that's the board you must play in next. This lends the game a strategic element. You can't just focus on the little board. You've got to consider where your move will send your opponent, and where his next move will send you, and so on.

2. Problem Statement:

The aim of the project is:

- To implement an advanced and tougher version of simple Tic-Tac-Toe, commonly known as Ultimate Tic-Tac-Toe.
- To use Artificial Intelligence in making single player Simple Tic-Tac-Toe game.
- To display appropriate information during the gameplay.
- To include additional features such as Instructions of the game, New Game etc.

3. Requirements:

A) Hardware Requirements

- Monitor screen : The software shall display information to the user via the monitor screen.
- Mouse : The software shall interact with the movement of the mouse and the mouse buttons. The mouse shall activate areas for data input, command buttons etc.

B) Software Requirements

S++ compiler (g++ integrated with simplecpp) is required to run the game.

4. Implementation:

A) Functionality:

a) **Taking input from the player and processing it :**

The player clicks within the canvas and selects a box. This graphical input is converted into numerical input (by using proper conventions) and then is further processed.

b) **Computer's Play :**

In the case of Single Player Tic-Tac-Toe, after player's chance, the computer take the input given by the player, processes the game's current condition and plays it's move.

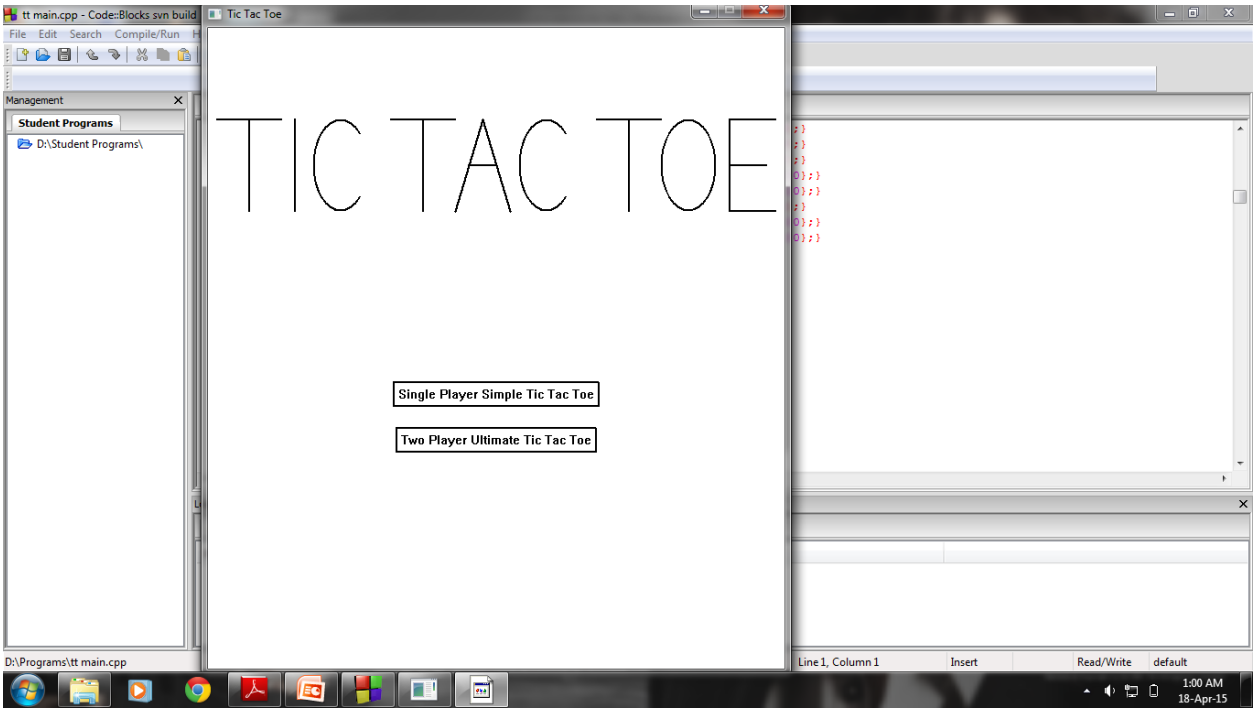
c) **Providing Check Functions after each move:**

After each move, numerous check functions have been defined to detect whether any player has won the game or the game has drawn. Also, there are functions that ensure that the game is played according to the rules and no box is selected twice. If any of the checks become true, appropriate information is displayed and the game ends.

5. Testing Strategy and Data:

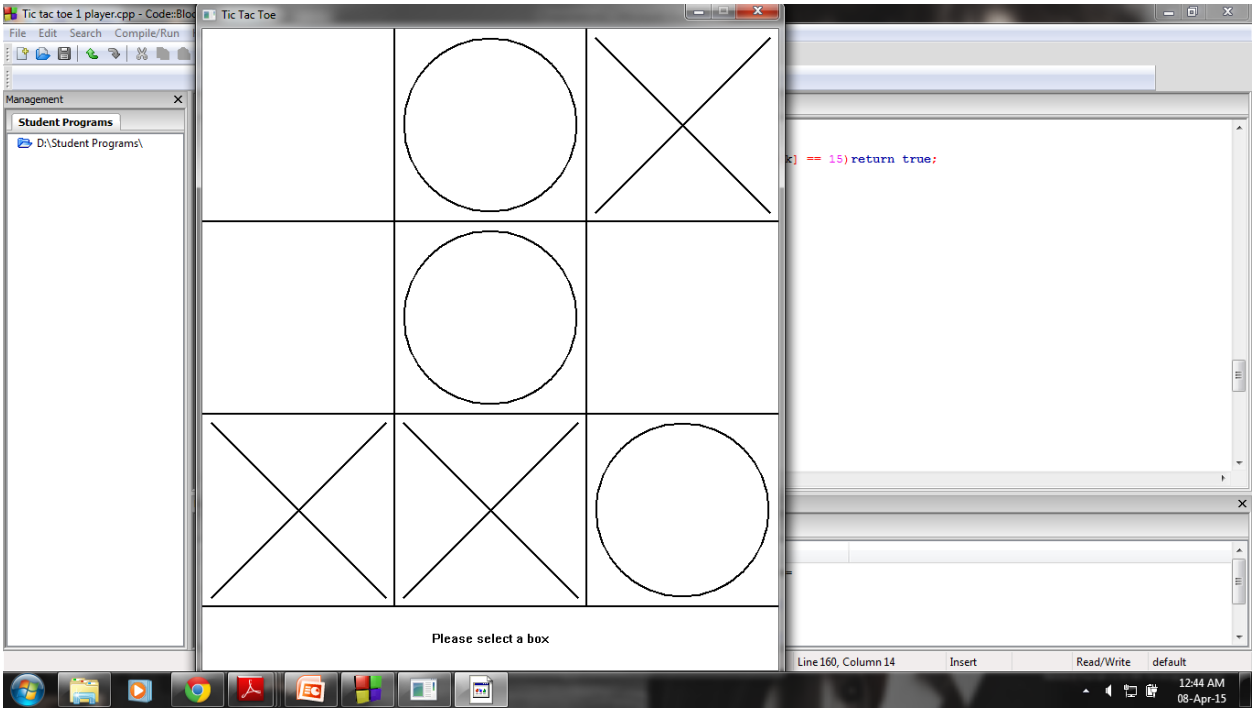
When the game starts running, main menu is displayed which asks whether the player wants to play Single player Simple Tic-Tac-Toe or Two player Utlimate Tic-Tac-Toe. This Main menu was tested by clicking at various places and observing the output.

Main Menu:

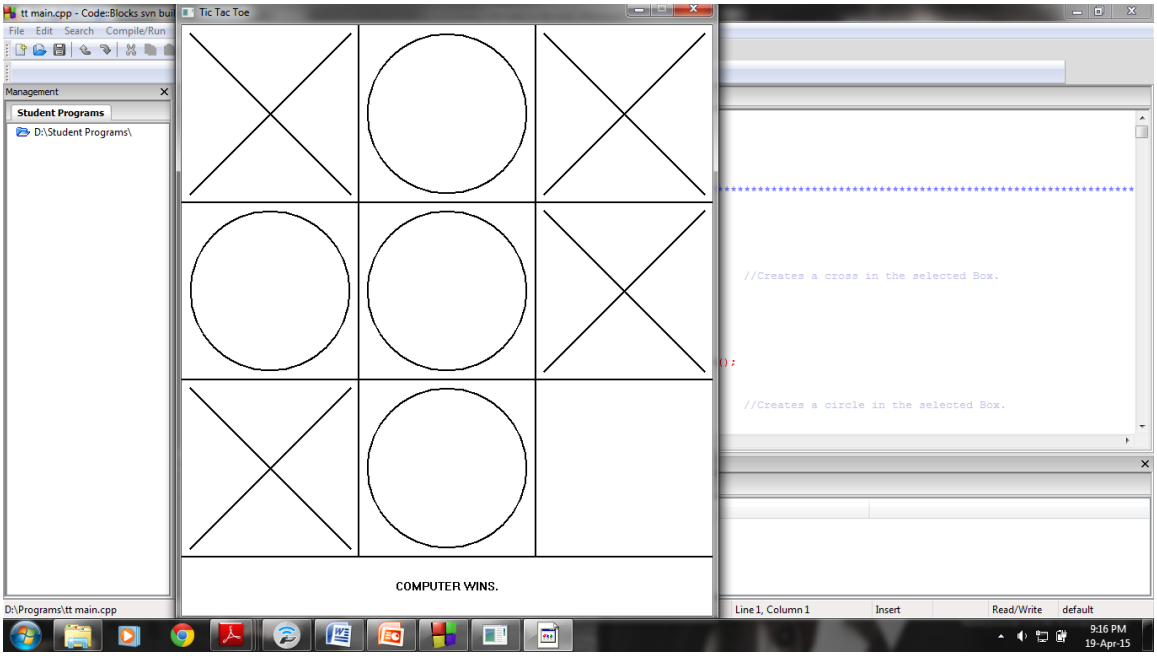


If the player selects Single player Simple Tic-Tac-Toe, following screen appears.

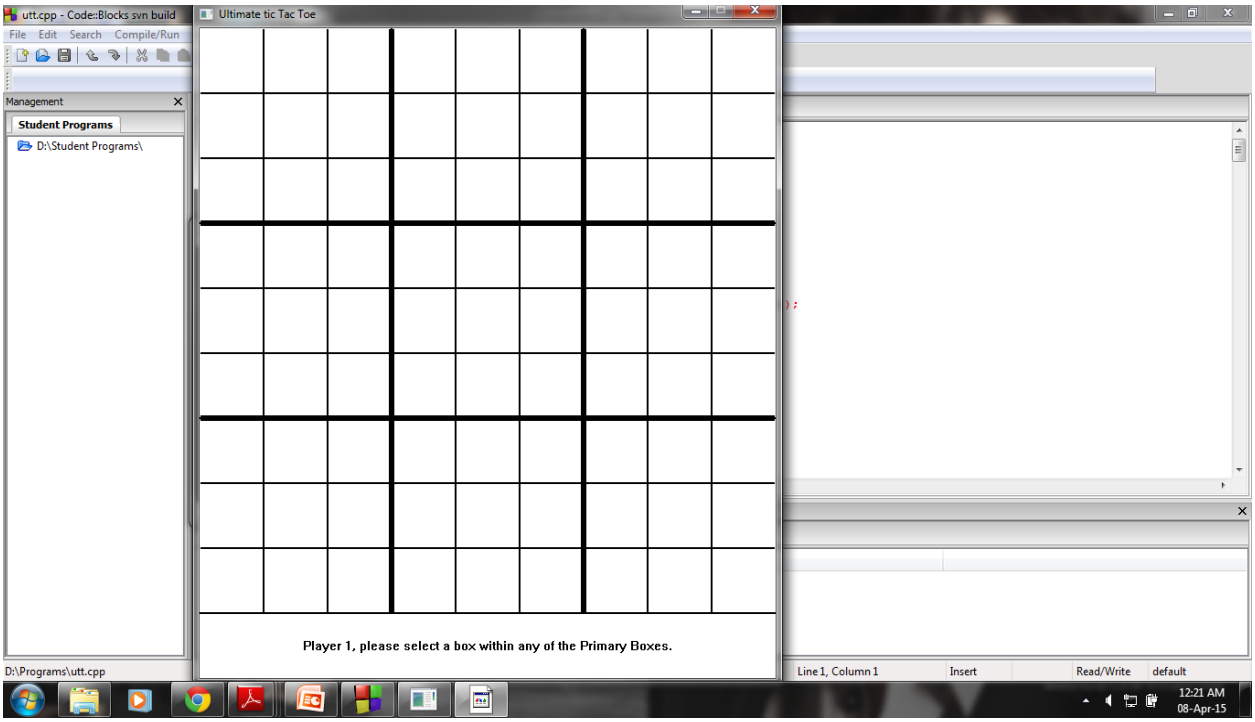
The player then proceeds with the game by selecting a box and the computer follows.



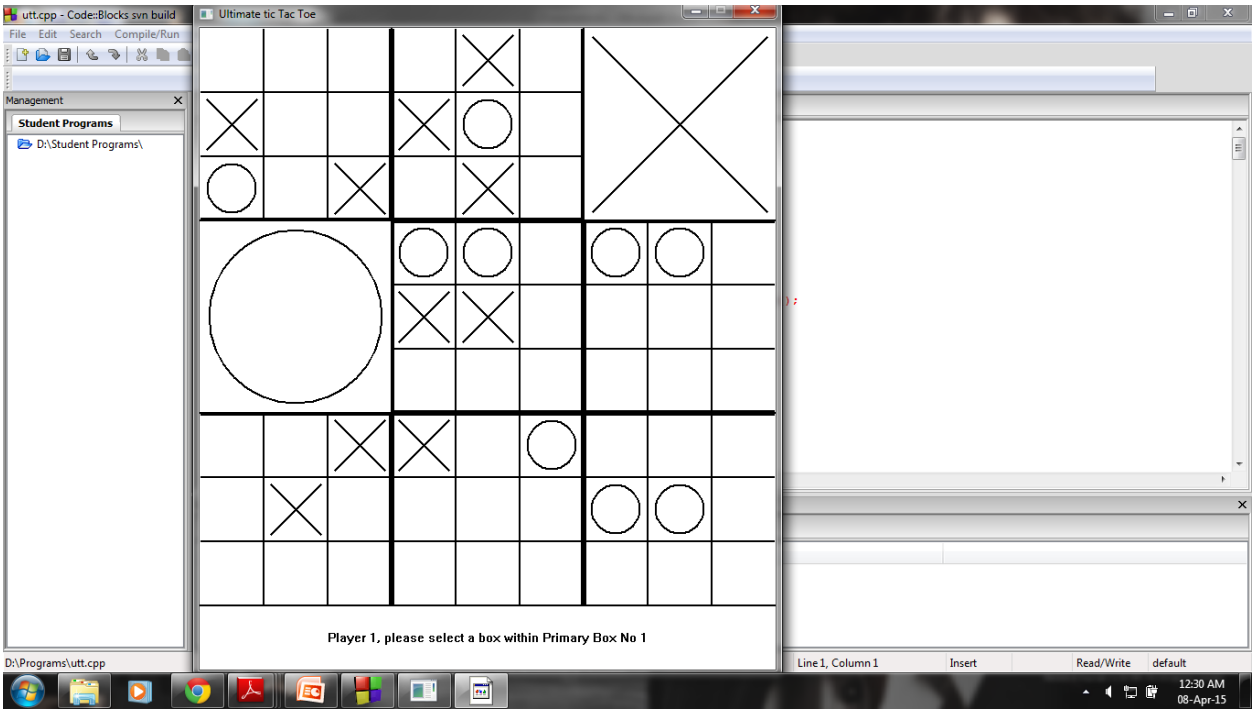
The game ends by either the player or computer winning the game or a draw.



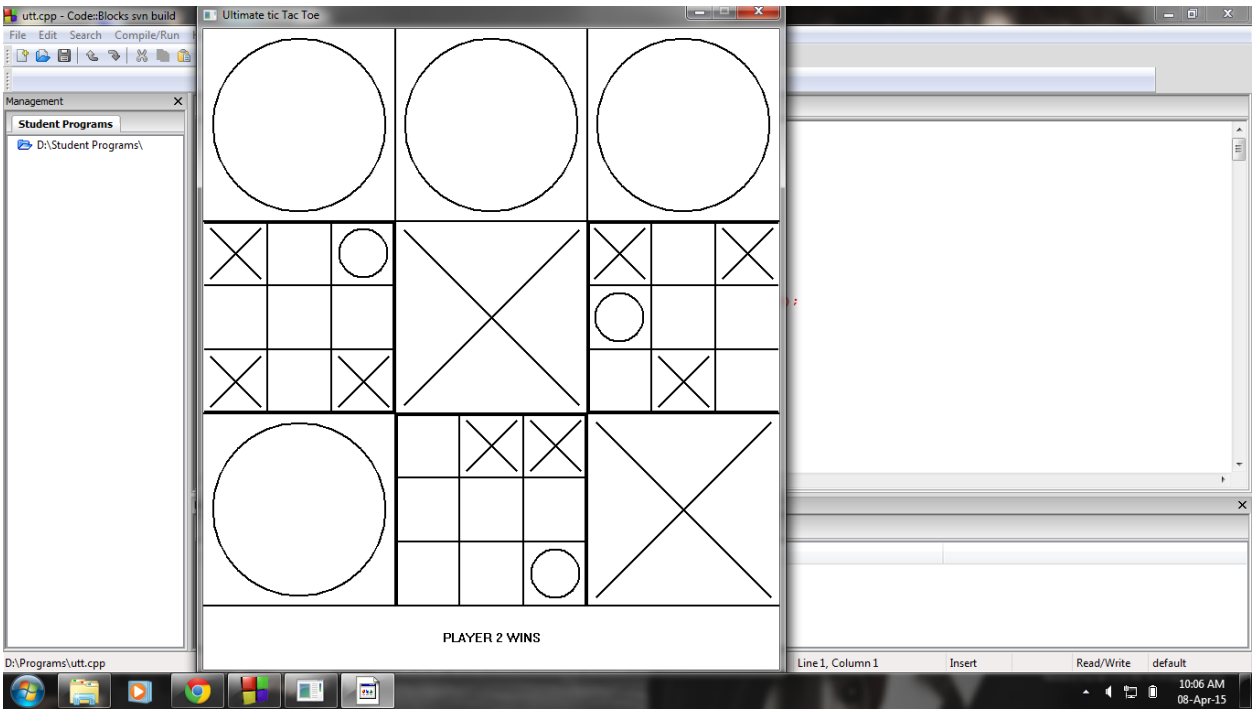
If the player selects Ultimate Tic-Tac-Toe, following screen appears at the start.



During the gameplay both players play their turns alternately. The next move of the player is determined by the move of previous player.



The game is won by any of the players winning the big board or it results in a draw.



6. Discussion of System:

A) What worked as per plan?

1. Single Player Simple Tic-Tac-Toe:

The algorithm currently used works perfectly and the computer never loses most of the times.

2. Two Player Ultimate Tic-Tac-Toe:

All the graphics are working as per planned. Appropriate X's and 0's are displayed when the player selects a box and appropriate information is displayed during the gameplay. All the check functions are also working properly.

3. Graphics:

The Main menu is being displayed perfectly as per planned and all the grids, X's and 0's are being showed properly during the gameplay.

B) What we added more than discussed in SRS?

1) Information during gameplay:

Initially we didn't plan to display any information. Later we decided to display it in Command Prompt Box but then we added it in the game window itself.

(C) Changes made in plan:

1. Change in algorithm of Single player game:

Initially, we thought of using the minimax algorithm for the single player game but later we used a simpler algorithm which we got from Wikipedia.

Reason:

The Minimax algorithm along with alpha-beta pruning and depth was too complicated for us.

7. Future Work:

1. Single player Ultimate Tic-Tac-Toe can be added.
2. New variants of Tic-Tac-Toe such as Quantum Tic-Tac-Toe, 3D Tic-Tac-Toe etc can be added.
3. Advanced graphic packages such as Allegro could be used to make the game more attractive.

9. References:

1) Wikipedia : “http://en.wikipedia.org/wiki/Tic-tac-toe”
2) Minimax Algorithm : http://neverstopbuilding.com/minimax
3) GitHub Repository : https://github.com/SahilModi10/Tic-Tac-Toe
4) Youtube Link : http://youtu.be/G5HFI0XXAcA