PROJECT REPORT
ON
Tic Tac Toe Without CPU

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CERTIFICATE

This is to certify that the project on Tic Tac Toe in TTL and term work carried out in the subject of Term Project is bonafide work of Dharmesh Kanzariya (EC-030) and Khokhnasiya Hardik (EC- 034) of B. Tech. semester V in the branch of Electronics & Communication, during the academic year 2019-20.

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ABSTRACT

Tic-Tac-Toe can be played by two players where the square block (3 x 3) can be filled with a cross (X) or a circle (O). The game will toggle between the players by giving the chance for each player to mark their move. When one of the players make a combination of 3 same markers in a horizontal, vertical or diagonal line the led will show which player has won, whether X or O. we implement a 3x3 tic-tac-toe game, In The game is designed so that two players can play tic-tac-toe using a simple digital circuit. The board will contain a led and a push button to place the symbol as well as toggle between the symbols allowing each player a turn to play the game. The board will update after each player makes their move and check for the conditions of wining as it goes on.

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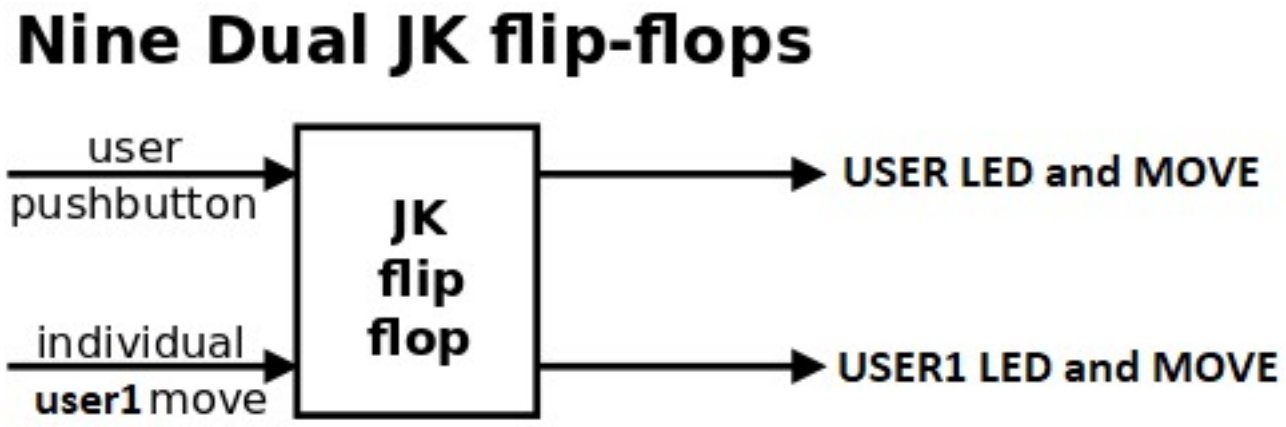
1. INTRODUCTION

Games provide a real source of enjoyment in daily life. Tic-Tac-Toe is a simple and yet an interesting board game. Traditionally, the game of Tic-tac-toe is a pencil and paper game played by two people who take turn to place their pieces on a 3 times 3 grid with the objective of being the first player to fill a horizontal, vertical, or diagonal row with their pieces. Tic-Tac-Toe game can be played by two players where the square block (3 x 3) can be filled with a cross (X) or a circle (O). The game will toggle between the players by giving the chance for each player to mark their move. When one of the players make a combination of 3 same markers in a horizontal, vertical or diagonal line the board will display which player has won, whether X or O. The Tic-Tac-Toe game is most familiar among all the age groups. The friendliness of Tic-tac-toe games makes them ideal as a tool for teaching the concepts of good sportsmanship. The game is a very good brain exercise.

2. BLOCK DIAGRAM



Logical Circuit

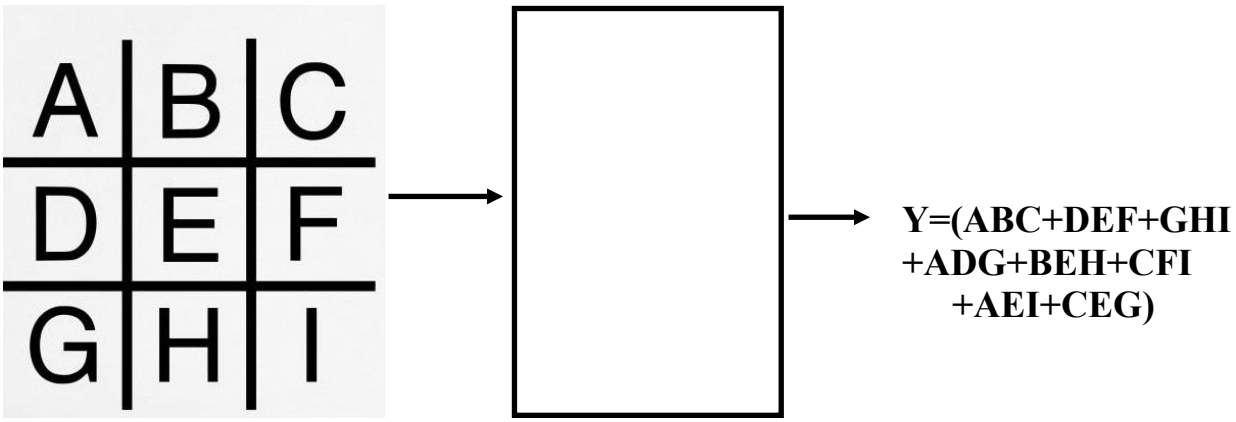


Figure 1.1 BLOCK DIAGRAM of Tic Tac Toe

3. CIRCUIT DIAGRAM AND WORKING OF CIRCUIT

The circuit uses flip-flops to register both the user's moves. The user state and the other user moves are combined to access a logical circuit to look up the result user win,tie or loose the game.
The state of each position on the board is stored in nine dual JK flip-flops. The user1 makes a move by pressing a pushbutton which is recorded in one flip-flop. Any move made by the other player is recorded in a second flip-flop. This allows two different LEDs to be lit up: green for a user move and red for other user move at each position.The nine "user move" outputs provide nine bits of address into the logical circuit.which is shown a final result of a game.

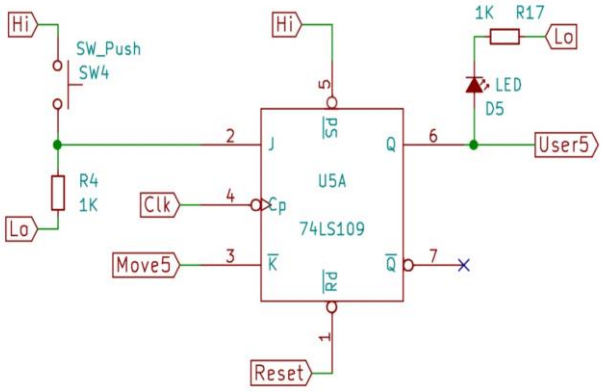


Figure 2.1 Player moves

The 555 timer is generate a high frequency clock pulse which is clock for a JK flipflop.user have to press the push button to make a move. when push button is pressed 'J' changes from logic 0 to logic 1,because of that output of flipflop(Q) will change to high.and due to these changes green led turns ‘ON’.

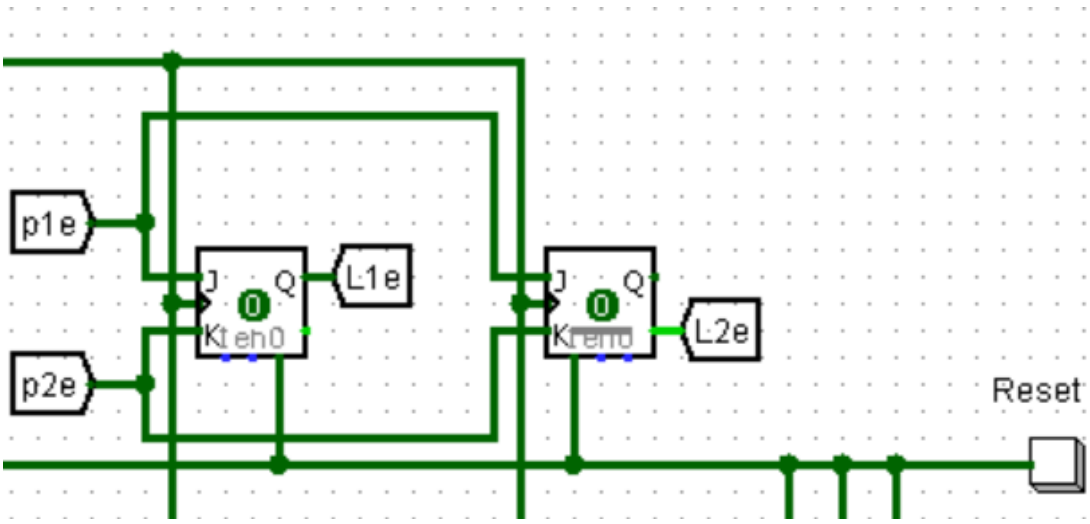
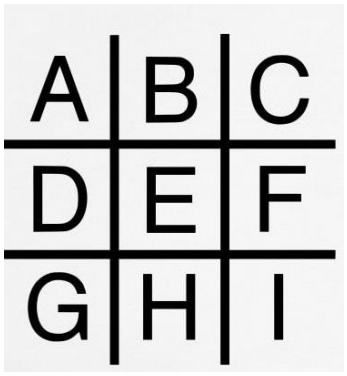


Figure 2.2 Both Player moves

Now, when second player will press the push button, red led will Turn ‘ON’. These is because ‘K’ changes from Low to High and (~Q) will be high.These process will go on and continuously check the condition for result.



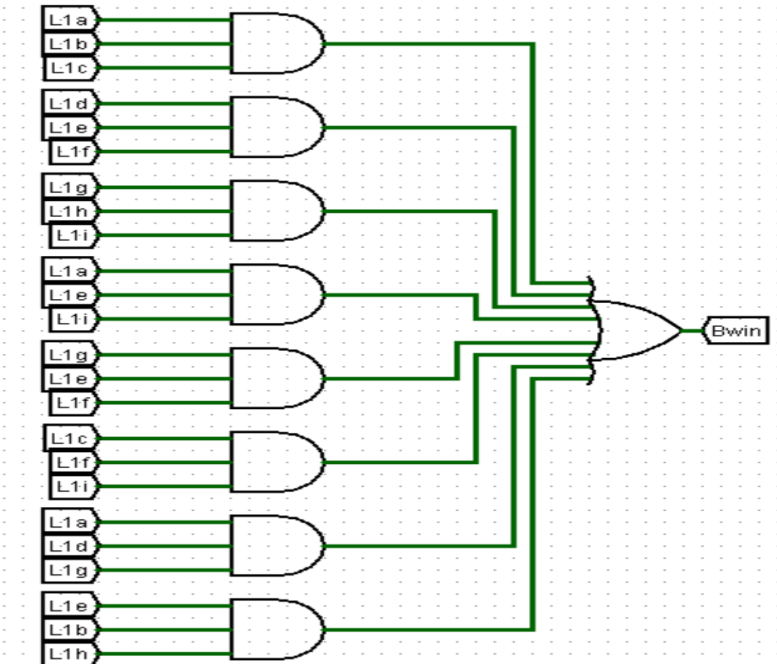


Figure 2.3 Logical Circuit for wining

In logical circuit, logic is implemented as shown below.

Y=(ABC+DEF+GHI+ADG+BEH+CFI+AEI+CEG)

These game will show result according to these boolean equation.So,this is the basic Working of the Circuit.We can solve this Boolean equation by FPGA,Microcontroller,Arduino,Rasberry pi,PLA,PAL etc…

3.2 Arduino Code :

int pinOut = 11;

int pinA = 2;

int pinB = 3;

int pinC = 4;

int pinD = 5;

int pinE = 6;

int pinF = 7;

```
int pinG = 8;

int pinH = 9;

int pinI = 10;

void setup()

{

  pinMode(pinOut, OUTPUT);

  pinMode(pinA, INPUT);

  pinMode(pinB, INPUT);

  pinMode(pinC, INPUT);

  pinMode(pinD, INPUT);

  pinMode(pinE, INPUT);

  pinMode(pinF, INPUT);

  pinMode(pinG, INPUT);

  pinMode(pinI, INPUT);

  pinMode(pinH, INPUT);

}

void loop()

{

  boolean pinAState = digitalRead(pinA);

  boolean pinBState = digitalRead(pinB);

  boolean pinCState = digitalRead(pinC);

  boolean pinDState = digitalRead(pinD);

  boolean pinEState = digitalRead(pinE);

  boolean pinFState = digitalRead(pinF);
```

```
  boolean pinGState = digitalRead(pinG);

  boolean pinHState = digitalRead(pinH);

  boolean pinIState = digitalRead(pinI);

  boolean pinOutState;


  pinOutState =(pinAState * pinBState * pinCState) + (pinDState * pinEState * pinFState) +
(pinGState * pinHState * pinIState)+ (pinAState * pinDState * pinGState) + (pinCState * pinFState
* pinIState) + (pinBState * pinEState * pinHState) + (pinAState * pinEState * pinIState)+
(pinCState * pinEState * pinGState);

  digitalWrite(pinOut, pinOutState);

}
```

4. COMPONENT DESCRIPTION

- 555 Timer

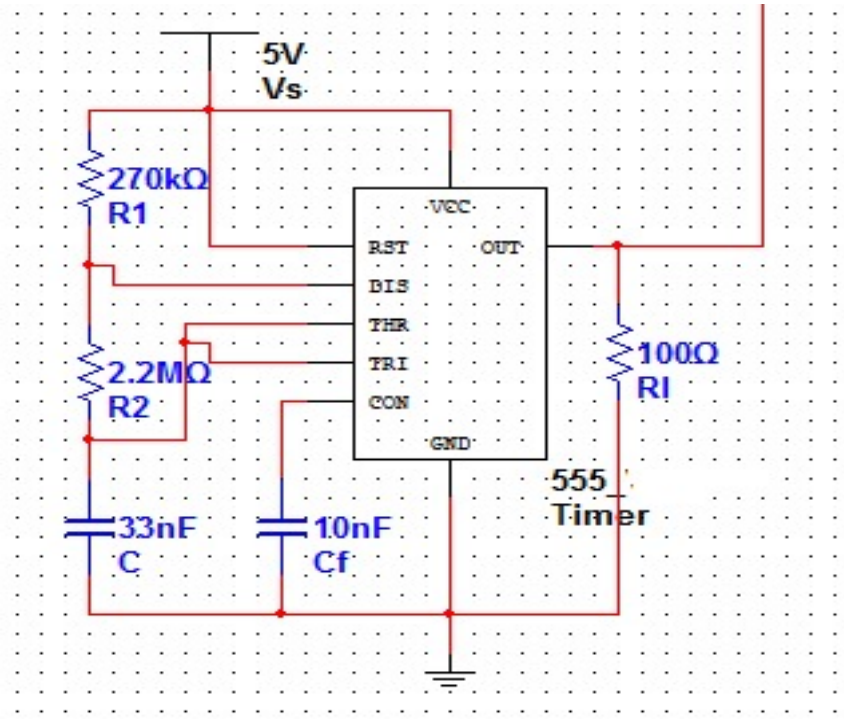


Figure 3 : 555 timer for generating clock

The 555 timer IC is an integrated circuit used in clock pulse generation.the 555 timer can be generate a clock pulse of different frequency and duty cycle.

The LM555 is a highly stable device for generating time delays oscillation. Additional accurate or terminals are provided for triggering or resetting desired. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. For a stable operation as an oscillator, the free running frequency and duty cycle are accurately controlled with two external resistors and one capacitor. The circuit may be triggered and reset on falling waveforms, and the output circuit can source or sink up to 200 mA or drive TTL circuit.

- 74HC109 (Dual Positive Edge Triggered JK flip-flop)

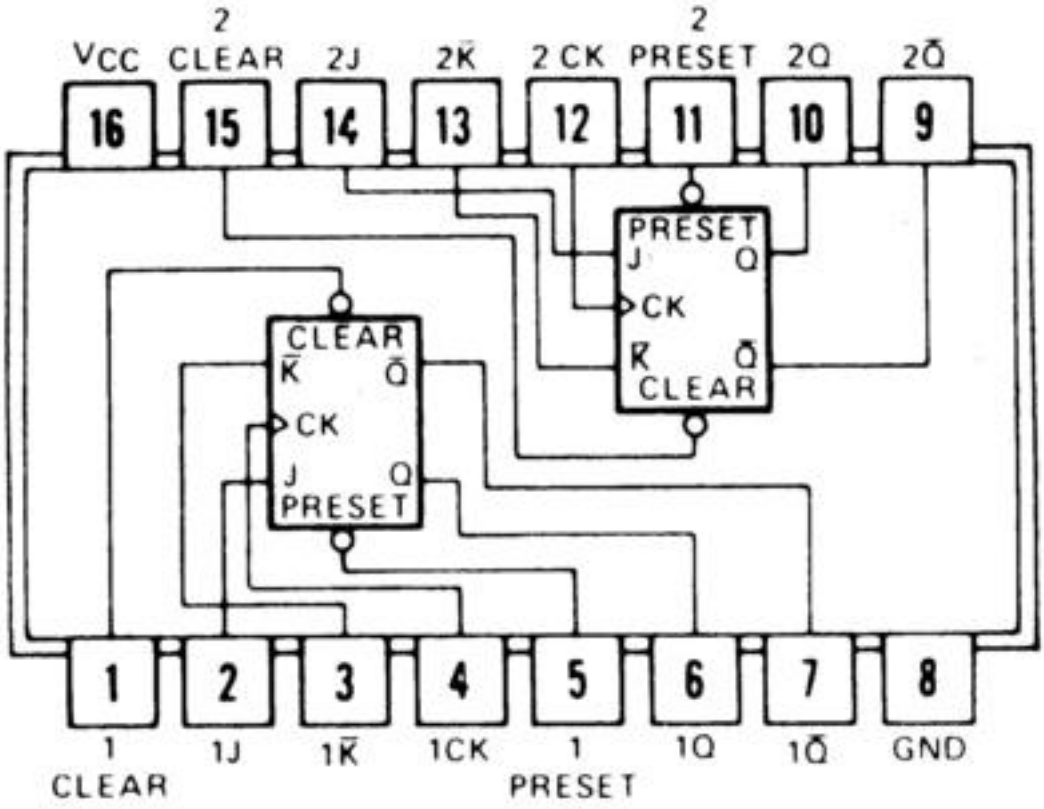


Figure 4.: Dual JK flip-flop with set and reset; positive-edge-trigger

74HCT109 is a dual positive edge triggered JK flip-flop featuring individual nJ and nK inputs. It has clock (nCP) inputs, set (nSD) and reset (nRD) inputs and complementary nQ and nQ outputs. The set and reset are asynchronous active LOW inputs and operate independently of the clock input. The nJ and nK inputs control the state changes of the flip-flops as described in the mode select function table. The nJ and nK inputs must be stable one set-up time prior to the LOW-to-HIGH clock transition for predictable operation. The JK design allows operation as a D-type flip-flop by connecting the nJ and nK inputs together. Inputs include clamp diodes. It enables the use of current limiting resistors to interface inputs to voltages in excess of VCC. Schmitt-trigger action in the clock input makes the circuit highly tolerant to slower clock rise and fall times.

- Dual LED
- Resistors
- Logic Gates
- Programable Device for Solving Boolean Equation

5. PRACTICAL STEPS

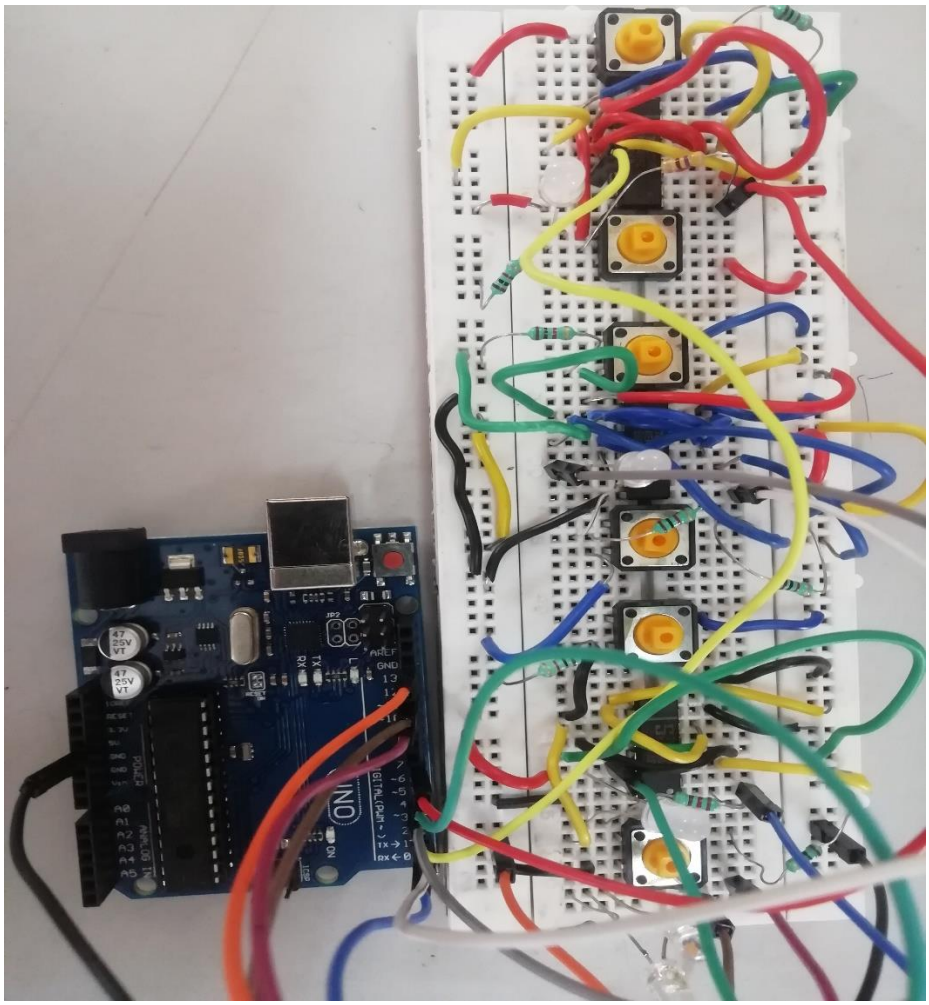


Figure 5.1 Practical on Bread Board

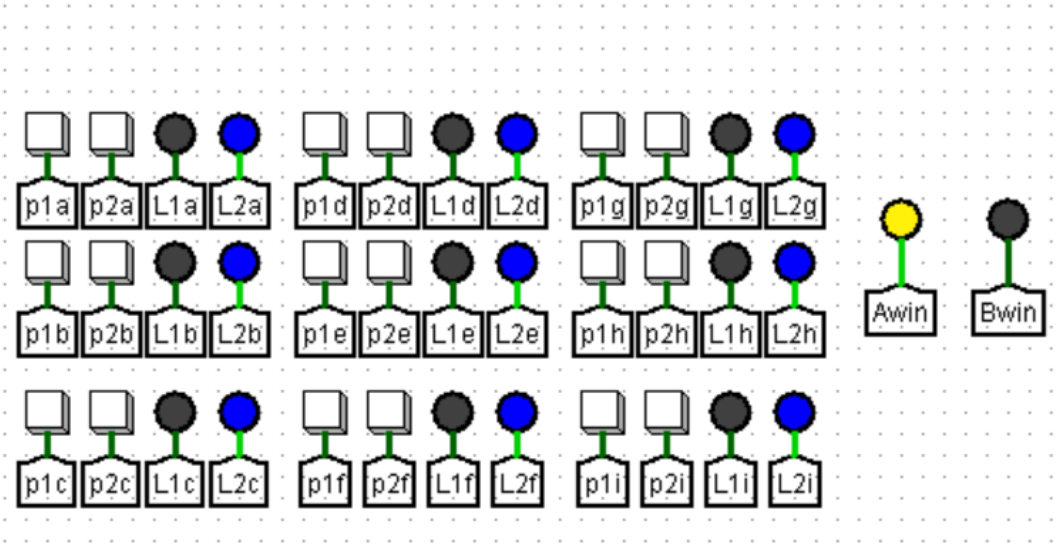


Figure 5.2 Outputs on simulations

- Steps

  - Simulate a Circuit in Simulator.
  - Implement on Bread Board also check result using Arduino.
  - Implement on GPB.

- Trouble Shooting

  - We don’t get any output when the match gets **draw.**
  - The circuit is very complex and difficult to implement on GPB.
  - This circuit has double layer PCB layout.

6. LIMITATION OF CIRCUIT

We don’t get any output when the match gets **draw.** This problem can be solved by using a sequential circuit.

This circuit is not able to detect cheating of users. So it is advisable to play fairly.

7. APPLICATION

Games provide a real source of enjoyment in daily life. Games also are helpful in improving the physical and mental health of human. Apart from daily life physical games, people also play board games. These games are different than those of physical games in a sense that they do not involve much physical activity rather mental activities. Getting games to react back to the user of a game has always been long hard question for game makers. Because, let's just face it, a good game that doesn't challenge the user's ability to play the game doesn't keep the user around very long. This idea can be applied to any form of game that is out there. Board games are never fun when the opponent that he or she is playing doesn't learn or catches on. With today people are always looking for new ways to make a board game more interesting and challenging for the user. The Tic-Tac-Toe game is most familiar among all the age groups. The friendliness of Tic-tac-toe games makes them ideal as a tool for teaching the concepts of good sportsmanship. The game is a very good brain exercise.

- FUTURE WORK
  - Done with TTL components only, no CPU
  - Minimum number of chips
  - Not two player: human versus the board, board makes optimal moves

8. Conclusion

We design and implement tic-tac-toe game in GPB using flip-flops and simple digital circuit. In this circuit, we create a 3x3 tic-tac-toe game also in Logisim . The system is designed so that two players can play a game of tictac-toe using Logisim and Board. The circuit will contain a LED and a push button to place the mark.The board will update after each player makes their move and will check for the conditions of the game as it goes on. Overall the system works without any bugs and is able to use.

9. REFERENCES

www.google.com

Research Paper : Implementation of Tic-Tac-Toe Game in LabVIEW.

Digital Electronics by Morris Mano.