Wireless Data Transfer

Zarna Parekh
U.G. student
Electronics and
Telecommunication
Department, DJSCOE, Vile-
Parle (W), Mumbai.

Hansal Shah
U.G. student
Electronics and
Telecommunication
Department, DJSCOE, Vile-
Parle (W), Mumbai.

Shivani Bhattacharjee
Assistant Professor
Electronics and
Telecommunication
Department, DJSCOE, Vile-
Parle (W), Mumbai.

ABSTRACT
ZigBee notice board is a type of wireless board which can be used for displaying message at public places. The main reason for using ZigBee is because it is the only standards-based wireless technology designed to address the unique needs of low-cost and low-power wireless sensor. Also, ZigBee is helping people control their world, save energy, increase convenience and improve the safety of where they live, work and play. The basic purpose of this project is to develop wireless notice board which can be used to display messages within a certain range when sent from the PC . When the User sends the message from the PC, it is received and retrieved by the XBee module at the receiver end and given to micro-controller ATMEGA16 which displays it on the Graphic LCD. As the communication is through ZigBee (XBee) the range of communication is around 300-400m.ZigBee is useful since it saves paper, making it more eco-friendly.

General Terms
Flowchart

Keywords
ZigBee, ATMEGA16, XBEE, Graphic LCD

1. INTRODUCTION
ZigBee notice board is an advanced hi-tech wireless notice board. ZigBee is based on PAN technology which has the ability to form a mesh network between nodes. This allows the short range of an individual node to be expanded and multiplied, covering a much larger area. The ZigBee used in this project is of Digi Company and operates at a frequency of 2.4GHz. The project is built around the ATMEGA16 micro controller from Atmel. This micro controller provides all the functionality of the display, wireless control and creating different display effects for given text. The ZigBee module is interfaced with the PC. The message can be transmitted to multi-point receivers. It uses regulated 5V, 1A power supply. 7805 three terminal voltage regulator is used for voltage regulation.

2. BLOCK DIAGRAM
2.1 Transmitter

2.1.1 PC
The data is in the form of an image. This image has to undergo few image processing techniques in order to get a final black and white image of 128 x 64 resolution. This is achieved with the help of MATLAB which is in the PC.

2.1.2 XBEE Explorer

XBee Explorer provides the base for the ZigBee. The data from the PC is transmitted using COM PORT to the explorer and then to the ZigBee.

2.1.3 ZigBee
ZigBee is used for wireless communication. The data is then transmitted as it is from the ZigBee to another ZigBee in the receiver section. The baud rate is 115200.
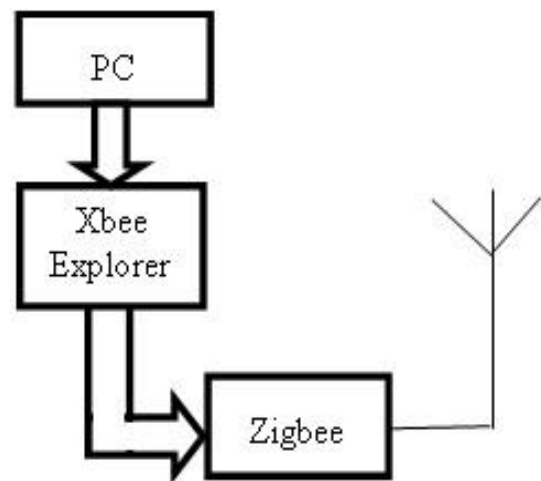

Fig 1: Transmitter Block Diagram

2.2 Receiver

2.2.1 ZigBee
The receiver ZigBee accepts the data from the transmitting ZigBee and is given to the microcontroller ATMEGA16. For proper communication it is essential that both the ZigBee must be adjusted to the same baud rate i.e. 115200.

2.2.2 Power Supply
Micro-controller needs power supply to operate. Thus the power supply provides 5 volts dc supply

2.2.3 Microcontroller ATMEGA16
ATMEGA16 is a 16KB micro-controller. The data from the receiving ZigBee is given to the micro controller. The micro-controller decides whether to print white or black pixel on the GLCD depending on the data received.

2.2.4 Rest and Crystal
The RESET pin is used to reset the controller. A 16MHz crystal oscillator is required by the controller to execute its operation.
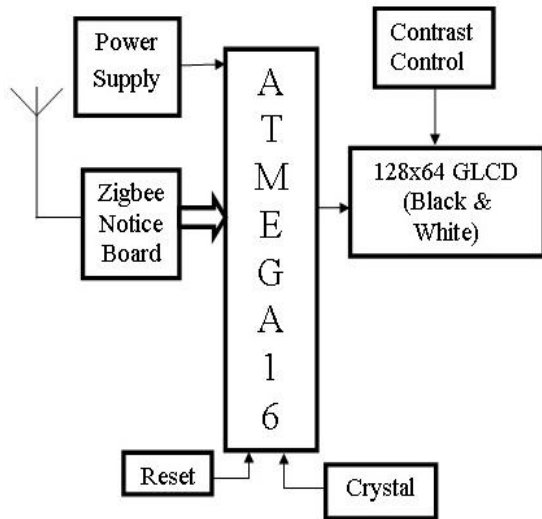
Fig 2: Receiver Block Diagram

2.2.5 Contrast Control

In order to adjust the brightness of the GLCD, contrast control is used. This contrast is achieved using a variable potentiometer.

2.2.6 128 X 64 GLCD (Black And White)

GLCD screen of 128x64 resolution is used to display the image that is being transmitted through the ZigBee. An exact replica of the original image should be obtained on GLCD if there is no disturbance in the communication path.

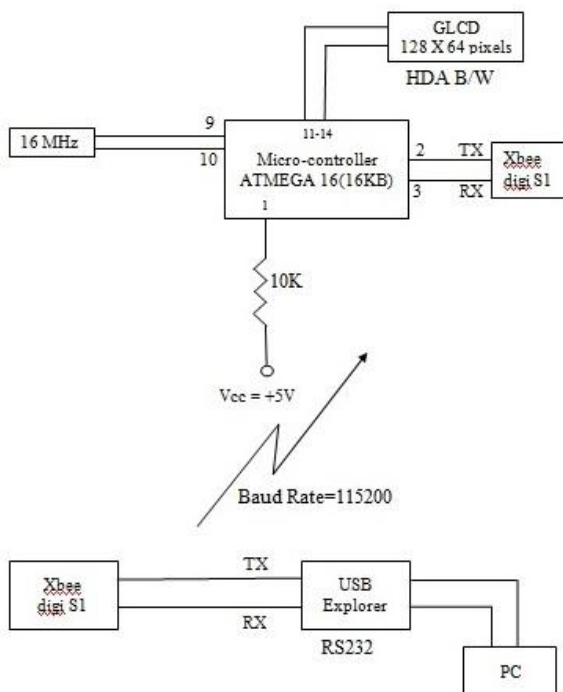## 3. WORKING OF ZIGBEE NOTICE BOARD

Fig 3: Circuit Diagram

In this circuit, the microcontroller ATMEGA16 of 16KB memory is used with help of 16MHz crystal connected across pin number 9 and 10 and a reset pull up at pin number 1

which pulls up to V_{cc}=+5V. An XBee shield is connected for reception of the data and its TX and RX pins are connected across pin number 2 and 3 of ATMEGA16 respectively. GLCD used is 128 x 64 pixels and connected across 11 and 14 pins.

We are transmitting via USB explorer which converts USB port to RS-232 communication which again has RX and TX pins which are connected to XBee's TX and RX pins respectively. The MATLAB program on the PC sends the data to the USB, USB to RS-232 and then to XBee which is transmitting at PAN ID 31 at baud rate of 115200 to other XBee.
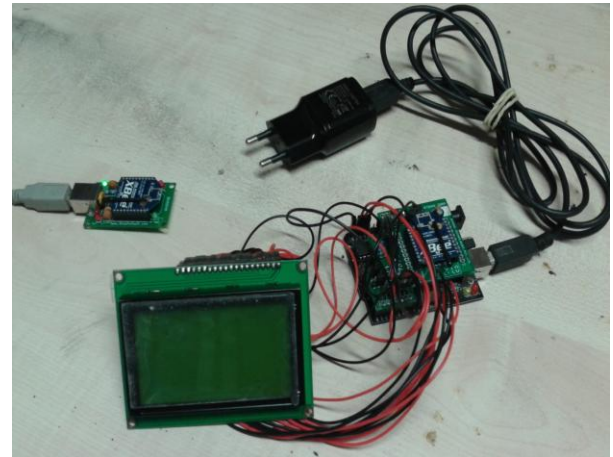

Fig 4: Project hardware

Further, the MATLAB program in the PC reads the image. If the image is colored then it will convert it into Black and White and if the image is already Black and White it is converted to 128 x 64. Thus, the colored image is converted to gray scale and then to Black and White. Now, the Black and White image means only '0' and '1' and for gray image it is between 0 to 255. All the values above and equal to 128 is considered to be '1' whereas the values below 128 is considered to be '0' and in this way you convert gray image to Black and White image.
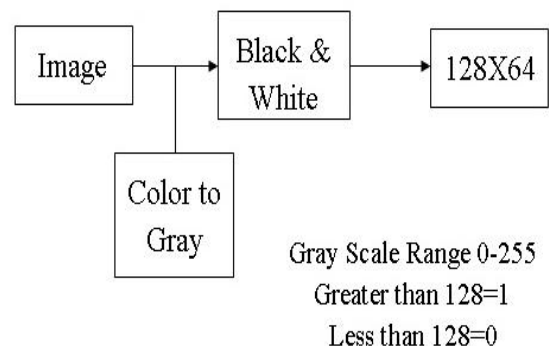

Fig 5: Image color conversion

Once the data is processed using few image processing techniques in MATLAB, it is then compiled before it starts to execute. The data is in the form of an image. During execution, each pixel of the image is compared with binary 1 or 0. If the binary value corresponding to the first pixel is 1, then binary 1 is given to USB COM port and then to the transmitting XBee. This XBee will transmit the data as it is to the receiving XBee. The XBee at the receiver transmit the

data to the micro controller. The baud rate of the transmitting and receiving XBee is 115200. The micro controller is coded in such a way that if binary 1 is received then it prints a white pixel at the corresponding pixel else if binary 0 is received then it will print black pixel. At a time only one pixel value can be transmitted and received. This process goes on until the entire image (i.e. from first pixel to the last pixel) has been read.

4. FLOWCHART
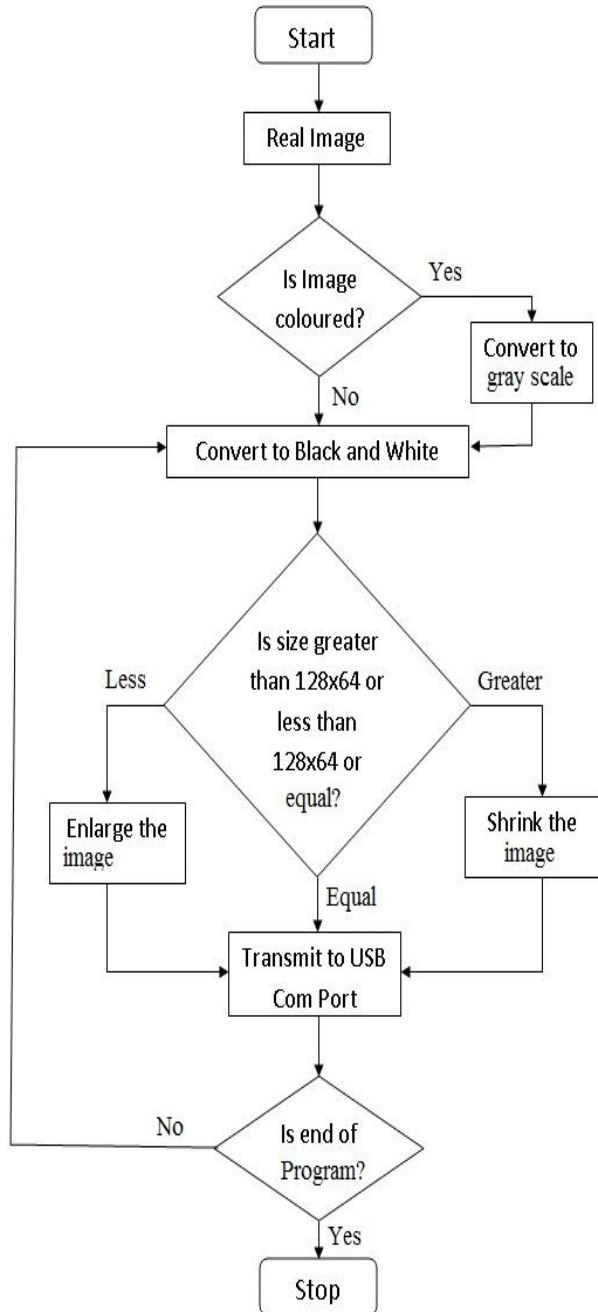### 4.1 Flow Chart for Matlab Program

Fig 6: Flowchart for MATLAB Program

The flow chart of MATLAB program can be described as: the execution starts by reading the image, then it checks whether the image is colored or not, if yes convert it to gray scale and

then into Black and White or else directly into Black and White image. The Black and White image is finally obtained. Then it checks for size whether it is greater than 128 x 64 or less than 128 x 64 or equal. If it is equal to 128 x 64, the image is directly transmitted to USB COM port from where XBee module is connected. If it is greater than 128x64 then it will shrink or if it is less than 128x64 it will enlarge. Thus, finally we get an image of 128 x 64. Then the program checks the last image if it is yes then it will stop the execution else it will read the new image and continue the above process.

4.2 Flow Chart for Arduino Program
For the controller coding the flow chart is as follows: it starts by receiving a data from XBee. Checks whether the new data received is '1' or '0'. If it is a '0' it will it will print a black pixel at corresponding co-ordinate on the GLCD whereas it will print a white pixel if the data received is '1'. Further it checks if any new data is available. If yes then it will repeat the same procedure as mentioned above. However the program will stop once the data is received in printed on the GLCD.
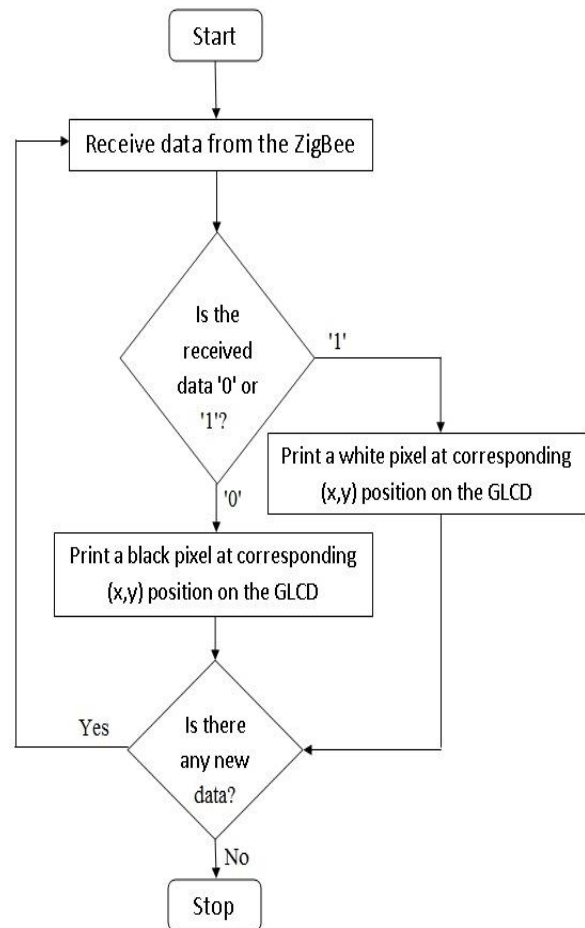

Fig 7: Flowchart for Arduino Program

5. RESULT
The result obtained on connecting the circuit as shown in the above figure we get various outputs. The various outputs were recorded and are as shown below:
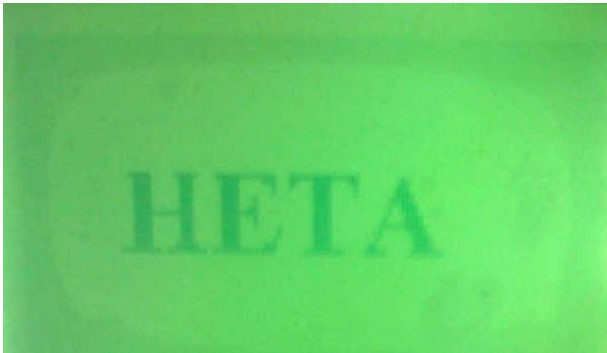
Fig 4: Output 1

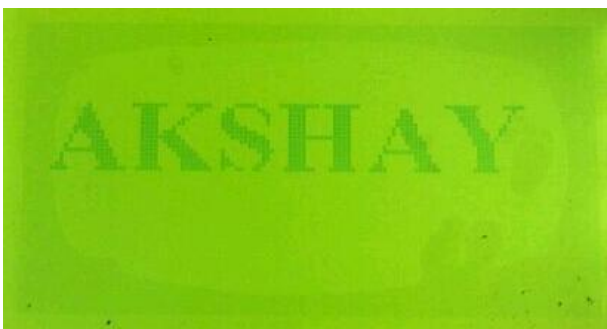

Fig 5: Output2

Fig 10: Output 3

Fig 11: Output 4

Fig 12: Output 5

6. APPLICATION

1. At schools, colleges for displaying assignments.
2. Public places, hospitals, government offices etc.

7. ADVANTAGES

1. Paper free notice board.
2. Secured data. Wireless communication.
3. Recovery of data after power failure.

8. DISADVANTAGES

1. The data may be received by another ZigBee having same PAN-ID.
2. The range is small

9. CONCLUSION

Thus we have successfully transmitted the data in the form of an image from the PC to the GLCD via the ZigBee. ZigBee have a long life time along with low power consumption as compared to Bluetooth and WIFI. Also, by connecting ZigBee in mesh network we can increase the range of communication. The hardware can be implemented on a large scale at various public places like highways, railway and bus station, airports etc.

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11. REFERENCES

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