Lab VIEW based Wireless Notice Board

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Abstract— Notice Board is primary thing in any organization and institution places such as schools, colleges, and public utilities such as shops, offices and other places. This wireless board can be used to save the environment from places where more papers, ink, and other organic material and especially a great time saver rather than posting a notice board with man power. ZigBee is a PAN technology based on the IEEE standard. Unlike Bluetooth or wireless USB devices, ZigBee devices have the ability to form a mesh network between nodes. Meshing is a type of daisy chaining from one to another device. This technique allows the short range of an individual node to be expanded and multiplied, covering a much larger area. The information is transmitted using ZigBee technique. The project is built around the pic micro controller. This micro controller provides all the functionality of the display and wireless control. It also takes care of creating different display effects for given text. The LabVIEW is also used as a graphical user interface in this system. LabVIEW is a highly productive development environment for creating custom applications that associate with real-world data or signals in fields such as science and engineering. The message can be transmitted to multi point receivers. At any time, the user can add or remove or alter the text according to his requirement. There is also user authentication in system used to avoid order to avoid any misuse in the system.

Index Terms— ZigBee, LabVIEW, Bluetooth

I. INTRODUCTION

Wireless technology has a tremendous progress over the past few years. The ever-increasing use of wireless networks serves as an indicator of the progress in the area of wireless networks. The demand for wireless technology not only increases in industrial applications but also in domestic applications. Some benefits of wireless technology are

Completes the access technology portfolio: customers uses more than one access technology to service various parts of their network and during the migration phase of their networks, when upgrading occurs on a scheduled basis. Wireless enables a full access technology portfolio to work with existing dial, cable, and DSL technologies.

Goes where cable and fiber cannot: the built-in nature of wireless is that it doesn't require wires or lines to accommodate the data / voice / video pipeline. The system will carry information across geographical areas that are prohibitive in terms of Distance, cost, access, or time.

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Involves reduced time to revenue: companies can generate revenue in less time through the deployment of wireless solutions than with comparable access technologies because a wireless system can be assembled and brought online within two to three hours.

Provides broadband access extension: wireless commonly both competes with and complements existing broadband access. Wireless technologies play a major role in extending the reach of cable, fiber, and DSL markets, and it does so quickly and reliably. It also provides a competitive alternative to broadband wireline or provides access in geographies that don't qualify for loop access.

In our project we have used the ZigBee wireless technology to allow the authenticated user to send the receiver Xbee number along with the message to be displayed. This information are then processed by the receiver Xbee and PIC micro controller the print the message on the LED running display board and LCD display.

II. PROPOSED WIRELESS NOTICE BOARD

A. Power Supply

The power supply circuit as shown in the below Fig 1 gives a high-level view of the working of a "regulated power supply".

Components of a typical linear power supply
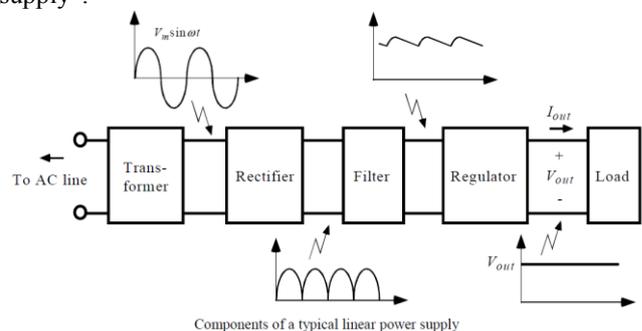
Fig. 1 Regulated Power Supply

1) Transformer

The transformer contains two huge copper coils, one in between the two terminals of the input power supply and other in between the two terminals of the output. Here we use a step-down transformer which is used to convert high voltage to low voltage. The number of turns of the coil will determine the voltage supported at input and output both.i.e.

$V_{in}/V_{out} = N_{in}/N_{out}$ V_{in} = Input AC voltage

V_{out} = Output AC voltage

N_{in} = Number of turns in the input terminal

N_{out} = Number of turns in the output terminal

2) Rectifier

The rectifier converts the AC voltage output of the transformer to a DC voltage. It just reverses the polarity of one half of the period of the AC signal. This will make both

period have the same polarity. Here we use a full wave bridge rectifier to convert the AC signal to DC. As show In the Fig.2 below
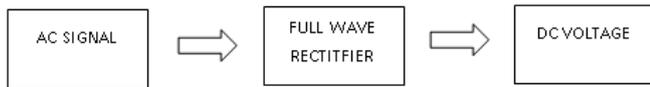
Fig. 2 Rectifying the Supply

3) Filter

The output of the rectifier is DC, but hardly constant. So, we use capacitive filter to smoothen the output as shown in the Fig.3. In this example, we are using a simple low pass filter at the output of the rectifier, but in real life, higher order filters may be used, which would give a much more smoother output.
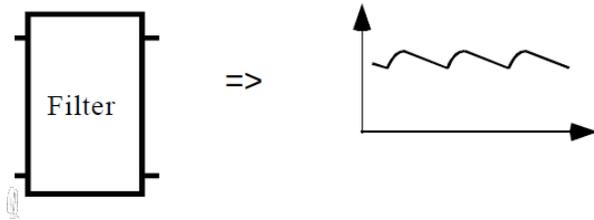
Fig.3 Filter Sample

4) Regulator

The filtering significantly smoothens the output of the rectifier, but even after that small ripples remain. If we use this directly to charge our phones, the constant fluctuation in the voltage may damage the device. It is very important to have a constant output voltage with low fluctuations. This is where the regulator stage kicks in.

Here we have used a simple Zener diode based regulator. The tendency of a Zener diode is to have a fixed voltage between two terminals when reversed biased. So when input voltage to Zener diode changes, the current through the zener diode also changes inversely. This regulator is quite simple to create, but it is that it wastes a lot of power. So, the cell phone chargers typically use IC voltage regulators, such as IC 7805, IC 7806, IC 7812 etc.

5) 5v Power Supply Circuit Diagram

From the Fig.4 show that 7805 is used as a 5V fixed three terminal positive voltage regulator IC. The IC has features such as safe operating area protection, thermal shut down, internal current limiting which makes the IC very rugged. Output currents up to 500mA can be drawn from the IC provided that there is a proper heat sink. A 12V transformer steps down the main voltage, 500mA Bridge rectifies it and capacitor C1 filters it and 7805 regulates it to produce a steady 5Volt DC. The circuit schematic is given below.
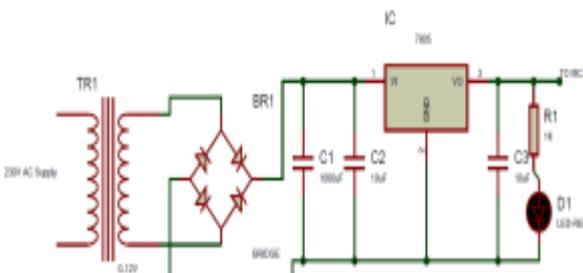
Fig.4 Power Supply Circuit Diagram

B) PIC Microcontroller

Peripheral Interface Controllers (PIC) is one of the latest microcontrollers developed by microchip technologies. These controllers are more advanced than normal microcontroller like INTEL 8051. Check out the following node links for an overview of the history of Microchip and PIC microcontrollers. It offers four families of PIC microcontrollers, each designed to be address the needs of different designers.

- Base-Line: 12-bit Instruction Word length
- Mid-Range: 14-bit Instruction Word length
- High-End: 16-bit Instruction Word length
- Enhanced: 16-bit Instruction Word length
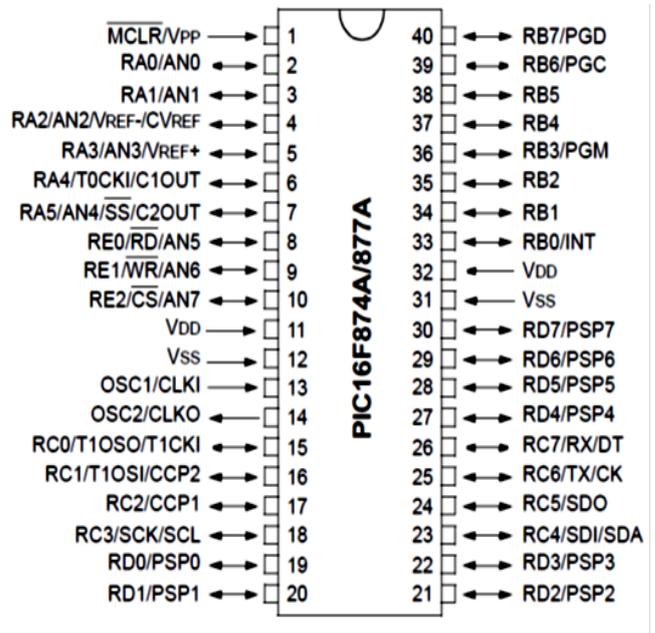
Fig.5 PIC 16F877A Pin Diagram

C) XBEE MODULE

1) ZigBee Protocol

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks it's shown Fig.6. ZigBee devices are often used in mesh network form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones. This allows ZigBee networks to be formed ad-hoc, without centralized control or high-power transmitter/receiver able to reach all of the devices. Any ZigBee device can be tasked with running the network. ZigBee targets on applications that require a low data rate, long battery life, and secure networking. ZigBee has a defined rate of 250 Kbit/s, best suited for periodic or intermittent data or a single signal transmission from a input device or sensor. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other industrial and consumer equipment that requires short-range wireless transfer of data at relatively low rates. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth or Wi-Fi.

Fig.6 ZigBee Module

A comparative study of the several wireless technologies is shown in Table I

Table I
Comparison of Wireless Technologies

	ZigBee	**Bluetooth**	**Wi-Fi**
Standard	IEEE*802.15.4	IEEE 802.15.1	IEEE 802.11 a,b,g
Network topology	All	Star	Medium depended
Data rate	250Kbps	725Kbps	10-105Mbps
Range	10-300m	10m	10-100m
Max.nodes	65,000	8	32

2) CC2500 RF Module

It is a trans receiver module which provides easy to use RF communication at 2.4GHz. It can be used to transmit and receive data at 9600 baud rates from any standard sources such as CMOS/TTL. This module is a direct line in replacement for were serial communication it requires no extra hardware and no extra coding to work in Half Duplex mode

3) Features
- Supports Multiple Baud rates (9600)
- Works on ISM band (2.4 GHz)
- No complex wireless connection software
- Designed to be as easy to use as cables.
- No external Antenna required.
- Plug and play device.
- Works on 5 DC supply.

4) Specifications
- Input Voltage - 5Volts DC
- Baud Rate - 9600
- TTL Interface & RS 232 Interface
- Range - Max 30 Meters - Line of Sight
- Channels - 3 Ch - JP1 & JP2 - Ch 1 On – On

Channel Setting - If we need to use More than 2 Xbee in the same place So we can set in Different Channels - settings Given Below - JP1 and JP2 is nearby Chip in BOT Layer PCB. The table II shows the multichannel details below.

Table II
Multichannel Details

CHANNELS	JP1	JP2
CH1	OFF	OFF
CH2	ON	OFF
CH3	OFF	ON

5) Applications
- Wireless Sensor Network.
- Wireless Device Control.
- Wireless Data Transfer.
- Wireless Energy Metering.
- Home Automation.

ZigBee Interfacing to PIC16F877A

Fig.7 ZigBee Interfacing to PIC16F877A

From the Fig.7, It shows the ZigBee interfaced with Pic 16F877A.The 25th pin and 26th pin of Pic reperesnts the TX and RX respectively are connected to the ZigBee RX and TX respectively.

D) LED Display
Display accepts simple string through UART and implements scrolling of the text on LED Matrix display. We can connect microcontrollers directly to update the string or connect to PC to send string and scroll. It supports various scrolling speeds. It even supports static display of text without scrolling. Format for sending string is very simple and it can accept maximum of 255 characters (ASCII text). We have provided sample source code for testing with microcontroller as well as details on testing with PC terminal software. A LED display board is show in the Fig.8 below

Fig. 8 LED Display

1) Features
- 48x8(384 LEDs) 5mm dot size LEDs in Matrix format (8 LED height and 48 LED width).
- Operates at 5V (800mA max current).
- Can connect directly to microcontroller or PC via RS232/USB.
- Many Scrolling speed available.
- Static display of characters without scrolling is possible.
- Internal buffer for 255 characters display.
- Sample source code for microcontroller to quick start wer application.

2) Pin outs
There are just three pins to use the display as shown in the Fig.9.

- **RX-IN = Receive Input** :
  Input serial data of 3-5V logic level, connected to TXD pin of microcontrollers / PC / RS232.
  Note: Do not connect this pin to direct PC serial port without MAX232.
- **+5V** = Power Input: Regulated 5V supply input. Current has to be capable of at least 800mA.

- **GND** = Ground level of power supply. Must be common ground with microcontroller.
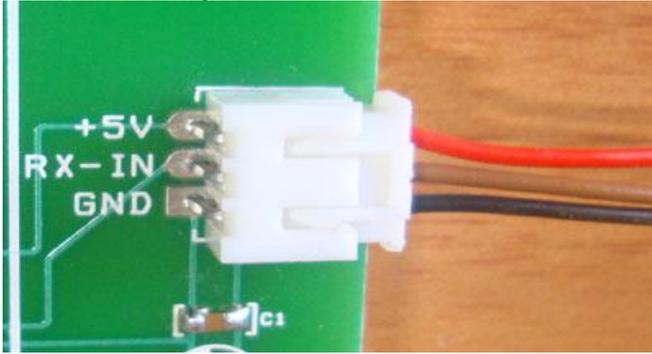
Fig.9   Pin outs

3) Specification

- Operating Voltage: Regulated +5V supply required.
- Operating Current: 800mA Peak - When all LEDs turn on the display takes 800mA, so have a provision of that much current. If no LEDs are turned on the display take around 100mA.
- Communication Baud Rate: This is the baud rate the board accepts as serial input string 9600 – 8 bit data – No parity – 1 stop bit – Handshaking NONE.
- Serial Input, It accepts Serial input baud rate from 3-5V voltage level. Can connect directly to any microcontroller TXD pins.
- Volatile Memory: The display has internal memory of 255 characters. When display turned off, the memory will be cleared.
- LED Dots: Width is 48 LEDs across Height has 8 LEDs.
- All LEDs are made on for a brief moment (1sec) during power up so we can test the display.
- Board Dimensions: 362 x 72 mm.

E)The LabVIEW Environment:

LabVIEW programs are called **V**irtual **I**nstruments, or VIs, because their appearance and operation imitate physical instruments, such as oscilloscopes and mustimeters. LabVIEW contains many set of tools for acquiring analyzing, displaying, and storing data, as well as tools to help we troubleshoot wer code.

When opening LabVIEW, we first come to the "Getting Started" window as shown in the Fig.10.

Fig.10 LabVIEW Starting Window

In order to create a new VI, select "Blank VI" or in order to create a new LabVIEW project, select "Empty project". When we open blank VI, a new or an untitled front panel window appears. This window displays the front panel which is one of the two LabVIEW windows we use to build a VI. The other window contains block diagram. The the front panel and the block diagram are described in the following sections.

1) Front Panel

When we have created a new VI or selected an existing VI, the Front Panel and the Block Diagram for that specific VI will appear as shown in the Fig.11.

Fig.11 Front Panel Window

In LabVIEW, we build a user interface, or front panel, with controls and indicators. Controls are push buttons , knobs, dials, and other input devices. Indicators are LEDs , graphs, and other displays. We build the front panel with controls and indicators, which are the interactive input and output terminals of the VI, respectively. Controls simulate instrument input devices and supply data to block diagram of the VI. Indicators simulate instrument output devices and display data the block diagram acquires or generates.

2) Block Diagram

After we build the user interface, we add code using VIs and structures to control the front panel objects. The block diagram contains this code. In some ways, the block diagram resembles a flowchart.
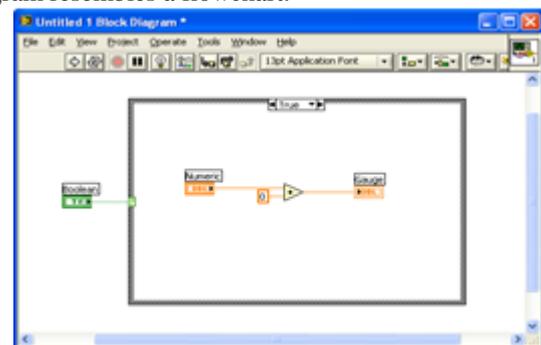
Fig.12 Block Diagram Window

After we build the front panel, we add code using graphical representations of functions to control the front panel objects. The block diagram contains this graphical source code. The objects in Front panel appear as terminals, on the block diagram. Block diagram objects include terminals, sub VIs, functions, constants, structures, and wires, which transfer data among other block diagram objects. The Fig.3.6. Shows a corresponding block diagram with front panel and block diagram components.

3) LabVIEW Web Publishing

Web publishing tool from LabVIEW allows simultaneous access from different remote computers to e-laboratory .

With LabVIEW, we can operate were front panel on a machine that is separate from where the VI resides and executes. Furthermore, we can embed the front panel into a web page and operate it within that page. All that is required on the client machine for executing in a web page is a browser and the LabVIEW run-time engine and browser plug-in.

Easy remote panels are to configure and use. There are two steps:
1. Enable the LabVIEW Web Server on the server machine.
2. Connect and execute remote panels on the client machine.
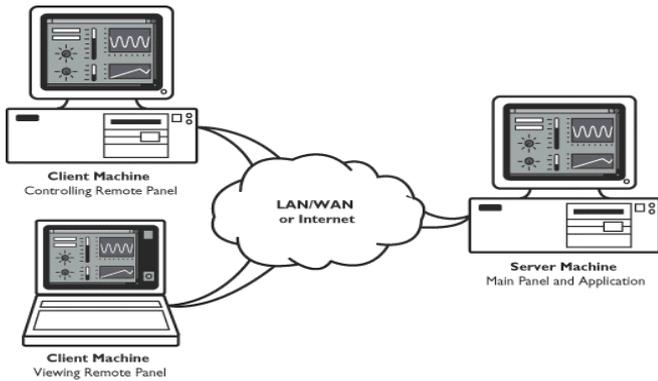
Fig.13   LabVIEW Web Publishing

The Fig.13 shows the LabVIEW web publishing, the GUI can be accessed form the internet by providing the GUI web address.

III. OPERATIONAL SEQUENCE BLOCK DIAGRAM
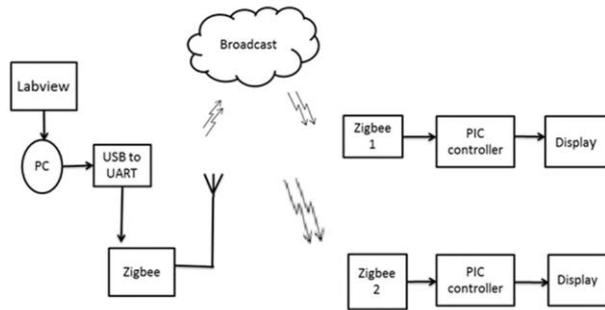
Fig.14 Block diagram

The working of the project begins with LabVIEW the authenticated user sends the data to be displayed to the serial port where the transmitter ZigBee is connected as shown in the Fig 14. The user can select the port number and the baud rate from the combo box menu in the ZigBee application. In the fig.15 shows Transmitter module The broadcasted message is received by the receiver ZigBee in the same personal network which is given to the PIC for processing. Fig.16 and 17 shows the received message consist of two parts the ZigBee to be displayed and the message to be displayed. The PIC RC7 pin are connected to the Rx pins in the ZigBee shield .It looks for the ZigBee number and then filters the message to the LED dot matrix display and LCD display.
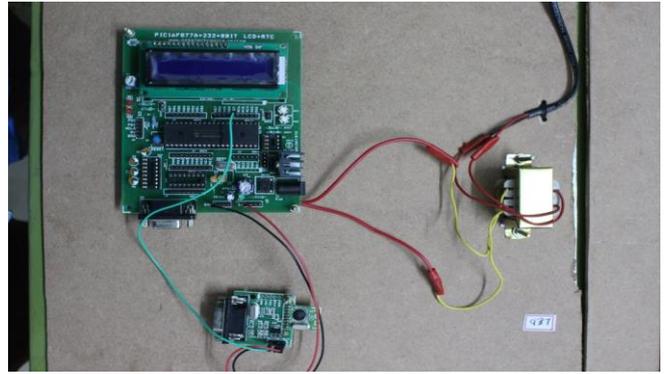
Fig.15 Transmitter module
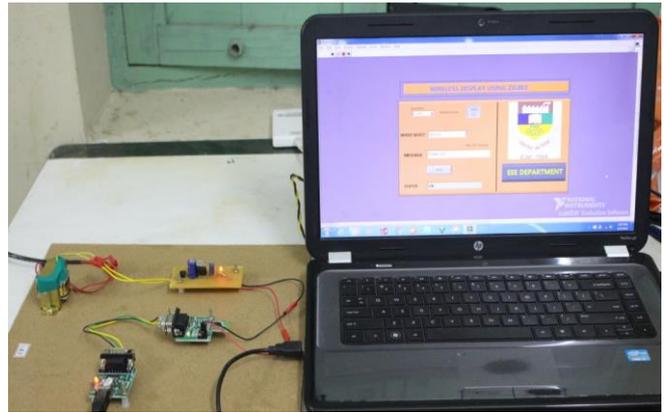
Fig.16 Receiver LCD Module

The data to be displayed goes from the data pin RC6 of the PIC to enable the seven rows of the dot matrix display using the 1:8 demultiplexer IC. The other data lines are used to enable the columns of the dot matrix display via 1:16 demultiplexer.

The circuit comprises of 1 of 8 demultiplexer 74LS138, octal tristate buffer 74LS244, 1 of 16 demultiplexer, transistors and five 5*7 dot matrix displays. Discrete LEDs can also be used in a matrix format to make an alphanumeric display, with each diode representing a pixel. However, it is advantageous to use a 5*7 matrix display which can be obtained in a single package.

The supply is provided through the DC battery. The 1 0f 8 demultiplexer provides ground path to the cathodes of all the LEDs of the dot matrix display through inverters and transistors by using time division multiplexing technique. The outputs of 1 of 8 demultiplexer are inverted by NOT gates and fed to transistors.
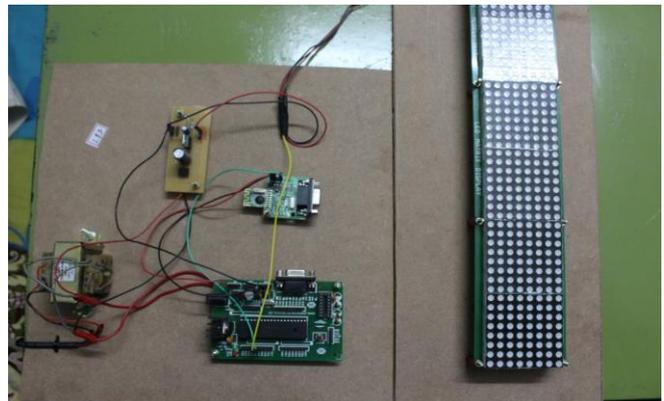
Fig.17 Receiver LED Module

IV. WORKING

The LabVIEW is used as the graphical user interface. (Fig.18 show the shows user window, it is contain Device select option, Message box and Status box)There are 2 parameter where the user have choice .The first one is Serial port of the connection given to ZigBee transmitter And next parameter is to choice which LED or LCD to be operated .As per the ZigBee protocol the transmission side will transmit the signal to both the ZigBee, The both ZigBee will accept the same signal and process to display the data .In order to avoid this both the ZigBee are provided with key switch /character such as +,- .Different key are provided to the two ZigBee, In the transmission side the key switch are provided to determine which displayed should be turned on.

The next parameter to be filled is the display message. The message can have maximum number of 20 characters.Character exceeding more than 20 will not be accepted. When the user fill these parameter and click the send, a user login dialogue will be popped up ,only authenticated personnel will have the password as to avoid the misuse.(Fig.19and Fig 20 shows the user login authentication window)

A status window is also given in the GUI to provide whether the message as been send to the display board. Fig.21 shows status message while the message is send or not.

Fig.18 Front Line Window
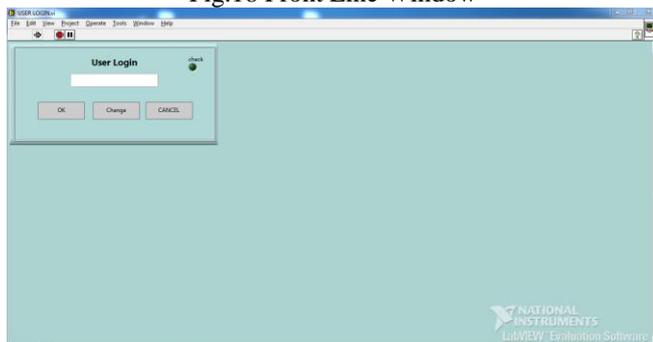
Fig.19 User Login for Authentication
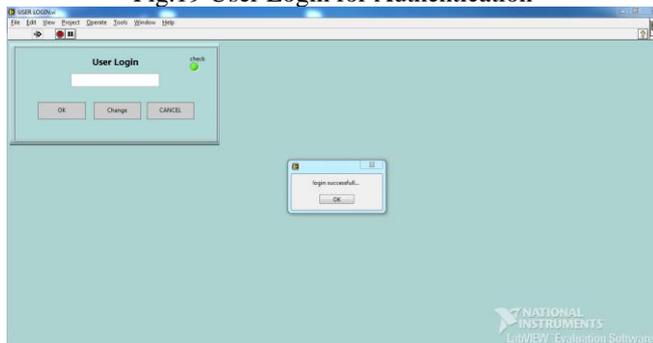
Fig. 20 Verified the Authentication

Fig. 21 Status message
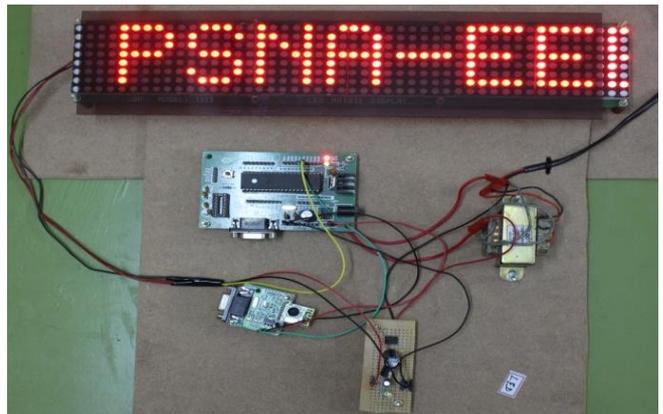
Fig .22 LED Output.

2) LCD Output:

The Fig.22 shows the LED output as PSNA EEE when the User selects the device as EEE303.

V. CONCLUSION AND FUTURE SCOPE

Hence the display boards for selective message display were designed and implemented using ZigBee protocol and the Pic Microcontroller PIC16F877A. Also, a graphical user interface using the Lab VIEW was developed to facilitate the user. It also provides user authentication in order to avoid any misuse of proposed system and the range for transmission can be increased by forming the mesh network. Therefore, it provides a better reliable and secure system than the conventional methods.

Wireless operations permit services, such as long-range communications, that are impossible or impractical to implement with the use of wires. It provides fast transfer of information and is cheaper to install and maintain. This paper provides an efficient way of displaying messages on one or more Display Board using Wireless Technology. It also provides user authentication in order to avoid any misuse of proposed system.

The design can be extended to form a mesh network which links all the display boards of an institution or an industry to increase the range of communication between the coordinator and other end users. The LED module can be attached chargeable battery. Moreover the data send can be stored in the display by external EPROM. The whole process can be monitored by using LabVIEW web publishing tools.

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