Simulation of Tic-Tac-Toe Game using LabVIEW

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Abstract. Tic-Tac-Toe game is a two player game, in which a circle (O) or a cross (X) will fill the square block with three rows and three columns. There will be switching between the players in the game where each player will be provided a chance to make their move. If one of the two players have marked the same markers horizontally, vertically or diagonally then that particular player would awarded points. LabVIEW is the platform in which the above game is simulated. Tic Tac Toe is a two-player game which can be played using the LabView software. In this program the select function is used for the player to select the marker and the view feature in the program is to place the marker selected by the player in the desired position of that player. After each player makes their move the software will update and scan while it continues for the conditions of the game. Overall, this tic-tac-toe operates with the features of the programme and can be used without security problems.

Keywords: LabVIEW, Tic-tac-toe, Players

Introduction
Games offer a real wellspring for daily entertainment [1]. In addition, in optimising human physical and emotional health, games are successful. In addition to physical sports, people also play video games day after day. These games are not quite the same as those of video games because they do not involve a lot of physical exercise, emotionally and enthusiastically. The persistent problems that game developers are facing is that, getting games to react to a client of a game. And it's a nice game that does not test the gaming ability of the client and the game can be played within for a short period of time that will not hold the client’s time. It is possible to apply this thought to any kind of game available today. When the rival individual players do not comprehend or get on, tabletop games are terrible all over. Developers are continually searching for new ways to make an additional computer game exciting and challenging for the client, with the latest PCs constantly propelling. Tic-Tac-Toe is a two-player game, where the square (3 x 3) is filled with symbols cross (X) or a circle (O). The game will switch between the two players, giving both player a chance to play. The software would indicate the player has won, regardless of whether X or O has won, whether one of the player’s marker is filled in a line, vertical or diagonal line. The game Tic-Tac-Toe is popular among all of the day's gatherings. Tic Tac Toe is a user friendly game that make it perfect as an instructional tool for illustrating the principles of good sportsmanship. The game is the work of a wonderful mind. It includes looking ahead and trying to make sense of what the person playing against you is going to do immediately.
1. Literature Survey

The review of few research articles on the game Tic- tac-toe summarises the findings below. Tic Tac-Toe is an interesting, yet straightforward table game. Specialists have employed numerous approaches to deal with learning the game Tic Tac-Toe.

Fok and Ong (1996) uses the falsified neural organisation-based systems to play it for scale [2]. Citrenbaum and Yakowitz investigate games that share a few parallels with Spasm Tac-Toe [3]. Numerous product use of Spasm Tac game was accounted for and as of late it became accessible for advanced mobile phones, for example, the one for Android, and the other for Apple iPhone condition. In general, the Spasm tac-toe round is also a pencil, a paper game played by two individuals who go to place their pieces on a 3 times 3 network with the objective of being the main player to fill a straight, upright or slanted line with their markers.

Consider that possibility, as opposed to just one person. Playing against each other, does one play against a group of nine players, each capable of one cell in the multiple 3 networks? The group needs to organise its players in this novel way of playing the game, which behave autonomously based on their restricted data. Soedarmadji (2006) offers a response that can be generalised to the situation where two of these groups are playing against each other and other table games [4]. The arrangement essentially uses a decentralised structure which appears to interfere with the arrangement from the outset.

Stephen Mann presented the structure of an equivalent computerised circuit that estimates the neural network (NN) to determine the location of Tic Tac-Toe [5]. FPGA's are designed to upgrade custom computerised systems by actually designing ways in between the logical gadget entrances. Using an FPGA allows for restoration of the NN system with no money-related costs. The developer believes NN usage has superior execution over custom programming usage, as it utilises the inherent equal structure of the NN. Shahzeb Siddiqui et al. (2002) is running another NN play, expanding the game by adding two extra columns, two extra lines, and was reached [6]. Pinaki Chakraborty (2009) officially characterise the Spasm Tac-Toe game and develops fabricated knowledge-based strategies, which are equivalent to play later [7]. Leaw and Cheong (2010) plays out a mild quantization of the old spasm tac-toe style round, by enabling the superposition of old-style movements [8]. Edward (1996) uses an optically guided entryway display (OPGA) to perform a straightforward round of Spasm consideration toe to demonstrate the effectiveness of electrooptical circuits, and what's more, logical capacities in a solitary gadget [9]. Advances are also made on the nature of steering methods and the reasoning for replication. Alauddin (2013) promotes the use of the equipment for canny Spasm Tac toy. Use of Graphical LCD (GLCD) microcontroller and touch screen. The microcontroller gets GLCD player move (shown as X) and use informative calculation to investigate the action and find the best counter step [10]. The microcontroller shows the counter continuing as circle (O) towards the screen. The calculation selects the winner when the Spasm Tac play rule allows the game. The system is implemented using modestly accessible electronic segments off the rack, and tested to function rapidly and skillfully.

2. Proposed Work

In this work, LabVIEW is the software in which the 3x3 tic-tac-toe game is to be simulated. The proposed system is designed, so the two players can use LabVIEW programming to play tic-tac-toe game. The display works and an option to switch between the chosen marker of the player is provided by the program. After each move of the player the game is restarted and finds the status of the game and the process repeats itself.
3. **SYSTEM FEATURES:**
The computer implementation has more features when compared to the traditional method of playing this game using pen and paper.

Let us see what makes computer implementation of playing Tic-Tac-Toe game different:

a. LabView software made this game user friendly
b. User is allowed to play the game any number of times without disturbance
c. The marker X/O can be chosen according to the user’s desire
d. The game was created as a detailed Expert framework
e. The probability of this game is three which can be winning the game, draw the game or losing the game
f. This game is suitable for all age group people.

4. **SOFTWARE REQUIREMENTS:**
Two players can play the game. The game is initiated with three steps. 1. Start Game, 2. Make a Move, 3. End Game and the flow chart of the game is shown in figure 1, and the flow chart of the tic-tac-toe game for the proposed methodology is shown in figure 2.

![Figure 1 Flow Chart of the game.](image-url)
Figure 2 Flow Chart of the tic-tac-toe game

Rule for Tic-Tac-Toe:

- Tic tac toe is a two player game, let us assume the players as player 1 and player 2
- The two players choose the marker (which can be ‘X’ or ‘O’)
- Player 1 begins his/her turn by putting his/her marker on one of the nine boxes according to his desire.
- The two players then make their turns again.
- If any player is likely to have three of his/her markers in a straight, vertical or slant line dominates the match

The aim of this design is to allow the players to play the tic tac toe using the LabVIEW software. The inclusions of this software is the showcase function and the select function in which the player will be allowed to position his marker and at the same time switch between the markers such that each player will be given a chance for playing. The interface of the tic tac toe game in LabVIEW is in figure 1 in which one of the two players has won as that particular player's marker is positioned in the first column in all three rows.

Winning Criteria:

In a tic-tac-toe game, there are 8 chances to win the game. The choices are to horizontally acquire the three combinations, same as vertical, acquire two combinations diagonally and it is shown in figure 3. Consequently, the best way to work out how to decide the winner is to verify the 8 combinations.

Figure 3 Winning Criteria

The aim of this design is to allow the players to play the tic tac toe using the LabVIEW software. [7] The inclusions of this software is the showcase function and the select function in which the player will be allowed to position his marker and at the same time switch between the markers such that each player will be given a chance for playing. The interface of the tic tac toe game in LabVIEW is exposed in figure 4 in which one of the two players has won as that particular player's marker is positioned in the first column in all three rows.
The criteria for the tic tac toe game that is designed in LabVIEW software are:
• Store the value of the marker (X or O) in an array.
• Switch between the players
• When clicked on ‘New game’ the previous moves are deleted and a new game is being started
• Check the value of the marker entered by the which has been stored in the array with the condition for victory that has been stored earlier

5. SYSTEM IMPLEMENTATION:
Use of programming is the step in the programming construction measure in which an executable programming framework is developed. At this point, where the conceptual plan becomes an operating arrangement. LabVIEW – (Laboratory Virtual Instrument Engineering Workbench) is provided by NI (National Instruments). LabVIEW is graphical programming that takes into account the operation of the instrument, the securing of information and the preparation of the information procured.
LabVIEW offers the adaptability of an outstanding programming language without the intricacy of customary criteria for evolution. Some of LabVIEW’s benefits include
• Understandability is elementary
• Full Functionality
• Requirements for optimised I / O
• No valid justification to compose programme line code
• Makes less of an optimal programming opportunity
• Cost and labour is the least needed
LabVIEW are called Virtual Instruments (VI) applications. Stress which controls equivalent sources of data, points equivalent yields.
VI is composed of three main components:
• Front Panel–The way customers interact with main VI.
• Block Diagram-the software control code.
• Icon / Connector-Way of VI to interfacing with different sub VIs or main VIs
For obtaining the client’s image and show the images, a couple of cluster capacities have been developed, one for showing and the other to procure because LabVIEW does not have the capability to examine and display at the same time. They were set to 2 dimensional clusters once both clusters had been created.
• Creation of selection array: In order to obtain the markers from the player and is play them two, 2-dimensional array functions are created for obtaining and displaying the markers respectively.
Figure 5 shows the creation of the array in the front panel and the same represented in the block diagram using the FOR loop, outer FOR loop represents the row and the inner FOR loop represents the column for the tic-tac-toe game and it is shown in figure 6. This is the 2 dimensional array in which the value of the symbol is obtained and displayed.

Figure 7 shows the 3 SubVI which checks for three conditions i.e. whether the same symbols are obtained vertically, horizontally and diagonally. This is done using booleans. Whenever the player gives the input the value of the input is stored in an array and transferred to sub vi which is then converted to binary digits. The marker ‘X’ will be stored as 1 whereas the symbol ‘O’ will be stored as 0. Figure 8 the encircled component is a 3 input OR gate which stores the players input values in terms of 1’s and 0’s.

The SubVI for the three criteria are given in the figure 9.
The case structure is connected to two booleans for two different cases, if true it displays the winner, else start a new game.

The output of the sub VI is OR ed and given as the input to the case structure and it describes the true and the false statement and the Figure 10 describes the complete VI of the tic tac toe game.

6. **SYSTEM TESTING:**
The loop that uncovers blunders is called testing. When the source code has been made, as many blunders the software must be attempted to expose as may reasonably be anticipated before conveyance to the consumer. Programming testing may be expressed as approval period and validation of a Computer programme / application / item:
(A) further meet the requirements guiding its strategy, development
(B) true to form fills
(C) equivalent values can be executed
(D) satisfying the requirements of partners.

LabVIEW coding diagrams are called Virtual Instruments (VI). Different VIs are made for the spasm tac-toe framework; each VI speaks to one section in the company. Inspection is performed for each VI.
In LabVIEW the blunders are recognised while the VIs are created. VI won't work if mistakes do occur. This blunder should be corrected prior to the execution of a VI. Both VIs are tried independently and are triumphant in inspection. Numerous Virtual Instruments and sub Virtual Instruments are associated together in the system to create an absolute arrangement. In organised testing the coordination of all Virtual Instruments is annoyed and found to be successful. It is found that the bonds operate well. The framework is eventually tested for application testing to establish that the application fulfils the overall needs of all clients and that the system meets all user criteria as a whole and has been found to be successful.

7. RESULTS:
The game of tic-tac-toe is played with two players in LabVIEW. Figure 11 describes the overall view of the front panel window, it has the array of LED controls, the toggle switch is used to represent the turn of players. In figure 12, the player O has placed it horizontally and the X is waiting for the next turn. Similarly in figure 13, the player O has made it vertically, and the diagonally mapping is shown in figure 14, the player O is the winner. Similarly, the same process is repeated for the Player X as the winner by placing vertically, horizontally and diagonally.

![Figure 11 Start of the Game with player X and O](image1)

![Figure 12 Player O is the winner, horizontally placed](image2)

![Figure 13 Player O is the winner, vertically placed](image3)

![Figure 14 Player O is the winner, diagonally placed](image4)
The figure 15 shows where the player X and player O has not made the game successful, so it declared as game draw and new game is initiated again.

8. CONCLUSION
In this paper we provoked the tic-tac-toe game using the LabVIEW platform in an event driven GUI software. We made a 3x3 tic-tac-toe game using LabVIEW. The system is developed with the intention of allowing two players to play a round of tic-tac-toe using LabVIEW programming. The software will include a showcase job and find opportunity to position the image much like a switch between the images that allows each player to play the game. After each player makes their turn the programme will restart and search for the conditions of the game as it continues. The system typically works with no damages.

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10. References
[1] Tic-Tac-Toe game in wikipidia, http://en.wikipedia.org/wiki/Tic-tac-toe
[2] S. C. Fok and E. K. Ong. A High School Project on Artificial Intelligence in Robotics, Artificial Intelligence in Engineering, Vol. 10, No. 1, 1996, pp. 61-70.
[3] R. L. Citrenbaum. Strategic Pattern Generation: A Solution Technique for a Class of Games, Pattern Recognition, Vol. 4, No. 3, 1972, pp. 317-329.
[4] Soedarmadji. Decentralized Decision Making in the Game of Tic-tac-toe, IEEE Symposium on Computational Intelligence and Games, May 2006.
[5] Stephen Mann and Matthew Netsch, "A parallel Embedded Neural Network for an Intelligent Turn-Based Engine".
[6] Shahzeb Siddiqui, Francis Mutuc and Nicholas Schmidt, " Designing a 5x5x5 Tic-Tac-Toe Game using a Neural Network with Backpropagation with a Twist", Evolutionary Computation, 2002.
[7] Pinaki Chakraborty, Artificial Intelligence Based Strategies to Play the Tic-Tac-Toe Game, Journal of Technology and Engineering Sciences, Vol 1, No. 1 January –June 2009.
[8] J N Leaw and S A Cheong, Strategic insights from playing quantum tic-tac-toe, Journal of Physics A: Mathematical and Theoretical Volume 43 Number 45, 2010.
[9] Edward P. Vogel, Tic tac toe game using an optically routed gate array, Proc. SPIE 2863, Current Developments in Optical Design and Engineering VI, 407, Nov 1, 1996.
[10] Alauddin Al-Omary, Machine- Human Tic-Tac game based on Microcontroller Technology, International Journal of Computer and Information Technology (ISSN: 2279 – 0764) Volume 02–Issue 05, September 2013.