Online Remote Playing Chessboard

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Abstract—We have developed a remote chess playing device by which players can achieve the enjoyment of playing chess face to face but sitting at a distance. There is already a developed system in which we can play human vs computer. But we have developed a system in which we can play human vs human via internet although they are far away from one another. Also there are multi levels like beginner, intermediate and advanced. There is no chance of wrong moves as there is checking after each move whether it is right or wrong.

Keywords—Reed Switch[1], Ghost Key[3].

I. INTRODUCTION

In modern era of technology, electronics and science has brought the human race usher of success. The science has done some of the unthinkable jobs which we could not think of ever. It has contributed a lot in helping human achieving any of their purpose; whether it be for the use of greater mankind or for shear recreation. Many recreational activities are now possible with the proper combination of science, electronics and most importantly computer.

Playing different kinds of indoor games (e.g. chess) has been one of the enjoyable way of recreation. For example, chess is a very popular indoor game, which is played between two players. Both the players play using a single chessboard at same place. But there are no such way through which two players play chess using a chessboard, staying at different places. There is a project available, where this game is played between a human and a computer in which the human gives a move in that board and computer, the opponent, gives the next move according that one. Our project will take this approach to a further level, where two human will be albe to play chess staying at different places using a chessboard of their own. The main aim of our project is to make them feel about the real chess play. This project introduces a special type chessboard through which two players, staying at different places, can play chess. In order to do this, the two players need to use this particular chessboard individually. When a player will give his/her move, two lights will be glowed to the previous and next position on the opponent's chessboard. So, the opponent will place that chess piece following the glowed lights. Similarly when the opponent will give his/her move, two lights will be glowed according to the given move on the other player's chessboard. Thus, this game is played.

The remainder of this paper is as follows: Section 2 presents our contribution and related works. Section 3 presents system architecture. Section 4 represents block diagram. Section 5 represents equipment needed. Section 6 represents the equipment description. Section 7 provides all the features of this project. Section 8 provides exponental setup and results.Section 9 and 10 provides the future work and conclusion.

II. OUR CONTRIBUTION AND RELATED WORKS

Our project, remote online chessboard, is a unique game based project where two players will play each other using this particular chessboard. In the existing system a player plays with a computer-whenever a player gives his move, a signal is generated by which the computer detects the movement of the chesspiece. According to this move the computer generates it's next move calculated by a program in it's system. In this case the player is not able to experience the real excitement of playing chess because it is kind of easier to crack the algorithm used for next move of the computer. In our project, two players will be physically involved to give the next move using their own intelligence. The main attraction of our project is that two players will be able to play this game from distance using wireless data transfer system.

In the circuitry design of this project, all the chesspieces are arranged in a 8X8 matrix. The detection of chesspiece, which has been moved from one position to another position-used for a player's next move, is done by crosschecking of row and column of an 8X8 matrix. At first, all the rows and columns of the matrix are supplied high voltage. Then, all the rows are

supplied with a low voltage sequentially. If any the column gives a reading of low voltage, we will be able to detect that a chesspiece has been placed in that particular position giving a reading of low voltage in the row index and column index. Suppose, the 1st row is supplied with a low voltage. Now we will check in every column if it contains a low voltage or not. If none the column gives a reading of low voltage, then we will be able to say that there is no chesspiece in that row. Subsequently, we will check in the 2nd row. During checking all the columns, suppose in the 3rd column a low voltage reading is obtained. So, we will be sure that there is a chesspiece in 2nd row, 3rd column of the matrix.

To detect the movement of chesspiece, we use a magnetic reed switch in the 8X8 matrix. Now we will briefly the discuss about the ghosting problem and the masking problem.

A. *The Ghosting Problem*

When the output C is HIGH, then the input 2 will also become HIGH. The uC will understand that the button C2 is pressed. But something else happens here. The button B2 is also pressed! This means that the HIGH signal will go through the button B2 to the column B. And due to the fact that the button B3 is pressed, the signal will arrive simultaneously at input 3 as well! But the microcontroller knows that at this moment, only the output C is HIGH, and because it detects HIGH signal at inputs 2 and 3, it will think that buttons C2 and C3 are pressed, something that is wrong! The button C3 is NOT actually pressed! This is known as ghosting, and usually gives a headache to PC gamers, especially when the game requires multiple buttons to be pressed simultaneously. Take for example the MAME console, which simulates arcade games. If you play samurai shodown 1v1, and one player has low defense and kicks while the other is flying high and uses the sword, this will require 6 keys to be pressed.
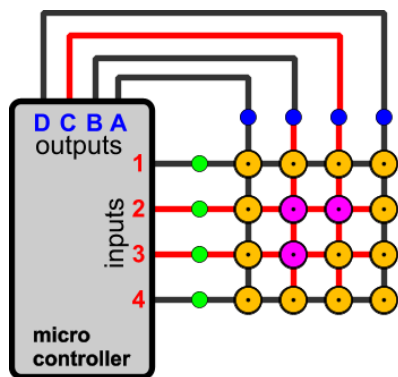

Fig. 1.   The Ghosting problem.[3]

B. *The Masking Problem*

The masking problem[3] comes in continue to the ghosting. When masking is occurred, the controller cannot detect a key change that has occur. Suppose for example that the ghosting problem has occur, by pressing C2, B2 and B3 simultaneously, like the previous example. The controller will think that the button C2 C3 is pressed, although the operator has not pressed C3. Now, the operator presses the button C3 without releasing

any other button. Nothing changes at the microcontroller. And now the operator releases the button C2... What happens? Nothing! The microcontroller still thinks that C2 is pressed and cannot detect the button release! This is the masking problem, also a gamers headache.
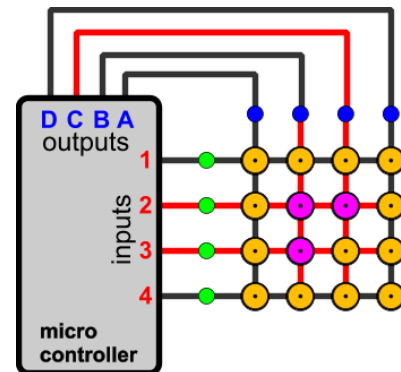

Fig. 2.   By pressing buttons C2, B2 and B3 simultaneously, the ghosting problem occurs.
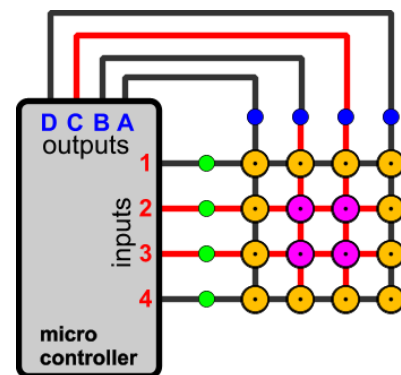

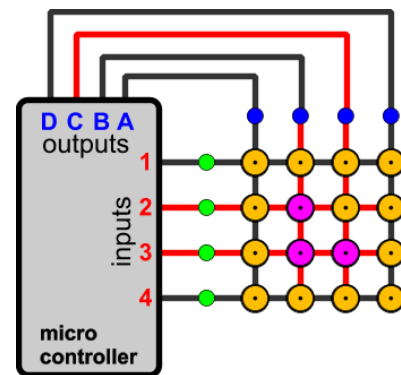Fig. 3.   The operator presses button C3, yet nothing changes .

Fig. 4.   Now the operator releases button C2. Still nothing changes and the uC cannot detect the button release! Masking has occur.

C. *Solution To The Masking And Ghost*

Using a diode for each button, the masking and ghosting problems are instantly solved! This is how it works: The
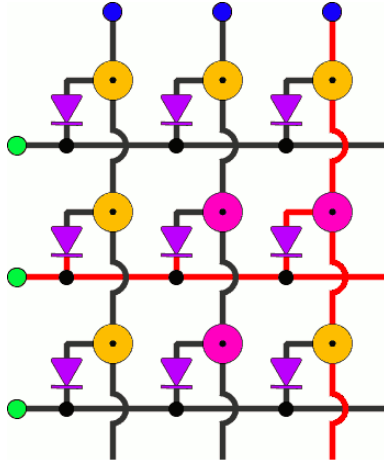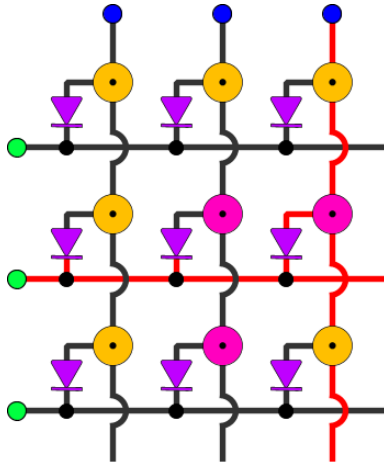

Fig. 5. Solution to the ghosting and masking.

above situation would normally cause ghosting. Yet, the diodes prevents the current to go backwards. For better understanding, you can see the 3 steps of the above animation here :

Because the cycling speed must be quite fast (some Khz), you should choose proper diodes. A cheap solution is the 1N4148 general purpose diodes. If you plan to have many keys and thus you need faster sampling, then select a schottkey diode instead.

III. SYSTEM ARCHITECTURE

In our project, we have implemented two remote playing chessboard with the help of magnetic sensors(reed switch). These magnetic sensors help in detecting a player's move for playing the game. Data from these sensors are tranferred to ARDUINO. The reading from ARDUINO are consequently sent to a JAVA program running in a PC. These data are sent to opponent's PC. Then the opponent can see the move given by the 1st player, make that particular move in his/her chessboard

and give a new move to continue the game onwards. Similarly these data is sent to 1st player's PC via ARDUINO and thus the game continues.
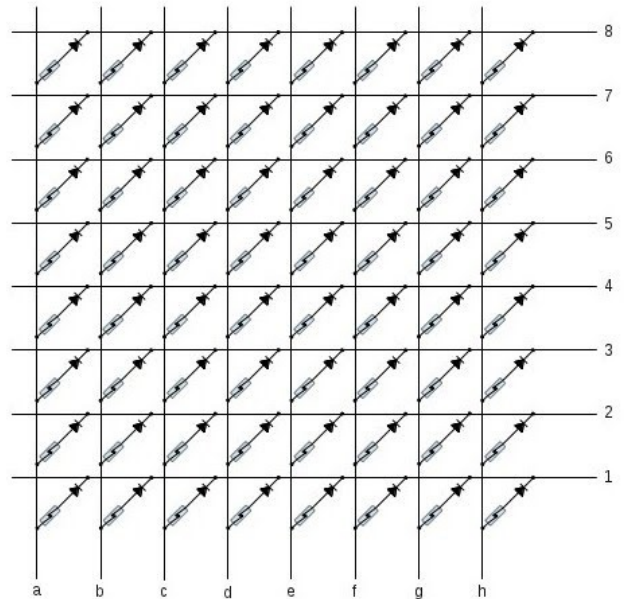
IV. BLOCK DIAGRAM

Fig. 6. Block Diagram of customized PCB Chessboard[2]

V. EQUIPMENTS NEEDED

Name of Equipments (for each player)	Quantity
Personal Computer with internet connection	1
ARDUINO Mega	1
Ethernet Shield for ARDUINO	1
Ethernet Cable	1
Reed switch	64
Diode	64
Custom made PCB board	1
Magnetic chess pieces	32

VI. EQUIPMENTS DESCRIPTION

1) Personal Computer with internet connection :
   - Transfer data from one player's PC to another player's PC.
   - To see opponent's move given in the chessboard with the help of a JAVA program.
   - To detect wrong movements of players.

2) ARDUINO Mega :
   - Detect movements of chess pieces from PCB chess board.
   - Send data to PC.

3) Ethernet Shield for ARDUINO :
   - It is used to send data from ARDUINO to PC via Ethernet Cable.
   - It is placed over the ARDUINO.

4) Ethernet Cable:
   - It connects ARDUINO with PC.

5) Reed Switch :
   - It is the magnetic sensor.
   - As we are using magnetic chess pieces, data is passed by the movement of the chess pieces to the reed switch. We use reed switch for each chess piece.

6) Diode :
   - It is used to remove the ghost effect (described earlier).
   - It is connected with Reed Switch.

7) Custom made PCB board :
   - We have made customized PCB board to implement the circuitry needed in building our project.
   - The circuitry is made in such a way that each 64 places get equal space for placing chess pieces, reed switches and diodes.

VII. PROJECT FEATURES

1) *Graphical Interface:*
   Two players will be able to play chess with this remote chess board where two players are connected over internet. Firstly, they will be provided with a choice to select their own chess piece color like figure 7. Both the players are given an interface
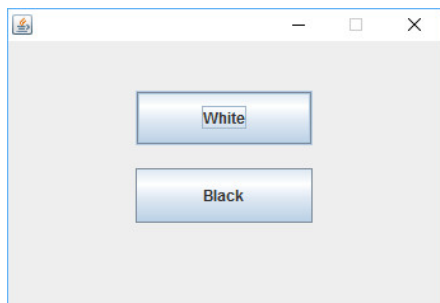

Fig. 7. Color Selction for Chess
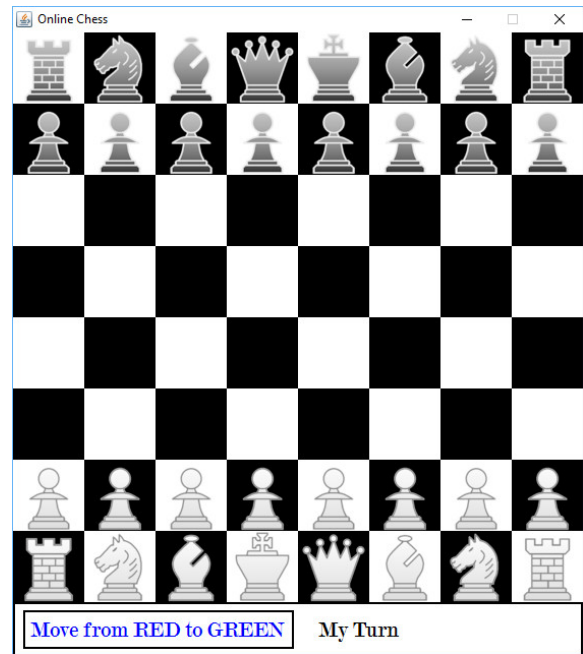
that provides the present state of his/her own and

Fig. 8. Interface of Chessboard

opponents chess piece. The interface will look like the figure 8. The main part of the figure is the chessboard.in the bottom part there is some instruction how to move the chess piece and whose turn is the current move.

2) *Animation of Chess moves:*
   At the beginning of the game, first player gives a move and the movement is shown in both his/her own and opponents interface. The interface will look like figure 9. Seeing the first players
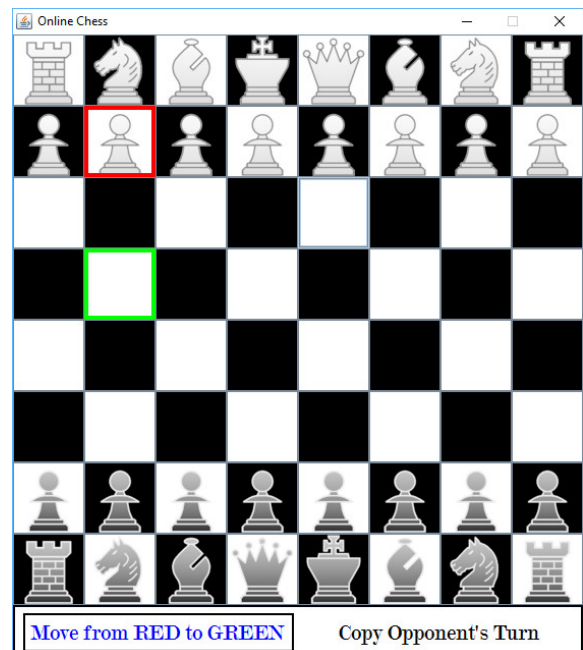

Fig. 9. interface after a chess move

movement the second player places his/her opponents move in his/her board from red to green. After that second player gives his move and the first player have to repeat the same procedure.

3) *Error Checking:*

According to standard chess rule a bishop can only move along its diagonal direction, a queen can move front, back, and diagonal direction and so on for others. One player can move only one chess piece at a single instant. If any the standard rules are violated by any of the player the game is terminated. There is also some other error checking like if both player select the same color in figure 7.If a player move a chess when he or she is not supposed to make a move.

4) *Checking Check and Checkmate:*

When the movement of the king is blocked by opponent then the game finishes and opponent is declared as winner. This things is done automatically in our software .When a king is check or checkmate position in our interface it is shown automatically.

VIII. Experimental Setup:

A project showcasing program was arranged by our university where we showcased our project. We had made customized PCB board to implement the circuitry needed in building our project. We had wrapped the PCB board with plywood. We also had used magnetic chess pieces. We played several games in front of a crowd in different critical condition. Figure 10 shows our chessboard.
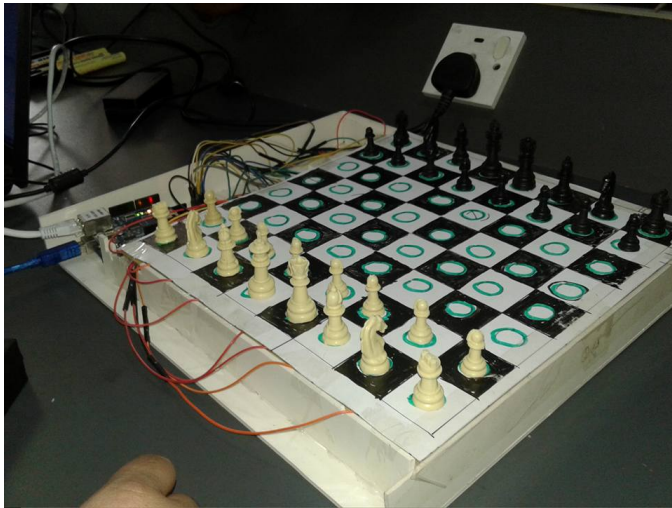

Fig. 10. Our Chessboard

IX. Experimental Result:

We had operated our remote chess in two different pcs at our laboratory. As our magnets are not strong enough so we needed to wait sometime after one movement in order to give time for transferring data from board to pc through Arduino. Almost all the error checking movement was tested and we got satisfactory output.

X. Future Works:

We had to fulfill our project within very short time. So, we had to limit our functionalities. But there is huge scope of improvement. We would like to remove the drawbacks.

In our system, opponents move is only shown in computer screen. So, we would like to introduce an automatic system for the easy transferring of opponents chess piece.

There are some lag or data loss when transferring data to Arduino. So, movements of chess pieces are not detected instantly. Some efforts are needed to remove this difficulty improve game experience.

There is also a chance of data loss over internet as we used UDP connection for lab environment. But TCP connection is necessary for reliability and surity of correct data.

XI. Conclusion:

The main aim of our project is to play chess with someone sitting at distance places. We could accomplish this feature using internet and has brought a new dimension in playing chess. We have also successfully handled the situation of wrong movement. With this our aim of the project has been served and we have built a successful project.

References

[1] https://en.wikipedia.org/wiki/Reed_switch

[2] https://sites.google.com/site/bergersprojects/reedcb/matrix

[3] http://pcbheaven.com/wikipages/How_Key_Matrices_Works/