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MATLAB Based Automation through Wireless Communication for Disabled Peoples

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Abstract— **The main concept of this paper is automating the appliances and machines through wireless communication and GUI Screen (Graphical User Interface). This idea is used to physically disabled peoples for operating the electrical appliances from sitting place. This proposed system consists of controller, RF transmitter, Encoder, RF receiver, Decoder, Relay driver and Matlab (Matrix Laboratory) software. In this proposead system, appliances are controlled using GUI screen created in Matlab. When we click the icons in Matlab screen, command is passed to controller through serial port of computer. After receiving this command controller takes the decision and passed this decision through RF transmitter. At receiver side RF receiver receives the signal and decode this signal. After decoding, this signal is given to relay driver circuit. This proposed system operates around 300 meter distance. So we are controlling the appliances around 300 meters. GUI screen is created with help of Matlab and also commands are created using Matlab. This proposed system is very useful to physically handicapped peoples and older peoples.**

Keywords: **Automation, Matlab, Wireless Communication, Microcontroller.**

I. INTRODUCTION

This article presents Matlab based automation through wireless communication for disabled peoples. In home, disabled peoples are operate the electrical appliances is very difficult. Because they are move near to the appliances and switch on it. To avoid this inconvenience we are proposed this novel. In this method disabled peoples are no need to move near the appliances. Because all the appliances are controlled through computer or Laptop. This method consists of Matlab software, Computer, Arduino controller, RF (Radio Frequency) transmitter, RF receiver, encoder and decoder. Users can control the appliances using Matlab GUI screen. This screen shows the appliances name with on/off label. So users just click the label, it will be controlled through RF communication.

When the user clicks the label, the corresponding signal is transmitted to the Arduino controller [1]. Output of this signal is given to encoder. Encoder encodes the given signal and transmitted to RF antenna. This antenna transmits the signal through air. At the receiver side, RF receiver receives the signal and given it to the decoder. It decodes the given signal and sends it to relay driver unit. Appliances are connected in relay driver circuit and it turns on/off based on the GUI screen. This concept is also used for industries and older peoples.

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II. BLOCK REPRESENTATION

The block representation of the proposed Matlab based Automation through RF communication for disabled peoples are shown in Fig. 1.and Fig.2. In this proposed article we are using two block diagrams. One is transmitter section and another one is receiver section. At a transmitter section Matlab software [2] is installed into windows operating system of computer. Arduino Uno board is connected to USB port of computer through cable. Output from Arduino board is given to encoder. After encoding the data's are given to RF transmitter. RF transmitter is used to transmit the given signal into air.

At Receiver side signal is received through antenna and given to RF receiver. This received signal is passed to decoder section. This decoder decodes the given signal and sends to relay driver circuit. Home appliances are connected to this relay driver circuit. When the users clicks the appliances on button [3], then relay driver circuit is activated and turn on the load. When the user clicks the appliances off button, then relay driver circuit is turn off the load. So appliances are controlled through Matlab screen in computer.

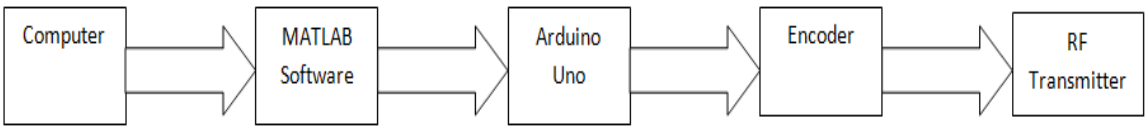

Fig. 1. Block representation of the proposed system transmitter

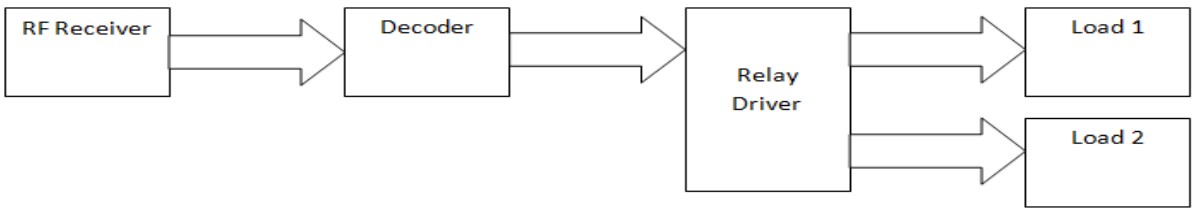

Fig. 2.Block representation of the proposed system Receiver

III. HARDWARE IMPLEMENTATION

The hardware details of the proposed Matlab based automation through wireless communication for disabled peoples are detailed below.

a) Arduino UNO

Arduino uno is an open source integrated development board. This board consist of atmega328p controller, 14 input/ output ports, 6 analog pins, power adaptor connector and Universal Serial Bus (USB) port [4] & [5]. For programming purpose we are using Arduino 1.6.5 software.This is also an open source software from arduino.Operating voltage of this board is 7-12V Direct Current (DC) and output current from each pin is 20mA. In this software we are using Embedded C coding for programming purpose. Main advantage of this arduino software is monitoring the output through serial port option. This port displays the output of

micrcontroller with different baudrates and one more special option is serial plotter.This plotter draws the graph for output values. At a time we are monitor the output values in graph or serial port. This arduino board is compatable with Matlab software and Labview software with help of some supporting packages and arduino software is also compatable with Teensy controller board. Arduino board is operates at DC adaptor as well as Computer USB power.After the programming we will remove the controller from arduino board and this controller is soldered into separate PCB (Printed Circuit Board). So this controller is not only working in Arduino board it also working in separate PCB baord with proper supporting components. Arduino UNO board is shown in Fig.3.

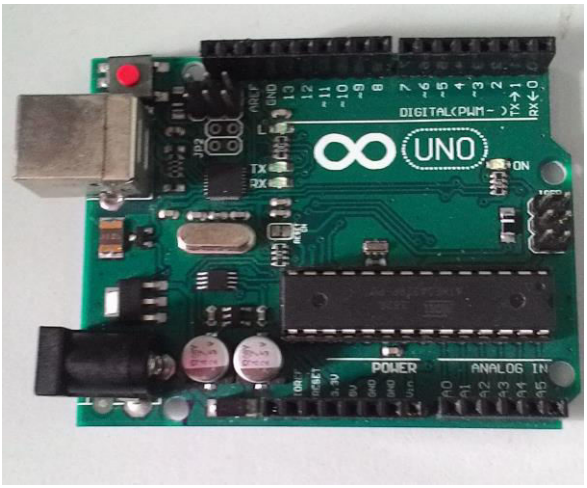

Fig. 3.Arduino UNO

b) Encoder

Encoder is used to convert 12 bit parallel input data into serial output data [6]. These 12 bits are classified into 8 address lines and 4 data lines. These address lines are used to give security for our data transmission. Operating voltage of this encoder is 2.4V to 12V and it consists of inbuilt oscillator. This encoder IC (Integrated Circuit) is totally consists of 18 pins. Encoder IC pin diagram is shown in Fig.4. Out of these 18 pins, pin 14 is used to allow data transmission. This pin is called transmission enable. When we are transmit the data, must give active low signal to this pin. If it is not active low, then data is not transmitted. In this proposed system we are using two loads only. So data input is given to pin number 12, 13 and remaining two pins are left. Output of serial data is taken from pin 17 and given to RF transmitter module. Encoder IC is shown in Fig.5.

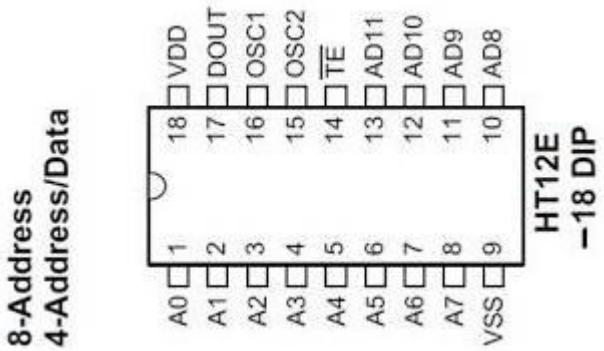

Fig. 4. Encoder IC Pin details

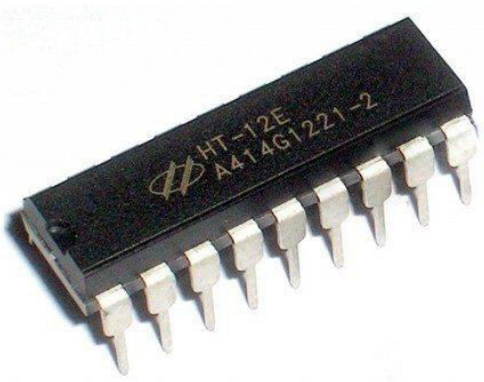

Fig. 5.Encoder IC

c) Flowchart

A basic flow diagram of Matlab based automation through wireless communication for disabled people is shown in Fig. 6.

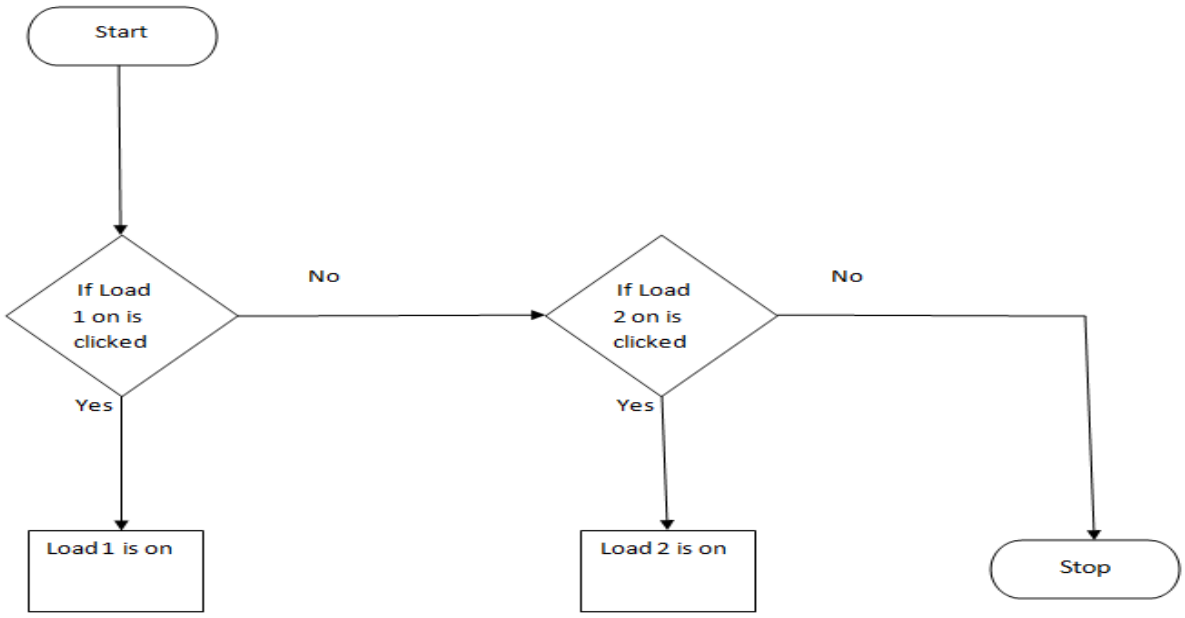

Fig. 6. Flowchart for Matlab based automation through wireless communication for disabled peoples

d)Decoder

Decoder is used to convert 12 bit serial input data into parallel output data [6]. Decoder IC pin diagram is shown in Fig.7. These 12 bits are classified into 8 address lines and 4 data lines. These address lines are used to give security for our data reception. Operating voltage of this encoder is 2.4V to 12V and it consists of inbuilt oscillator. This decoder IC (Integrated Circuit) is totally consists of 18 pins. Data output is taken from pin number 12, 13 and remaining two pins are left. Data output from RF receiver is given to pin 14 of decoder. Then it converts serial data into parallel data. Decoder IC is shown in Fig.8.

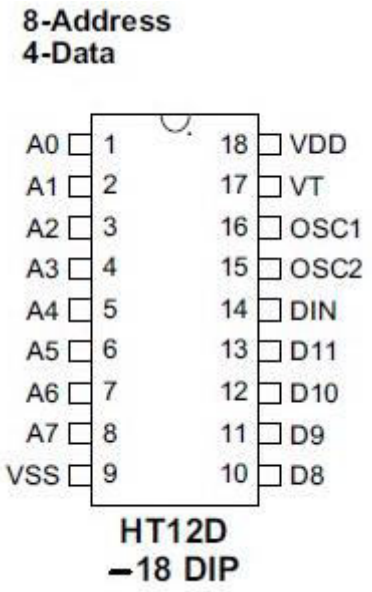

Fig. 7. Decoder IC Pin details

Fig. 8. Decoder IC

e) RF Transmitter

In this paper we are using RF transmitter module for transmitting the data's through air [6]. Output from encoder section is given to RF transmitter DATA pin. Operating frequency range of this transmitter is 433MHz. Amplitude Shift Keying (ASK) modulation is used in this RF transmitter. This module consists of four pins namely VCC, GND, ANT and DATA. RF signals can travel even obstacle is present in path of RF waves. The transmitter output is 8mW at 433.92MHz with range of 400 feet open area. Indoor range is 200 feet and goes through most walls. This module accepts both linear and digital inputs can operate from 1.5V to 12V Direct Current (DC), and makes building miniature hand held RF transmitter is very easy. RF transmitter module is shown in Fig.9.

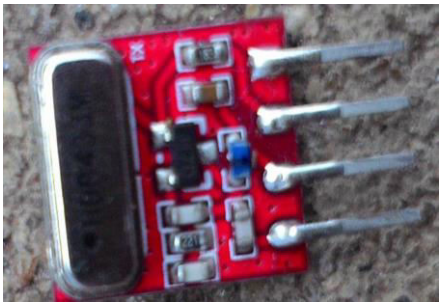

Fig. 9. RF Transmitter module

f) RF Receiver

In this proposed system we are using RF Receiver module for receiving transmitted data from RF transmitter through air [6]. This module consists of 8 pins namely VCC, GND, DATA and ANT. This receiver is also operates at 433.9MHz and has sensitivity of 3uV. This module is operates at 1.5V-5.5V DC and has both linear and digital outputs. Output from RF Receiver module is given to Decoder. RF Receiver module is shown in Fig. 10.

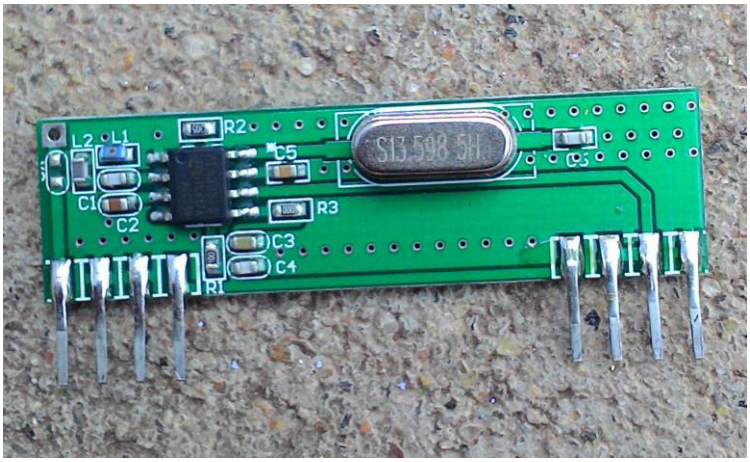

Fig. 10. RF Receiver module

g) Relay Driver

Rely driver consists of NPN transistor, diode, resistor and relay. In this Paper we are using two electromagnetic relay for switching the electrical appliances [7] & [8]. This relay driver is used to drive 230V /5A load. It consists of 5 pins namely NC (Normally closed), NO (Normally Open), C (Common) and two coil leads. When the transistor gets high input signal from decoder, transistor is switching the relay contacts from NC to NO. The loads are connected to NO terminal of relay. So loads are turned on condition based on the GUI screen clicked. When the load off button is clicked in GUI screen, then input of transistor is low signal. Now the loads are turned off condition. PN junction diode 1N4007 is connected parallel to relay coil. Because this diode is used to avoid circuit damage from back electro motive forces (emf). Relay driver is shown in Fig.11.

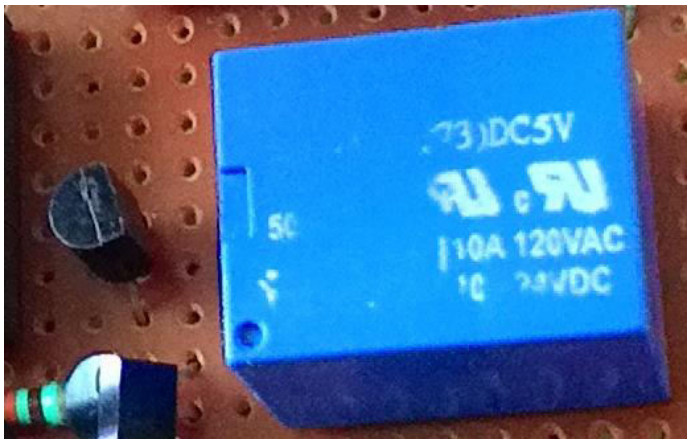

Fig. 11.Relay Driver

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IV. SOFTWARE IMPLEMENTATION

The software details of the proposed Matlab based automation through wireless communication for disabled peoples are detailed below.

a) MATLAB

In this proposed system we are using MATLAB Software 2015a version for controlling Electrical appliances in GUI screen [9] & [10]. The following figures are indicates the Matlab working screens. In the following pictures ON1 and ON2 indicates loads.

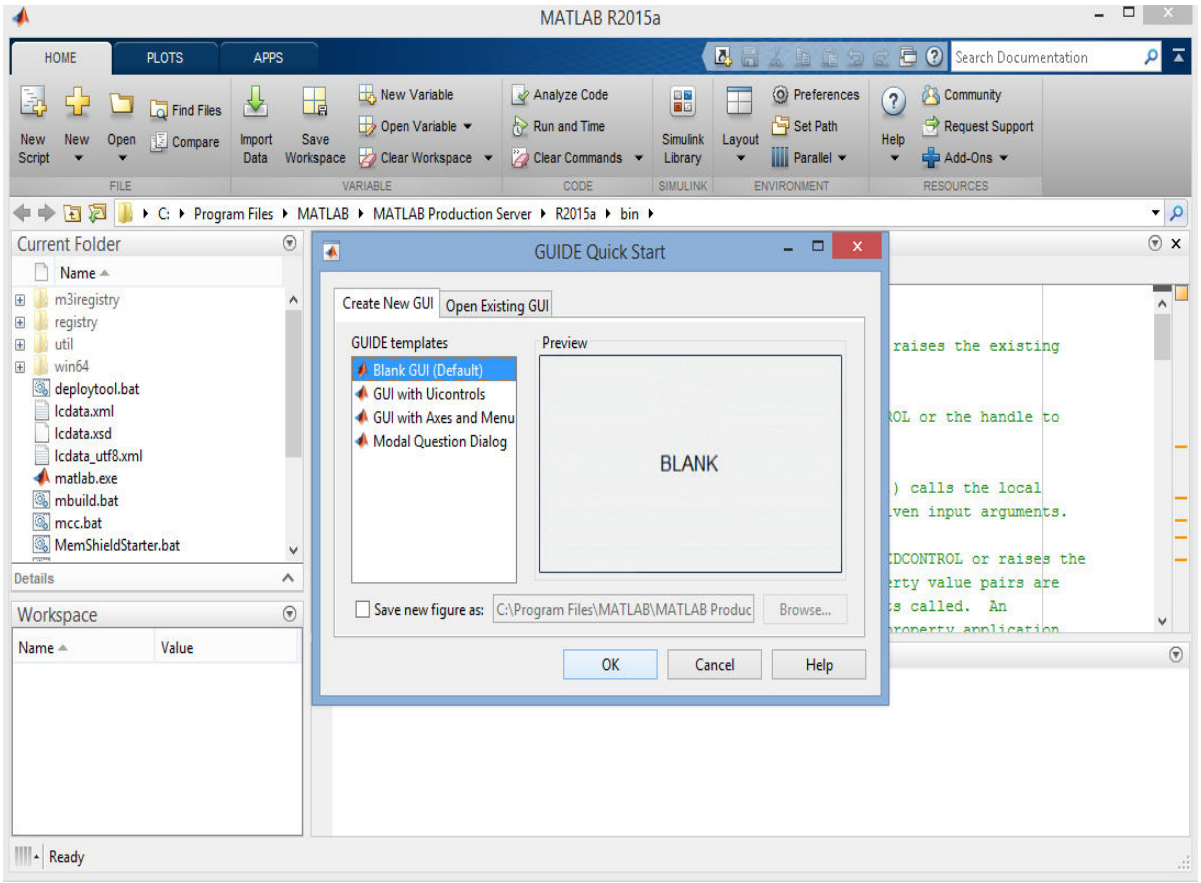

Fig. 12.MATLAB front page

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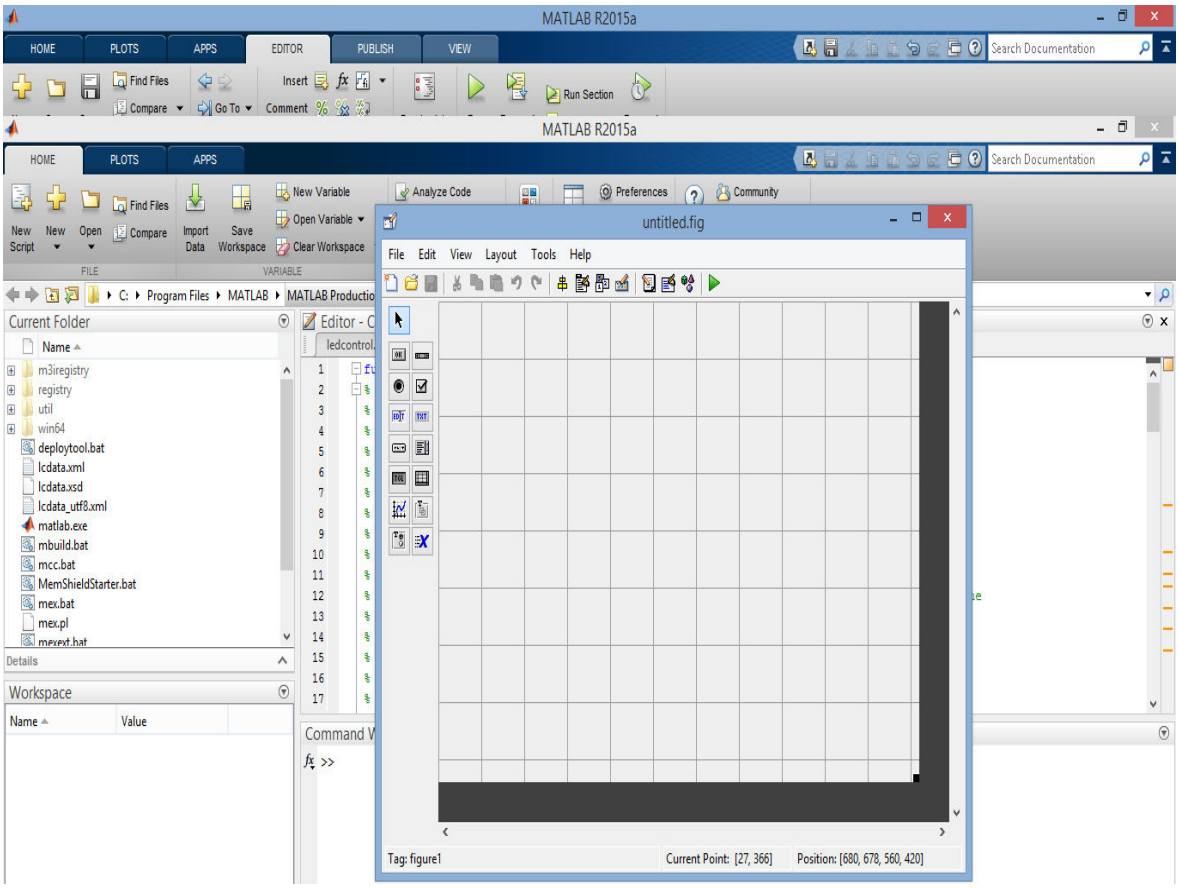

Fig.13. Opening of GUI screen

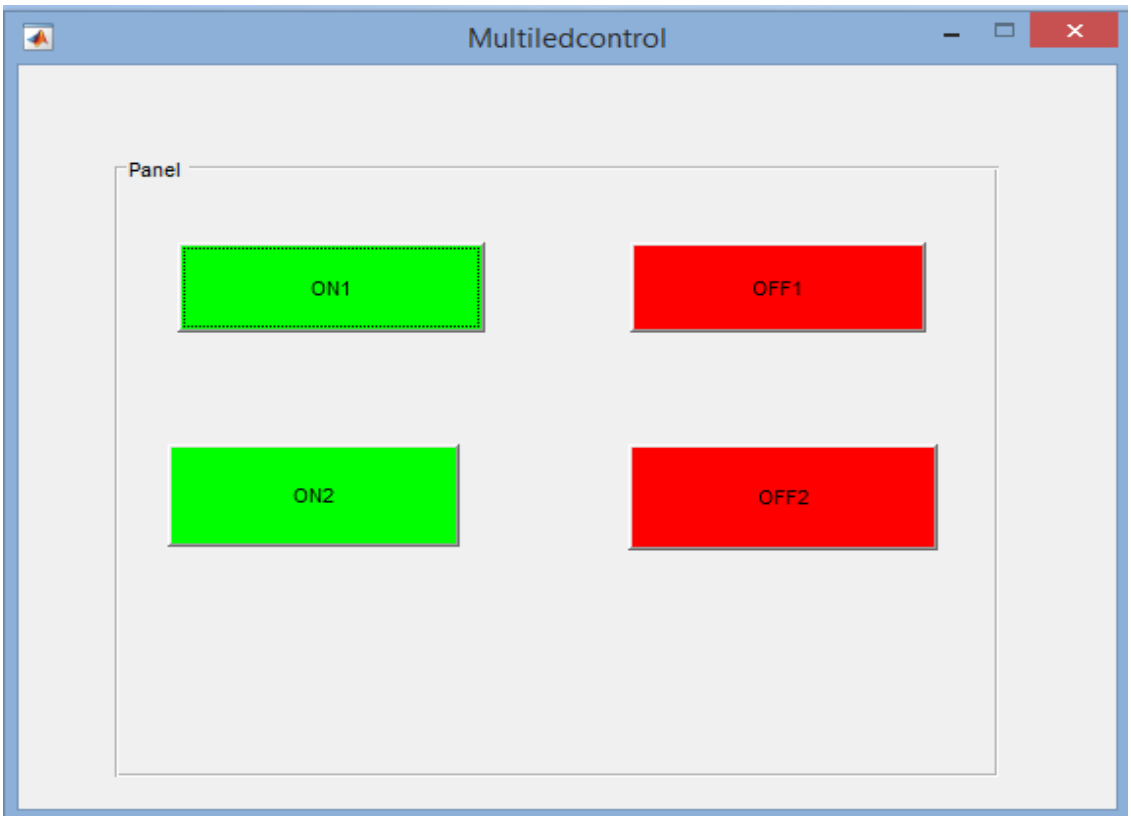

Fig.14.ON1 Button clicked

Fig.15. OFF1 Button clicked

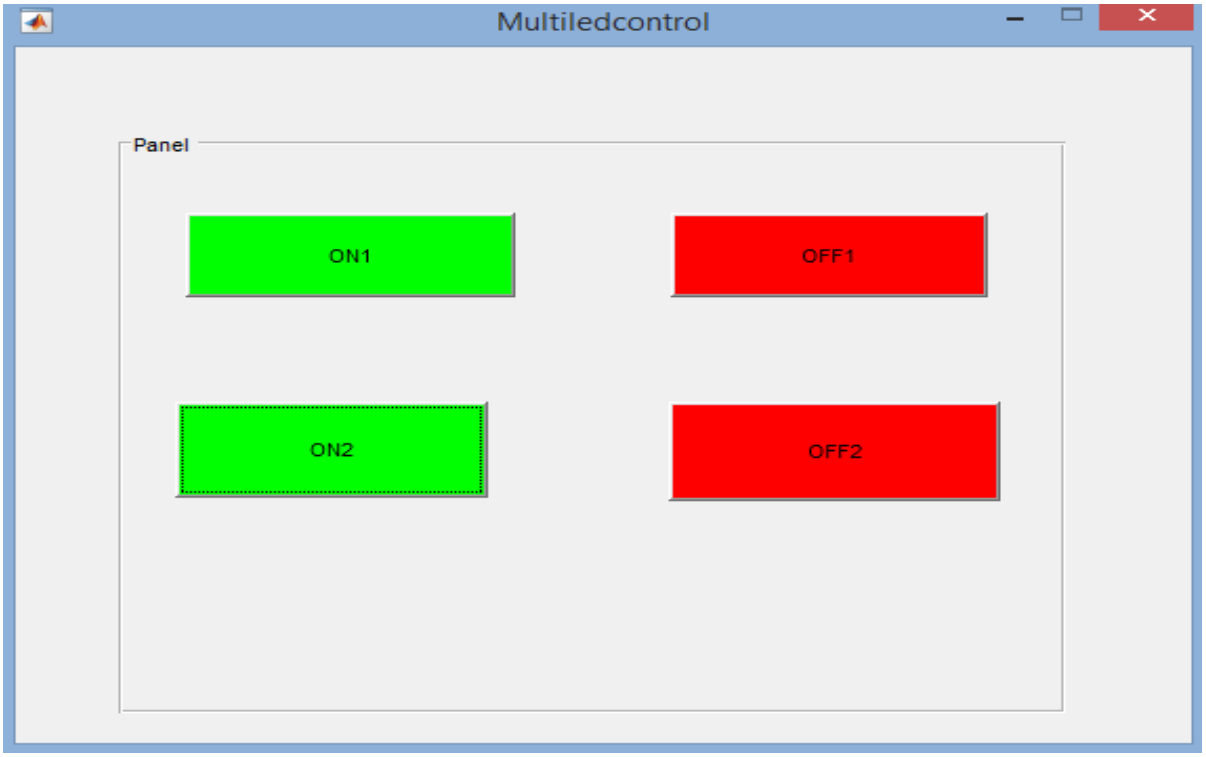

Fig.16.ON2 Button clicked

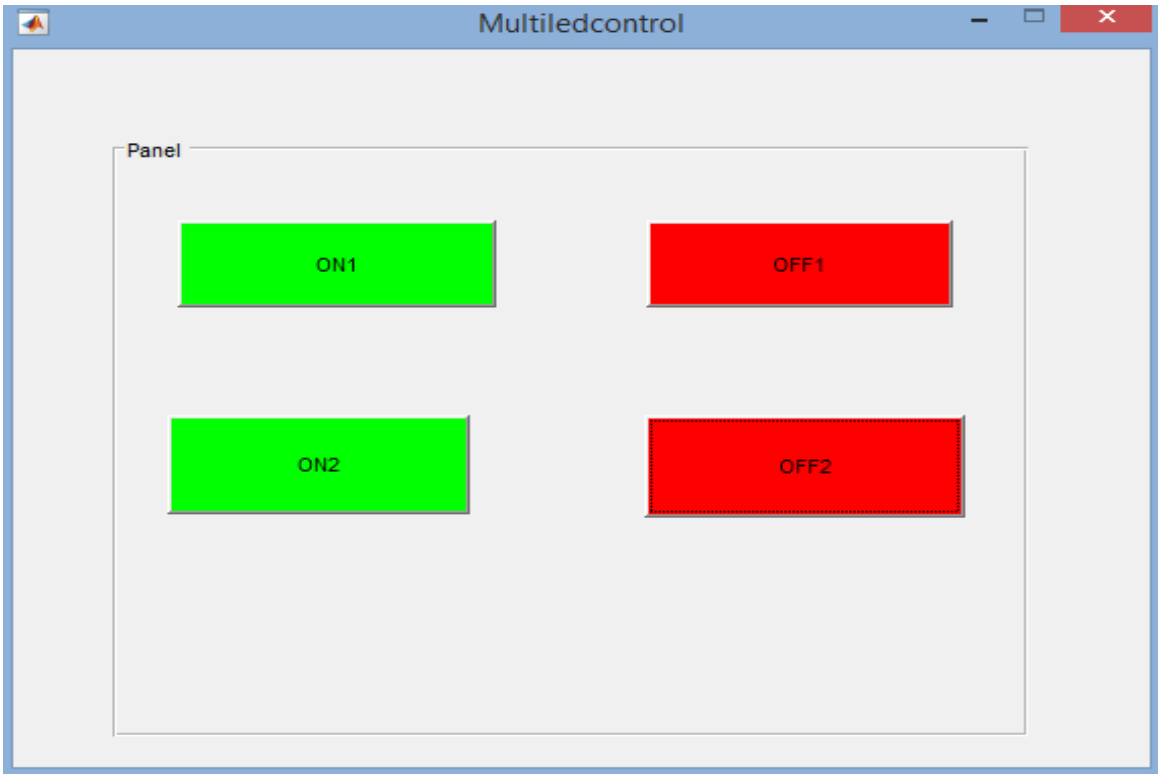

Fig.17.OFF2 Button clicked

V. CONCLUSION & FUTURE WORK

This article proposes a low cost and user friendly Matlab based automation through wireless communication for disabled peoples. Main advantage of this concept is no need to move near the appliances for on/off purpose. So it is very useful to physically challenged peoples. A single computer is used to control the appliances in sitting place. No need of separate computer for controlling these appliances because this software runs windows platform. So user can use this software and other software's simultaneously. The proposed concept is reliable, robust and requires less maintenance. This proposed method can be used in industries, class rooms, hospitals, old age home and apartments. In future the proposed idea can be extended to control the more than two appliances through internet from anywhere in the world.

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