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LabVIEW Based Wireless Switch Control System

Bhargav B Patel[1], Suchita B Patel[2], Keyur Chauhan[3]

[1]*Electronics and Communication,MBICT College*
[2]*MSc.IT Department, ISTAR College*
[3] *Electronics and Communication, MBICT College*

Abstract — *This system is mainly the control system by which one can control the power of the room which is connected through the Zig-Bee. One can ON or OFF the equipment of the room using LabVIEW control panel and also can get the status of that equipment to the control panel.*

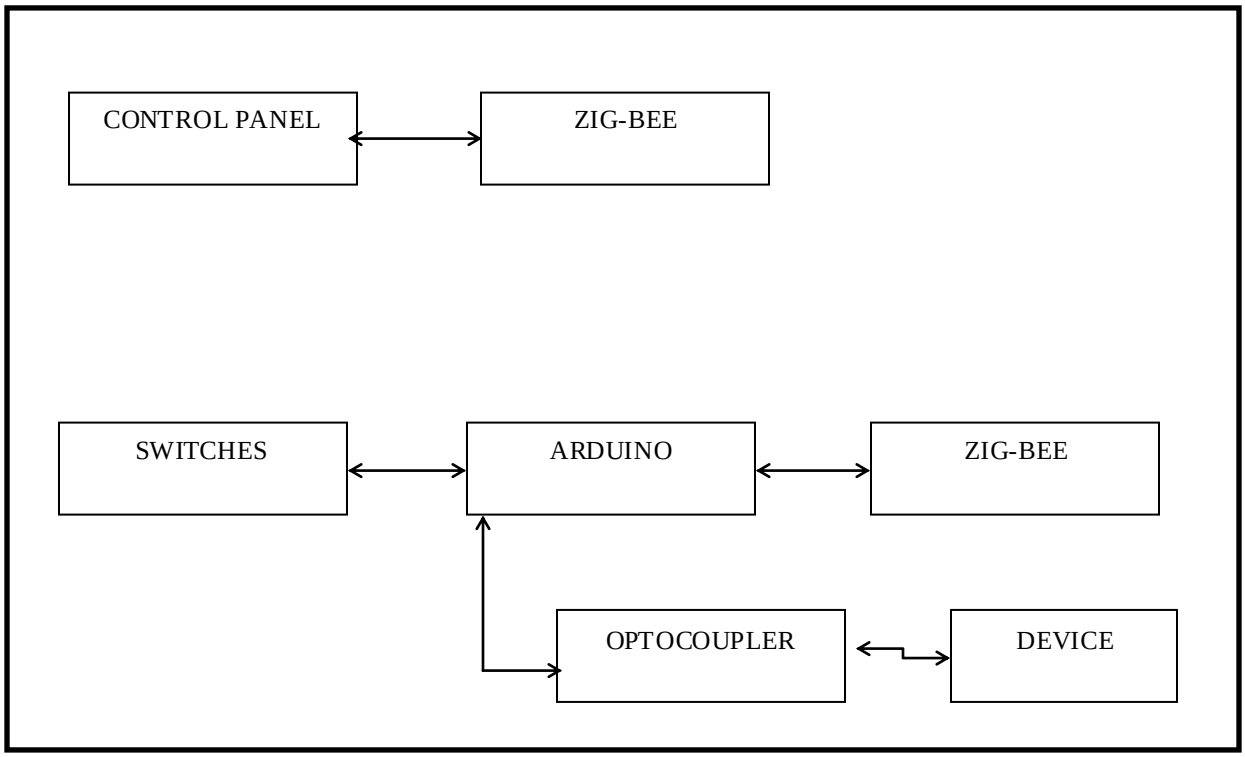
LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a system-design platform and development environment for a visual programming language from National Instruments. By using LabVIEW, one can change the status of the switch of the room through wireless media. Here wireless media is to be used which is ZigBee. Now the data which is coming from the LabVIEW will go to the controller and then according to the programming of controller, the optocoupler would be turn ON or OFF. According to the status of the optocoupler the status of the switches will be changed.

Keywords- *Lab VIEW, Zig-Bee, Optocoupler, Arduino Board.*

I. INTRODUCTION

This system consists of input processing circuit and the output. The main components of this system are switch board, microcontroller, optocouplers, Zig-Bee and LabVIEW. Here I am using push buttons as switches for convenience. It is an electronic switch for turning a circuit ON and OFF. This type of switches turn ON the device by pressing for the first time and it will turn OFF the device by pressing second time. The controller which I am using is AtMega328 as Arduino Board. According to programming, the equipment will get turn ON or OFF. Optocouplers are often used to interface an electronic circuit which is working at low voltage, to an electrical circuit which works at very high voltage. Zig-Bee is used to communicate wirelessly. It is used to communicate between the controller and the LabVIEW. LabVIEW, short for Laboratory Virtual Instrument Engineering Workbench, is a programming environment in which you create programs using a graphical notation.

II. BLOCK DIAGRAM



BLOCK DISCRIPTION:

1) SWITCH BOARD: This is the switch board of the room where we want to control the power supply. If the switch of the board is on then one can change the status of that switch.

2) OPTOCOUPLER: There are many situations where signals and data need to be transferred from one subsystem to another within a piece of electronics equipment, or from one piece of equipment to another, without making a direct .ohmic. Electrical connection. Often this is because the source and destination are (or may be at times) at very different voltage levels, like a microprocessor which is operating from 5V DC but being used to control a triac which is switching 240V AC. In such situations the link between the two must be an isolated one, to protect the microprocessor from overvoltage damage.

3) MICROCONTROLLER: In this system, Microcontroller is used to ON or OFF the state of the relay. The microcontroller will be connected to the relays and by the output of those the relay will be turned ON or OFF.

4) ZIG-BEE: This device is used to transmit or receive the data wirelessly. There will be a Zig-Bee module to transmit and receive the data. One will be connected to the Microcontroller and the other will be connected to the PC. The module which will be connected to the microcontroller, will receive the data by the Zig-Bee module which is connected to the PC and vice-versa.

5) CONTROL PC: This PC will be used as the main control device or we can say the MASTER. This PC is having Lab VIEW front panel. The Lab VIEW is a dataflow visual programming language. Using this Lab VIEW programming, one can control the power of the room via Zig-Bee to the controller and then through the relay and finally the Power supply to the switches. If the switch of the room is mechanic ally ON then one can change the status of that particular switch by the Lab VIEW front panel.

III. CIRCUIT DIAGRAM

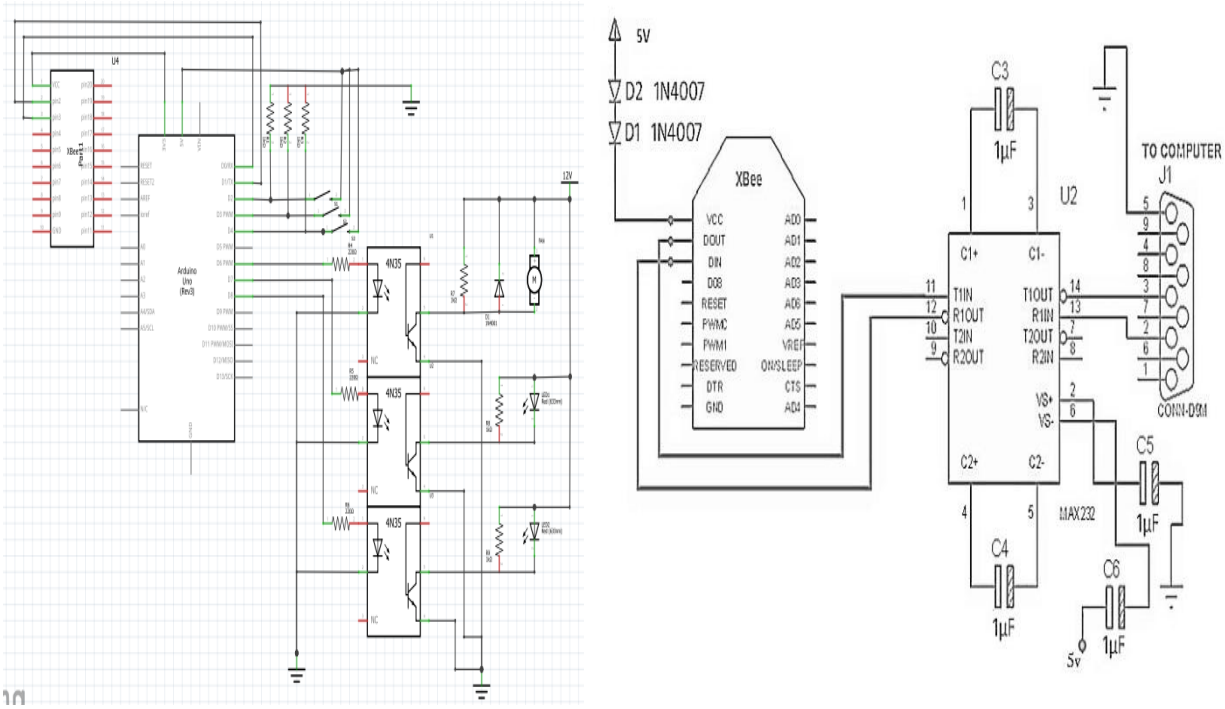


Figure 2: Circuit Diagram

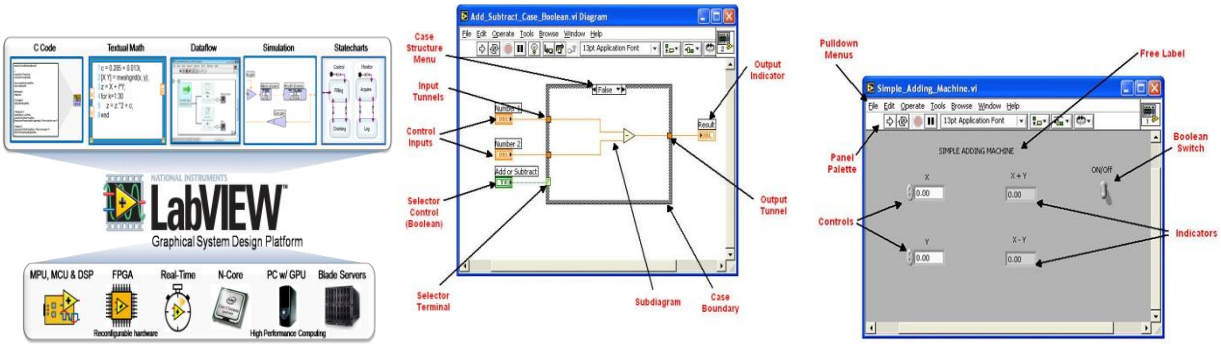
The system starts from the switches which are connected to the equipment like bulb or fan. Here we are using push buttons. They are mostly used to switch ON or OFF the device simultaneously by LabVIEW and the user. If one presses the switch from the switch board or from the LabVIEW front panel, trigger occurs and the state of the device will be changed according to the programming of the controller. As soon as another press occurs, state of that device will get changed. This whole operation will be done by the Arduino programming. In simple manner, first press will turn ON the

device and the second press will turn OFF the same device. It does not matter that whether switch has pressed from the switch board or the LabVIEW panel.
Switches are directly connected to the Arduino board. We are using opt couplers which are MCT2E to ON or OFF the device. It is used to connect fan or any equipment which contains the coil to the microcontroller. Because the motor needs isolation from the low power circuit otherwise the whole circuit will get damaged because of the EMF induced by the coil. Optocouplers will provide switching facility optically. We can block the current to the device by making it active. It will work as a switch. If it is open then no current will flow and the device will not get turn ON and vice versa.
The output devices are connected to the Arduino board through the optocouplers. This controller is programmed such that the data received from the Zig-Bee will be implemented on the devices to change its state. Detailed operation of the microcontroller has been mentioned earlier.
The second most important part of the system is the other side of the system. There is the main controlling software which is LabVIEW. This LabVIEW is having the front panel and on the front panel there will be same virtual switch board as the other side. One can change the state of the equipment by turn on or off the front panel switches. If the mechanical switch is OFF then also we can turn on or off that equipment by using LabVIEW. The LabVIEW sent the status of the switches to the other side by Zig-Bee. Zig-Bee is used for short distance wireless communication. Zig-Bee sends the data to another Zig-Bee serially. The data rate will be lower in case of Zig-Bee. Zig-Bee is connected to the PC. This communication will be fully duplex. It means the device can be turn ON or OFF by both the side.

IV. TOOLS REQUIRED

1) LabVIEW
2) Zig-Bee
3) Arduino board
4) Optocoupler

LabVIEW: NI LabVIEW software is used for a wide variety of applications and industries. LabVIEW is a highly productive development environment for creating custom applications that interact with real-world data or signals in fields such as science and engineering. The programming language used in LabVIEW, also referred to as G, is a dataflow programming language.



VI has three components: a block diagram, a front panel and a connector panel. A key feature of LabVIEW is the extensive support for interfacing to devices such as instruments, cameras, and other devices. Users typically interface to hardware by either writing direct bus commands (USB, GPIB, Serial...) or using high-level, device-specific, drivers that provide native LabVIEW function nodes for controlling the device.

Zig-Bee : ZigBee is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power wireless M2M networks. The ZigBee standard operates on the IEEE 802.15.4 physical radio specification and operates in unlicensed bands including 2.4 GHz, 900 MHz and 868 MHz.

Arduino : An Arduino is a tiny computer that you can program to process inputs and outputs between the device and external components you connect to it. It means an Arduino is a single-board microcontroller and a software suite for programming it. The hardware consists of a simple open hardware design for the controller with an Atmel AVR processor and on-board I/O support. The software consists of a standard programming language and the boot loader that runs on the board. An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components to facilitate programming and incorporation into other circuits.

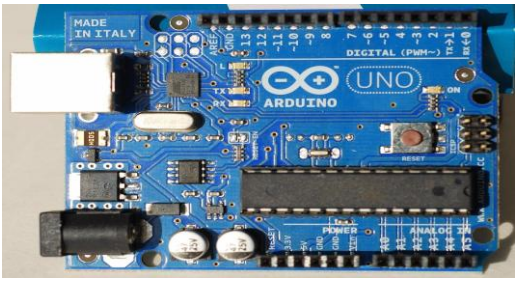


Fig: Arduino

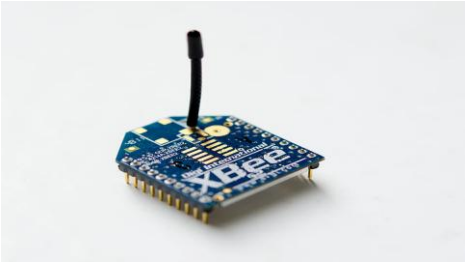


Fig: Zig Bee

OPTOCOUPLER : Optocouplers transformers and isolate the primary input voltage from the secondary output voltage using electromagnetic coupling by means of a magnetic flux circulating within the iron laminated core. But we can also provide electrical isolation between an input source and an output load using just light by using a very common and valuable electronic component called an **Optocoupler**.

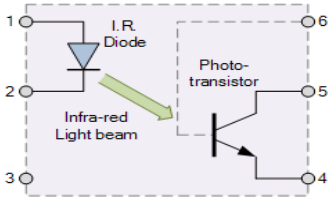


Fig: Phototransistor Optocouplers

V. INTERFACING TO VARIOUS COMPONENTS

a) LabVIEW FRONT PANEL

1) If the device is ON then the status of that device will be shown in the status of the front panel LED.
2) If the device is ON then the respective LED will be ON and vice -versa.
3) There will be facility to configure the respective port which is connected through Zig-Bee.

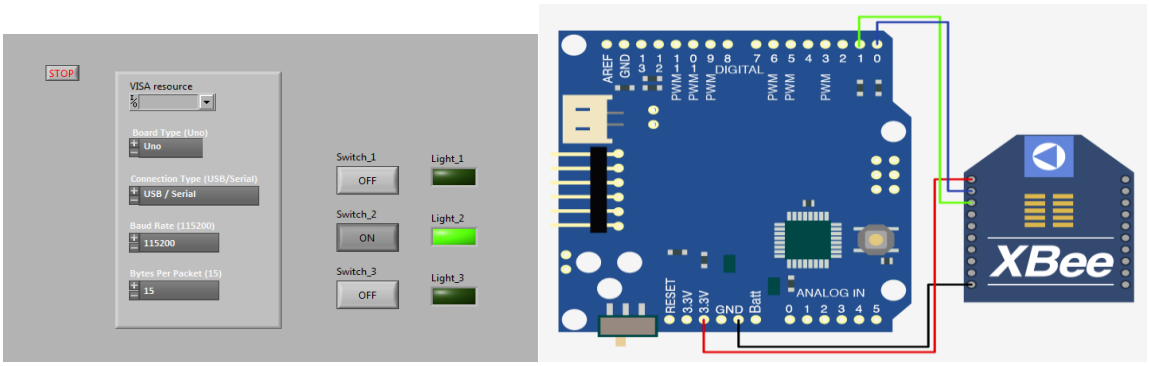


Fig: LAB View Front Panel & Xbee Interfacing

B) Zig-Bee INTERFACING WITH Arduino

1) Another Zig-Bee module is directly connected to the AtMega328.
2) The Zig-Bee module is connected as shown in the fig.2.4.3.
3) Both the modules will act as the transmitter as well as the receiver and they will communicate to each other wirelessly.

VI. Results

It shows the status of the device. If the device is ON then the LED in the front panel will be ON. And if the device is OFF then the LED will be OFF.

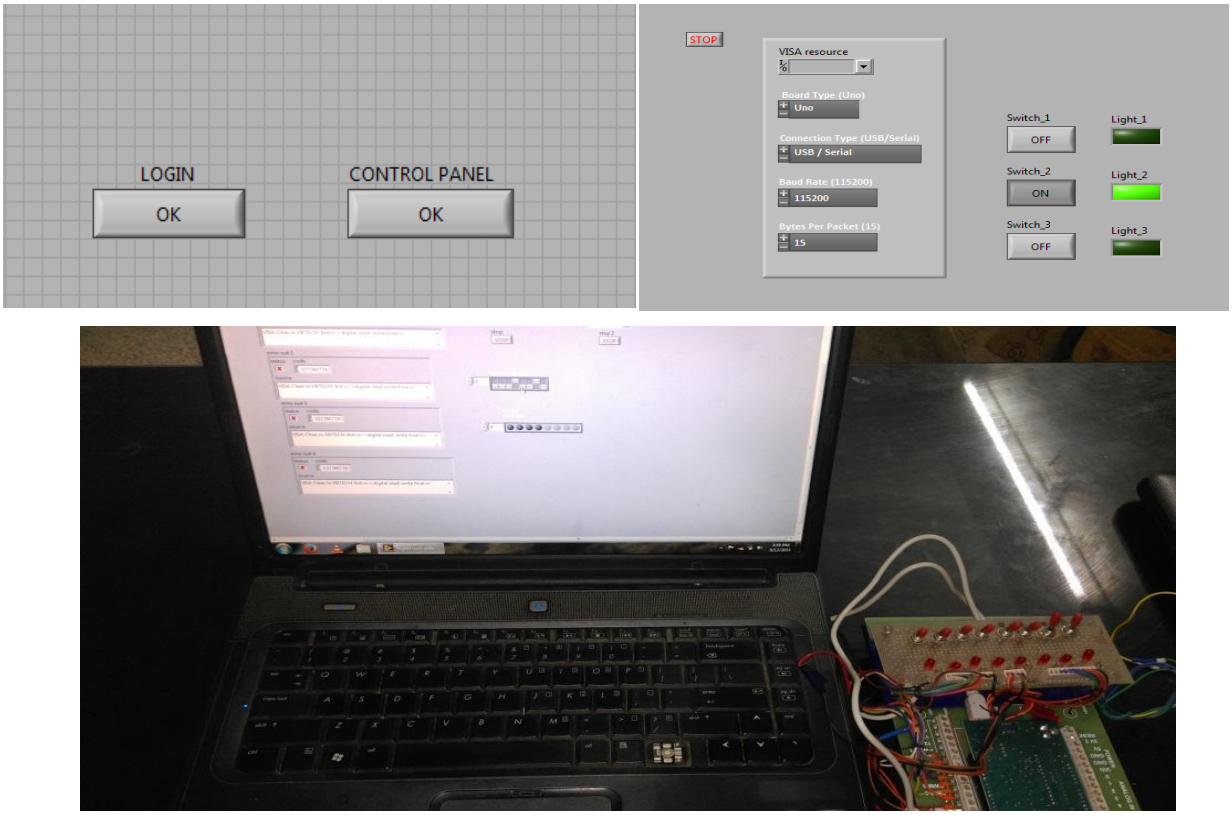


Fig: LED ON/OFF using Lab View and Arduino

VII.CONCLUSION

LAB View based home automation system is use to control the home applicences .using the Zigbee wireless communication device we can send the data to the PC from that data device should be ON /OFF.

VIII. REFERENCE

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BIOGRAPHIES

Mr.Bhargav B Patel, working as a assistant professor in electronics and communication. Area of interest is in Embedded system, Microcontroller, VLSI, Microprocessor. Member of ISTE.

Mr.Keyur Chauhan, working as a assistant professor in electronics and communication. Area of interest is in Microcontroller, Microprocessor. Member of ISTE.

Mrs.Suchita Patel, working as a assistant professor in M.Sc IT department in ISTAR College,Gujarat.doing PhD in mobile networking. Area of Interest is in .Net, Wireless Networking, mobile networkingAndroid.Board.Member of S.P University, Gujarat, India.

