Software Interfacing for GUI based Robot

Irfan Ahmad Pindoo,

School of Electronics and Electrical Engineering, Lovely Professional University, Punjab, India.

ABSTRACT

Now a day's safety and security are two major perspectives to sustain the human life to check weather human can live in a particular place. Whether that place useful to sustain for human life, so in this situation we are using a robot which can acquire the data which is useful to prepare our self, and it can also use as monitoring purpose in industry where we can decrease the human effort and make prevention to feel the environment as safe and security. So for this project making a GUI based robot which will acquire the various environmental data and send to user. The robot which made for completely the real-time data acquire and send to base station. It is an application based robot so the robot which is used to serve various practical purpose whether domestically, commercially or military.

Keywords: carbon nanotube, scaling, MOSFET, tunneling, CMOS

1. INTRODUCTION

In general, there are various robots are available in market for domestic, commercial or military purpose uses. These robots are come up with various features and ideas to perform specific task. Robot is necessary in 20th century for all purpose like in industry and domestic. Commonly the industry and military are hiring the robot for monitoring the specific areas where the human cannot go and robot can be monitoring, changes in that environment continuously and giving data to engineer with or without guidance of the engineers. Industrial robots are also used in Emergency situation broken out. Currently in market there are various robot coming with different features and function based upon the requirement. But generally all industry or military not using these robots or use very less numbers. Only the Huge industry or greatest army only using it commonly. Reason behind that robots are Much costly and it need much technical supports to maintain so mostly small or medium business industry or army are not preferring it.

Deploy the robot which having much functionality and feature's make the robot much costly as small Industry and Military having less number of resources but we need to maintain the resources, so either military or industrial has a lot of robots to perform professional tasks. And commercial or military robots are don't need much features and function to full fill those small requirements. So if the robot having standard features to perform professional task and which need much less technical supports to maintained as well as less budget then most of industry prefer to buying the robot. So this one of the way encourage the society using the robot and utilizing their usage.

To overcome all these aspects and concern the safety and security. We develop the GUI based data acquisition mobile robot which move to the specific place and acquire the specific data of environment like temperature, humidity and also pressure and also acquire magnetic field and GPS location of the place. Even more it acquires some parameter like acceleration and gyroscope of the robot. This robot having the vision to capture the surrounding and send along with sensors data to base station through the wireless communication with long range or short range. All the acquiring the data and controlling the robot we using the MATLAB GUI. This MATLAB GUI having lot a variation and facility to control the robot and plot the real-time sensor data to analysis the surroundings and it also display the video which capture by robot. Unlike the normal robot which hang on some obstacles, our robot having specific customs design to cross overs the obstacles or avoid the obstacles. This robot being like the tank as major advantage to reach the specific location without any obstacles problem and also more valuable to collecting data [1-6].

2. Software Interfacing

X-CTU:

XBee is the once of the RF module to use to transmit and receive with different frequency. This XBee are giving long range communication and low cost as well as easy implement in out projects. Radio Firmware is the program code store in the Module that provides the control program to the device. This firmware can update or we can use various in WEB.

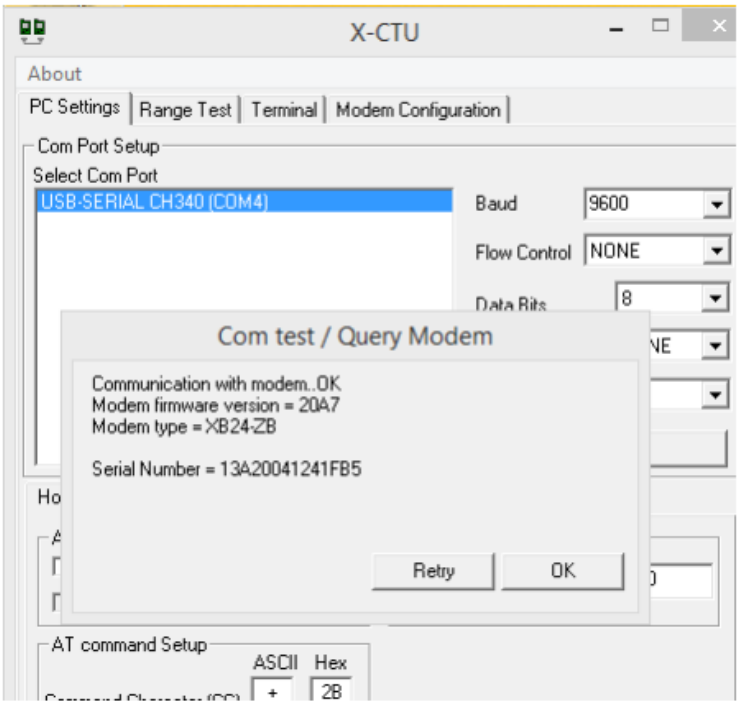


Figure 22 X-CTU UI

Radio Communication Protocol:

Radio communication Protocol is the set of Rule to communicate with other RF devise for exchange the data between them. These are depending on the hardware firmware of the devices to use which protocol. Each XBEE module support specific Communication protocol. Like XBEE Series 2 module using 802.15.4 for mesh firmware (point to multi point). The combination of XBee hardware and radio firmware determines the protocol that an XBee device can execute.

RF Module Operating Modes:

When configure the XBee configure we need to select the Operating modes. The radio modules can work in three different operating modes:

a. AT (transparent) operating mode

b. API operating mode

AT mode: When the XBee is working in AT operating mode then settings are configured as the AT Command mode interface. We can enter the command mode send the 3-character command sequence through the serial interface of the XBee like +++, within one second. Once the AT command mode can be executing then the module sends the reply OK, the command mode timer is started, and the radio module can receive AT commands.

API mode: API is the alternative mode of AT operating mode and API mode is communicate with structured interface or API frames. The API specifies how commands, command responses, and module status messages are sent and received from the module using the serial interface.

API Frames:

If module is configuring as API or API escaped operating modes, then in serial interface with radio module are using API frame to send and receive data.

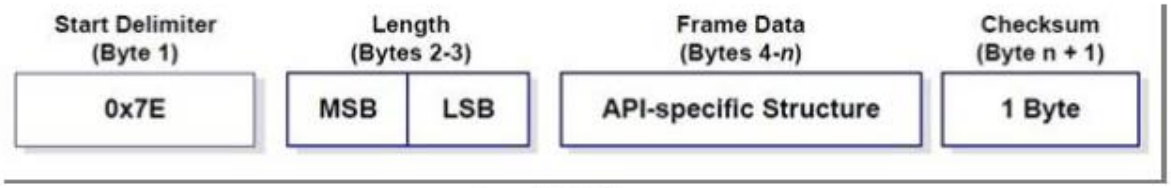


Figure 23 API Frame

a. Start Delimiter is the field and it always in 0*7E.
b. Length of the field is 2byte and it contains number of byte that will in the frame data, but it doesn't include the checksum.
c. Frame data consist of "API identifier" and "API identifier specific data".
d. Checksum which check the frames and add hash sum of API frame bytes

Configuration:

We need the XBee explore to interface with X-CTU or we can use any Arduino board to interface as we discuss before.

A. Test / Query

After connect with pc open the X-CTU software there is the option Test / Query when it clicks the X-CTU software search the XBee module in the computer comport and interface with that. Once interface has successfully done and read the XBee module detail like Serial Number or MAC ID, and which firmware is it. And once selecting it we can configure further.

B. Modem configuration mode

In modem configuration we need to read the XBee configuration details which was write already and when clicks read it will perform read the operations. After the read the XBee module, we need change the parameter to establish communication between the XBee.

C. PAN ID

It gives the Specific ID number to the XBee to connect all the same network of the PAN ID. So if two or more sensors having the same PAN ID then those RF modules form the Network to share.

D. DH and DL

Defining the DH (Destination High) address and DL (destination Low) address, so that XBee can communicate with that range of the MAC address.

E. SH and SL

Defining the SH (serial High) and SL (Serial Low) address also for that within the minimum range to maximum communication Broadcasting will be establish.

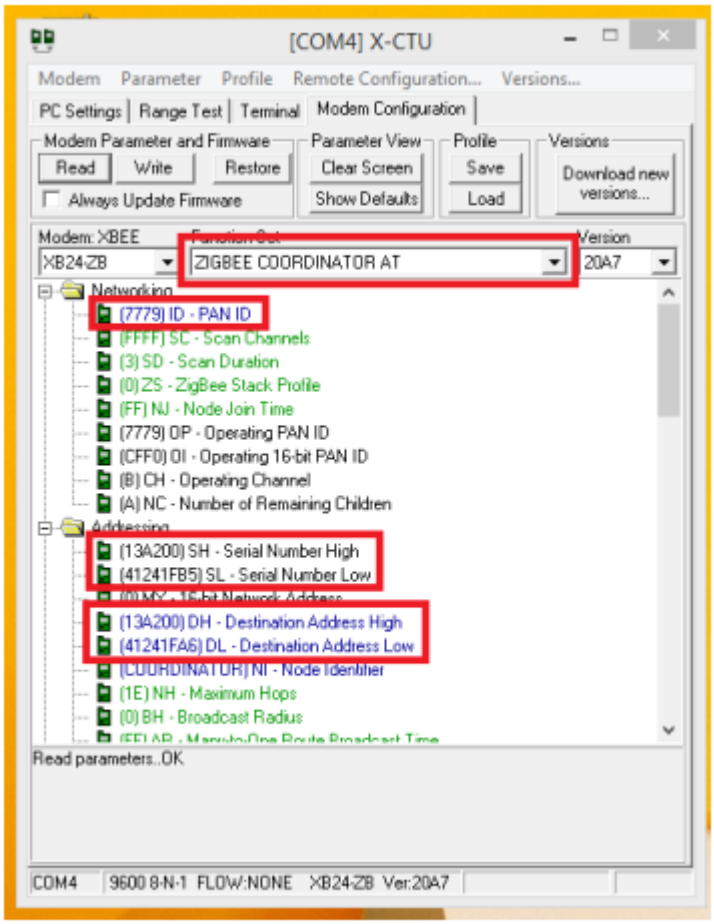


Figure 24 List of Configurations

F. Serial Interfacing

In serial Interfacing with the other XBee module we need to declare few parameters. The parameters are Baud Rate, Parity, Data Bit, Stop Bit etc. So in the Baud Rate should declare and incase if we need any parity to add we can add like Even, Odd, Mask, Space. Data bit should be 8 bit and Stop Bit should be 1 bit.

G.Terminal

After change the parameter we need to write the value to XBee by clicks the write button on configuration mode and it will take few seconds to write. AS do same setting to all the XBee in the Same Network We can check whether communication established or not by using terminals.

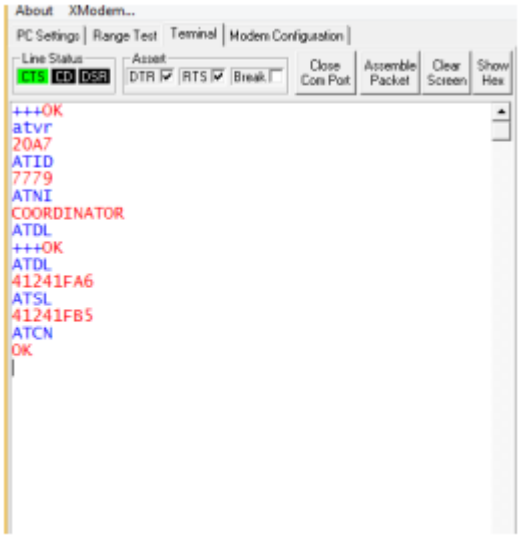


Figure 25 Terminal in X-CTU

Terminal are available in X-CTU software to using AT command on that RF module to communicate with others. Initially we should write +++ into the terminal and it will show OK/r then it works proper then we can execute further command on that to check (Destination High and Destination Low address in XBee we should use ATDH and ATDL are respectively.

Zigbee Nodes:

In XBee protocol having three types of nodes are available which are Coordinator, Router, End device to form the network. To form the complete network at least one coordinator must need and one or more router can have used and end of the network we may add the End devices.

Coordinators: Coordinators are most important one in the XBee node. In the network at least one

coordinators are must need to establish the network and this coordinator are store the information about the network including security key. Coordinator cannot sleep because it stores the End device data and backbone of the network.

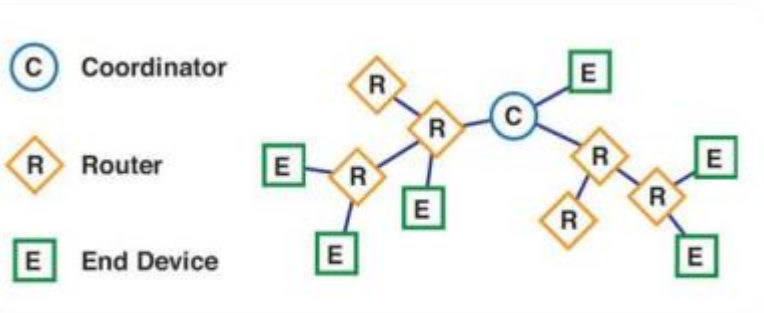
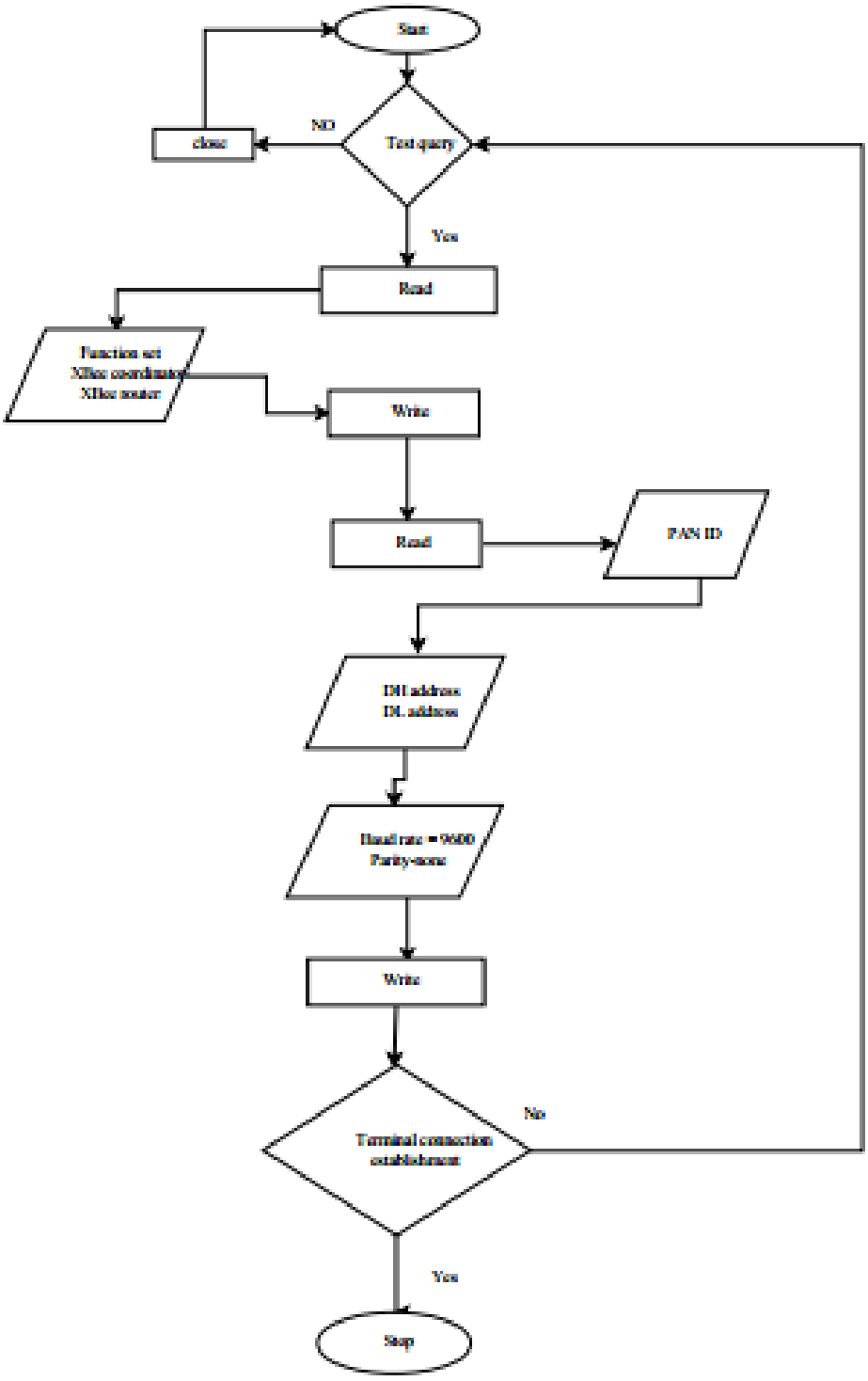


Figure 26 Network Nodes

Router: Router are in between the coordinators and End device as an intermediate note to act like relaying data from other device. Router connect with other device and also coordinator. Router cannot sleep because it stores the frame for the end device and Router are mostly used to extend the networks.

End device: End device are usually sensor to process the data and end device can't be relaying data but it having sufficient function to talk to their parent device and it can sleep.

Flow chart of Zig Bee Configuration:



REFERENCES

[1] V. Altunin, "Wireless Communication and Control of Autonomous Vehicles."

[2] D. S. Simbeye, J. Zhao, and S. Yang, "Design and deployment of wireless sensor networks for aquaculture monitoring and control based on virtual instruments," *Computers and Electronics in Agriculture,* vol. 102, pp. 31-42, 2014.

[3] A. M. Al-Busaidi, "Development of an educational environment for online control of a biped robot using MATLAB and Arduino," in *2012 9th France-Japan & 7th Europe-Asia Congress on Mechatronics (MECATRONICS)/13th Int'l Workshop on Research and Education in Mechatronics (REM)*, 2012, pp. 337-344: IEEE.

[4] Y.-m. Jeong *et al.*, "Method of modifying color composition for a color-blind person in a mobile displaying apparatus," ed: Google Patents, 2013.

[5] A. Deshmukh, H. Wadaskar, L. Zade, N. Dhakate, and P. Karmore, "Webcam based intelligent surveillance system," *Res Inventy: Int J Eng Sci,* vol. 2, no. 8, pp. 38-42, 2013.

[6] A. Kumar, D. Kamboj, J. Choudhary, N. Yadav, and V. Batra, "GUI based Device Controller using MATLAB," *IJSER International Journal,* vol. 4, 2013.