

Real time data acquisition using mobile robot

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ABSTRACT

These days many of the industrial tasks have been carried out with robots that can provide automation in industries. These robots can acquire the data from the environment and work accordingly. For this purpose we have designed a multi-sensor robot which can send any stimulus present in its environment and provide a quick solution to the problem.

Index Terms: Multifunctional Robot, Fusion, Internet Protocol, GPS.

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 provide data for analysis. Adding more functions to a robot will bring more cost but the robot can attain multi-functionality and thereon can be used in variety of industry. To overcome all these aspects of multi-functionality, We have develop the data acquisition mobile robot which move to the specific place and acquire the specific data of environment like temperature, humidity and pressure and and can navigate through magnetic field, acceleration and GPS location of the environment and can balance itself through the use of gyro sensor. 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. The robot has the tendency to work in any-terrain with the help of its well structure wheels with belts. The robot can be controlled and realize data with the help of GUI developed in MATLAB software. This MATLAB GUI having lot a variation and facility to control the robot and can be used for real-time acquisition and data analyzing of various sensor.

2. HARDWARE

Sensors: We have used sensors like pressure sensor, Gyro sensor, Photo sensor, temperature sensor, GPS to enable the functionality of the robot.

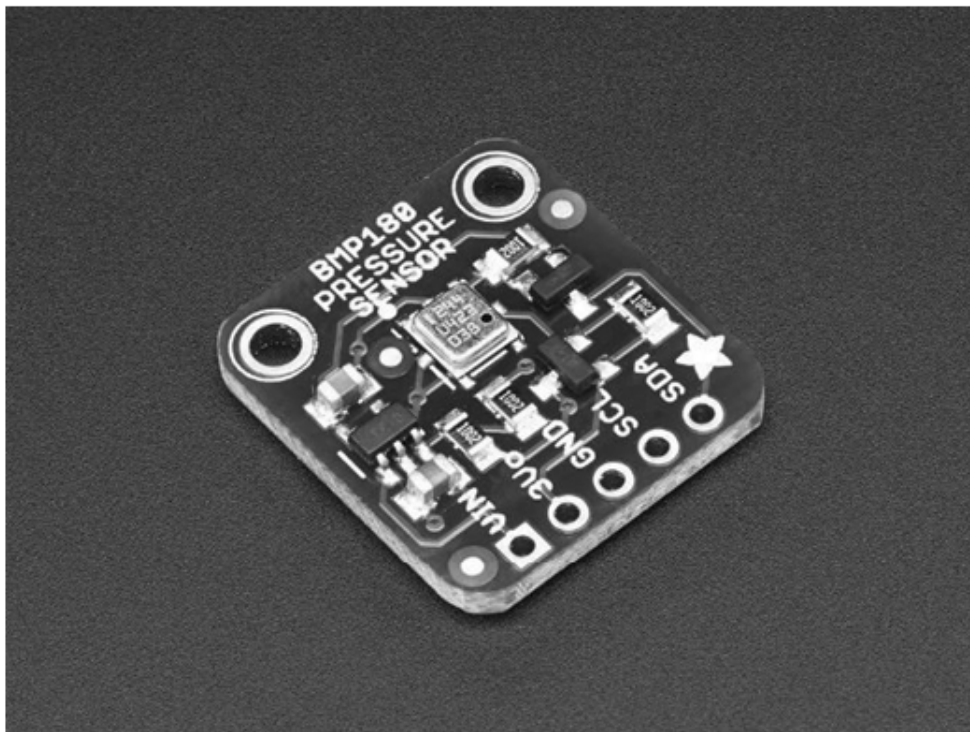
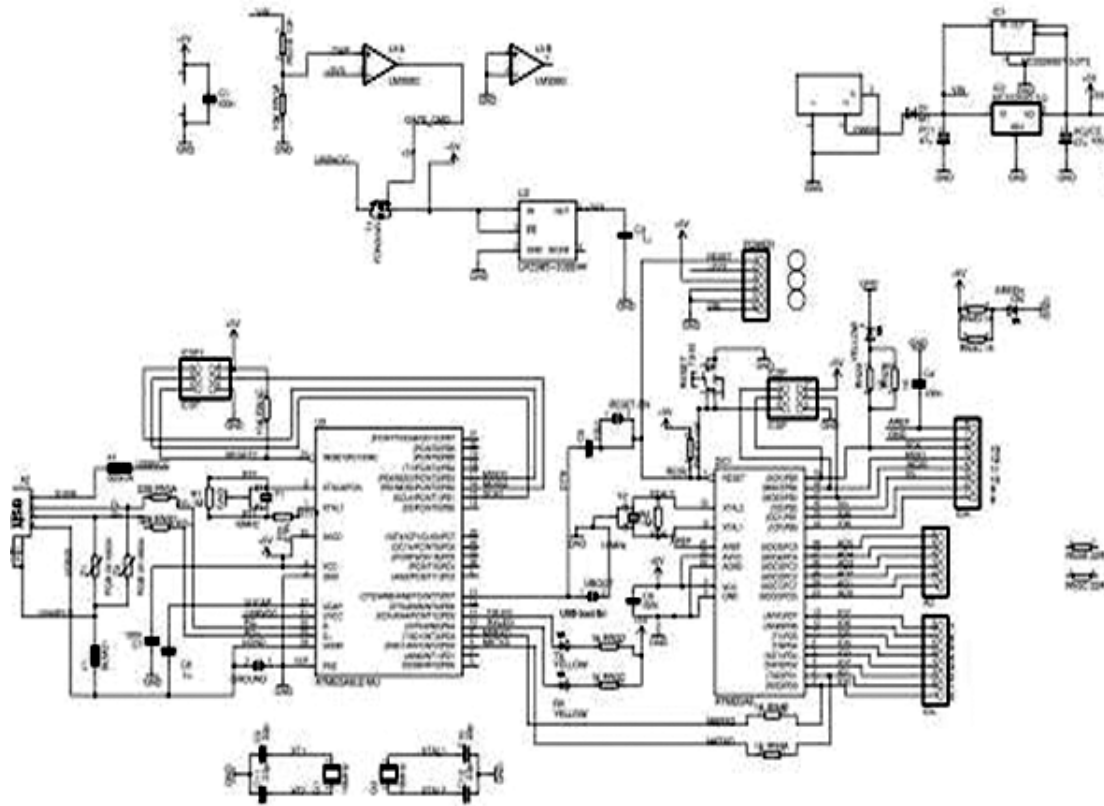
2.1. Pressure sensor

BMP 180 sensor are measuring barometric pressure and temperature. The sensor is has pull-up resistors on the I2C pins. We are using an Arduino, simply connect the VIN pin to the 5V voltage pin, GND to ground, SCL to I2C Clock (Analog 5) and SDA to I2C Data.

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Pressure Sensor

2.1.1. Temperature Sensor

We have used thermistor sensor to measure the analogue temperature inputs from the environment and then transmit to the microcontroller the temperature sensor itself has an analogue to digital converter which contains the digital inputs to the controller and then microcontroller transmits the digital output.

2.1.2. Humidity sensor

It is a sensor which is used to take analogue inputs from the environment and then transferred to the microcontroller it takes the inputs through the environment on the basis of how much humidity is available in the environment, the IC itself has analogue to digital converter and then transmits the analogue to digital converter value to the microcontroller and analyses the output and then display to the user.

This IC has 3 PINS one was voltage supply and the second was data pin and the third was ground pin.

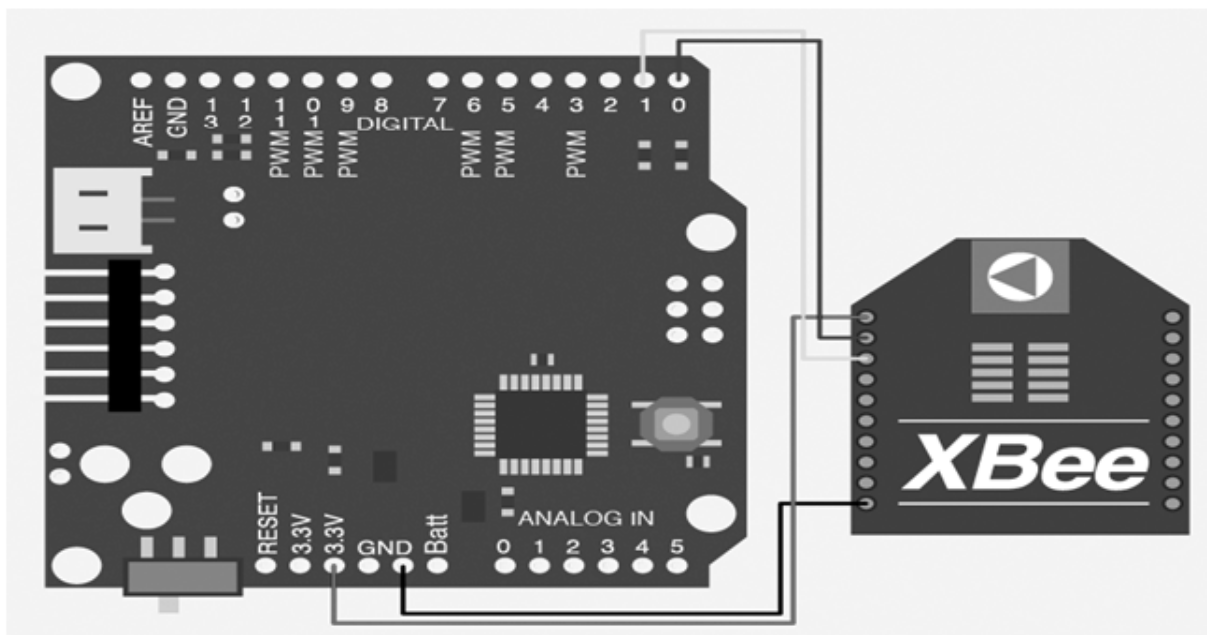
The data pin is responsible for collecting the data from the external environment of how much humidity is containing and passes to the converter and then to the microcontroller then the microcontroller converts the data into the language which is easy understandable by the user.



2.2. Hardware Interfacing

2.2.1. XBEE interface with Arduino

Before interface with Arduino we need two XBEE module to share the data each other's and also configure this two XBEE as point to point communication using X-CTU software. For configure we need the USB Explorer or XBEE adapter interface with pc to further X-CTU. Once configure XBEE Modules and make the hardware connection to controller. Where the controller having Tx and Rx for serial communications.



XBEE having 20 pins where pin 1 is used for the VCC (3.3 V) and pin 10 is used for Ground (GND). The XBEE having two data pins which are Data Out (Rx) and Data Out (Tx). When configure mode of XBEE we can use the Arduino as interface device instead of using USB explorer but in Arduino should not have any programming in IC or better remove the IC. Now XBEE DATA OUT (Tx) is connected to Arduino Tx and DATA IN (Rx) is connected to Arduino Rx. So in this way we can configure the Arduino.

To communication mode Arduino need the serial communication, so initializing Serial communication in Void Setup of the Arduino Program. For communication mode XBEE DATA IN (RX) is connected to Arduino Tx pin and DATA OUT (Tx) is connected to Arduino Rx. So that XBEE and Arduino share the information and shared information will be transmitting to another XBEE device in point to point communication. Transmitting mode always in Broadcasting to so that XBEE in same PAN ID all can receive the data on that network.

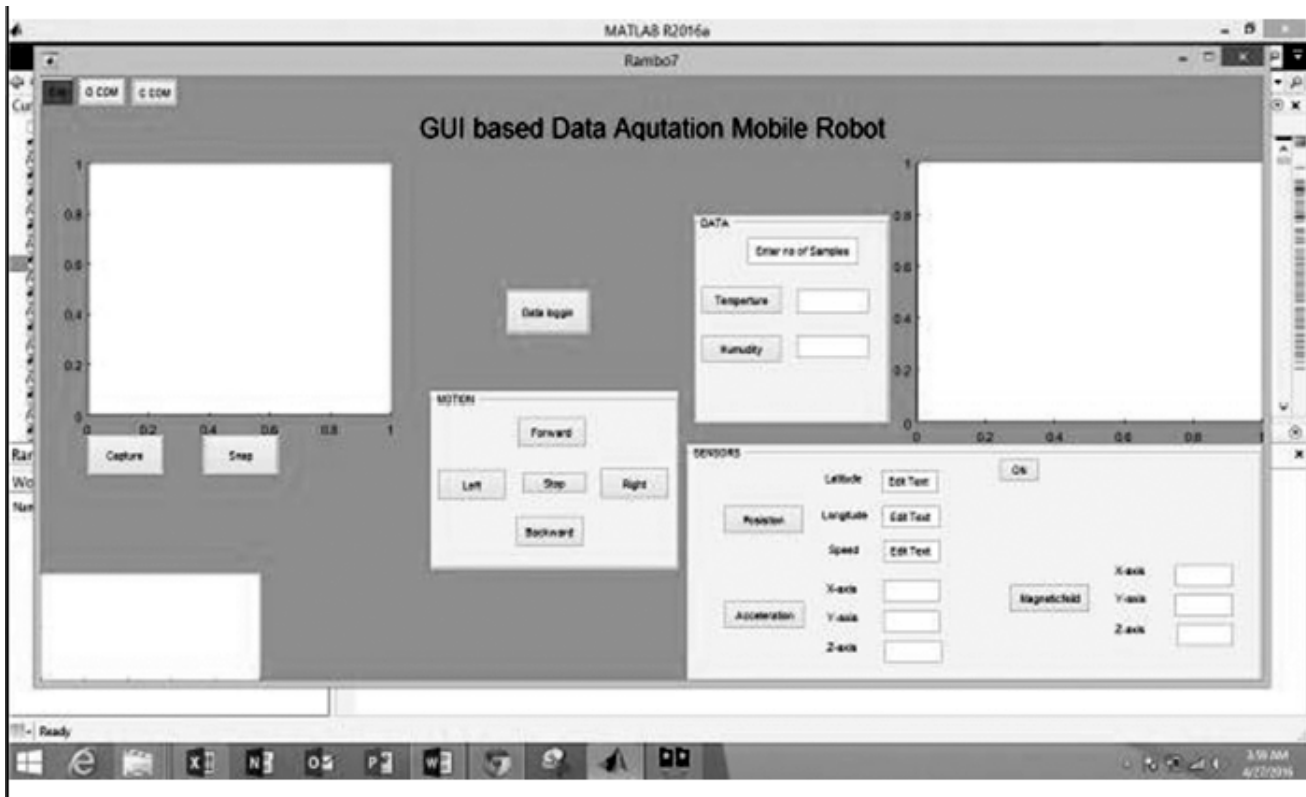
3. MOBILE PHONE INTERFACE WITH PC

We can interface the phone with MATLAB /PC with wire or wireless. In wire we can be using USB cable to interface the phone to pc. In wireless we having two option either using Bluetooth or Wi-Fi. Using Bluetooth is fair idea because the data rate and packet delivery of Bluetooth is much slow and connection are not much reliable to interface. Wi-Fi is the best option for long range and high data rate with lot many internal ports to delivery various data from phone to PC.

In PC we using Connectify Hotspot software to make virtual hotspot from PC and PC can also join some other route for Internet connection. So using this Virtual hotspot, we can join our mobile phone and pc in same network and also the mobile phone getting Internet facility from the PC. After join to the same network the PC allocate the IP address to the Phone. So when phone wants to send the data to PC/ MATLAB through the IP address and port ID we can send the data. So modern Mobile phone having the so many sensors and High-end camera so we can be utilizing these sensors and all through the Particular url. So in this normal TCP protocol are Using request the data from the phone through the specific IP address. TCP/IP provides Reliable to data request and delivery to source address and destination address without data loss and with data acknowledgement.

Syntax

```
void setup()
{
Serial.begin(57600);
}
Void loop()
{
}
```



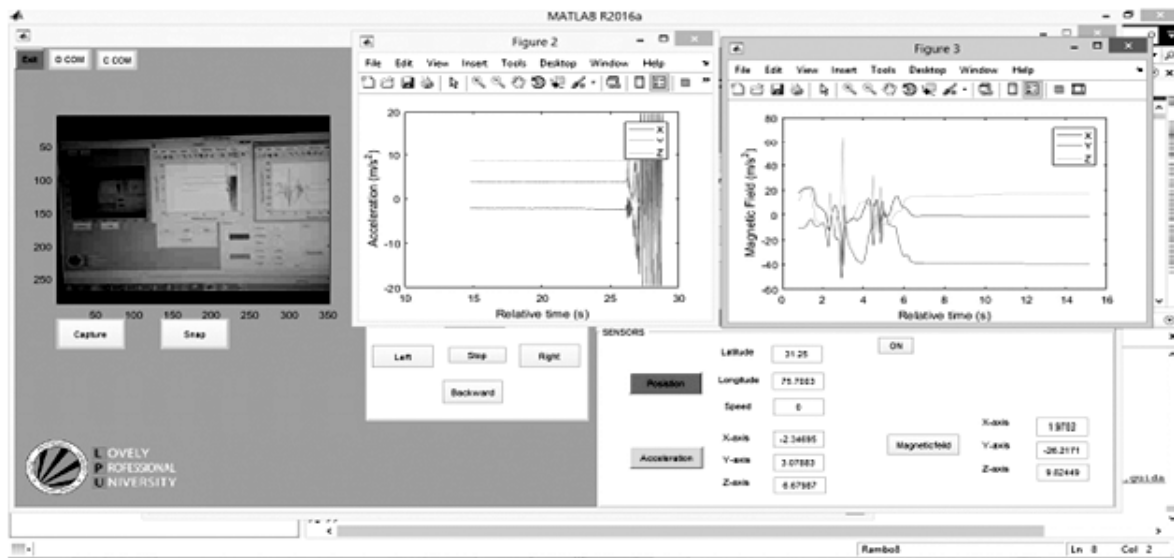
Connection Establishment and Connection

4. RESULTS

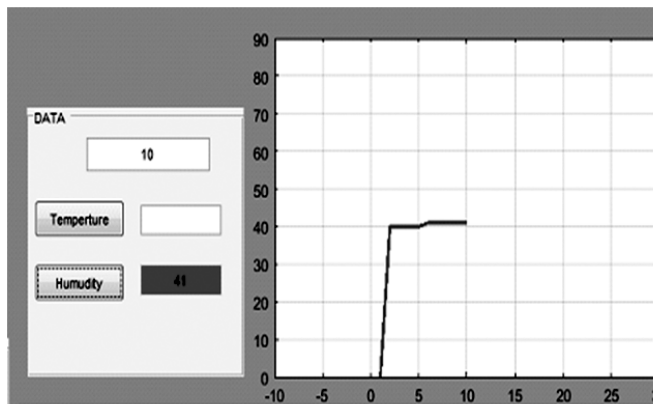
The Results are being analyzed on to GUI made in MATLAB and software. The GUI shown for data acquisition from mobile robot contains features of data storing and analyzing from several sensors simultaneously.

5. CONCLUSION

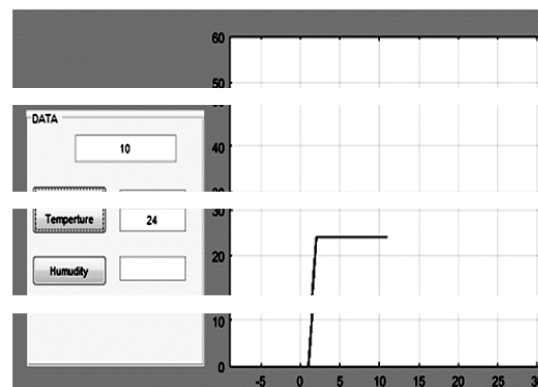
In this project we achieve that GUI based data acquisition mobile robot for the industrial and military purpose. The feature of our Robot is quite standard and has more functions to use in real time applications



MATLAB GUI



Data Analyzing on MATLAB GUI



Data Analyzing on MATLAB GUI

in commercial and military usage. The main ultimate goal is reduced the Technical maintenance and reasonable cost affordable by the industry to buy the robot for surveillance and military purpose. All acquired data are visualized in real time and even robot having the vision and broadcast the video in LAN. So our project encourages the people to use the robot data acquisition with less technical maintenance and cost affordable to use in commercial military and industrial purpose.

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