REMOTE MONITORING SYSTEM USING IoT

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Abstract

To create an intelligent sensor framework for monitoring the industrial environment using the beagle board. The framework of the monitoring system is established on the arrangement of distributing unis. It can be implemented by connecting many sensors to display the various device activities and control those data from anywhere to provide greater flexibility to the user. The system which records the several kinds of parameters such as temperature, humidity and GPS. The sensor node consists of various sensor to display the temperature value, relative moisture and track the board where it is placed. MQTT (Message Queuing Telemetry Transfer) system is the backbone for the internet of things operation which provides the information and instructions. The beagle board will be receiving the data from the sensor and the board will be transfer the information to the MQTT broker protocol using dongle or Wi-Fi modem.

Keywords*: Beagle Bone Black,GPS module, Internet of Things,MQTT, sensor*

1. Introduction

The different creations and innovations will enrich the technology for an automated environment. The main target for the automated environment is improving the conditions as a ubiquitous manner. And the concept behind in this is pervasive computing, to execute or experimented the concept we need a clean function or a feasible tool. The microcontroller is nothing but a complete microcomputer. In essence, the microprocessor contains I/O ports, timers/counters, memory, ADC and DAC etc. Larger computers were designed to solve complex scientific and industrial problems and handle records of large corporations and government organizations. Only big industries and institutions are able to purchase large computers.

A trend started in the middle of 60s to design smaller computers for smaller organizations and institutions. This situation gave the birth of minicomputer in the late 60s that prove the way for smaller institutions, organizations, etc. to use the computers. With the rapid advancement in the semiconductor technology, it because possible to fabricate the whole CPU of a digital computer on a single chip using VLSI technology. It is possible to construct a microcomputer having most of the features of third generation mainframe computers using just handful of ICs.The number of bits that a digital computer can access in parallel at a time is called its word length. It is a measure of the computing power of computer. The microcomputer has word length of 4 to 32 bits whereas large computers are 32 to 64 bits.

The 4-bit microprocessors are used for applications in domestic appliance control, calculators, video games, toys, etc. A calculator is not a computer as it is not a programmable device. The user does not prepare any program for his calculations. It performs calculations using step-by-step method. The calculator is based on a single chip microcomputer that

contains 4-bit microprocessor as its CPU, semiconductor memory and I/O devices. The manufacturers have stored permanent program on-chip semiconductor memory for making calculations. The data entered by the user are stored in the memory and utilized by the processor whilemaking calculations.

Themanufacturers have not made any provision forusers toenter programs. The working of microcontroller is often used to run dedicated code that controls one or more tasks in the operation of a device or a system. The system which needs a microcontroller for a continuous process without a microcontroller device is not possible nowadays. In this proposed system a new micro controller called beagle bone black can be attained a better results comparing to another microcontroller. The foremost aim for using the beagle board is for speed and accuracy. In this system beagle bone black is used as microcontroller device which sustains the conditions over the environment. The main process of IOT is the gathering of data over environment and remedy or recover the environment without any unwanted explosions.

2.Beaglebone Family

The Beagle Board is a mini CPU which was invented by Texas instrument. It has the all functionality of basic computer. It can support the various operating system such as debian, Android, Ubuntu and Angstrom. The various types of beagle board family are given below:

2.1 Beagleboard-XM

A beagle board-XM which will deliver the Advance RISC Machine (ARM)cortex A8 and also has the extra memory which consists of 512MB of low power DDR RAM. This board was announced in the month of August 27, 2010.It has the faster CPU core, more RAM, RS-232 port, JTAG connector and USB hub.

2.2 Beaglebone

It was established in the month of October in the year 2011, the Beagle Bone is a latest invention of the beagle board organization family as shown in the Figure 1. It is the minimum price ARM Cortex-A8 processor which was running at a speed of 720 MHz with a storage 256 MB of RAM. It also has a P8 and P9 connectors with each consist of 46-pin expansion connectors, Ethernet cable connection and a storage of 512 MB of DDR3.Beagle bone has a USB client which was connect to PC or laptop, USB host and also has a consists of four LEDs.

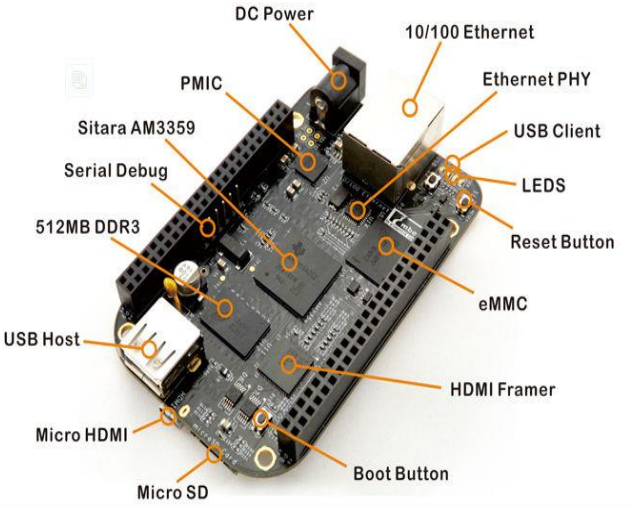

Figure 1. Beaglebone black

2.3 Beagleboard-X15

The Beagle Board X15 was announced in the November 2015. It was based on the TI Sitara AM5728 processor with two ARM Cortex-A15cores which was running at a speed of 1.5 GHz, two ARM Cortex-M4 cores running at 212 MHz and two TI C66x DSP cores running at frequency of 700MHz. The used processor provides USB 3.0 support and has a Power VR Dual Core SGX544 GPU running at 532MHz.

3.Sensor Module

A sensor is an object which is used to sense the events or changes in the surroundings and send the information to the PC or laptop which tells the output device to provide the corresponding output.

3.1 Temperature Sensor

A device is used to measure the amount of heat energy that allow us to detect a physical change in temperature, producing either a digital or analog output is known as Temperature Sensor as shown in the Figure 2. It is designed which was used to measure the heatness or coldness of an object. The LM35 device which will operate from −55°C to 150°C temperature range.

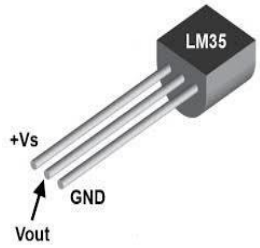

Figure 2: IC LM35

The features of LM35 are:

- Output impedance will be low
- Rated for −55˚ to +150˚C range
- Suitable for remote applications
- Operate from 4v to 30v
- Low self-heating,
- ±1/4˚C of typical nonlinearity

3.2 Humidity Sensor

A humidity sensor will sense, measures and reports the relative humidity in the air. Therefore, it measures the moistness and air temperature as shown in the Figure 3. Moisture sensors have extensive kind of applications such as manufacturing and domestic applications, medicinal applications and are employed to provide an indication of the moisture levels in the environment.

Figure 3.DHT 11

The specification details of DHT11 are:

- Power requirements **:**5 - 10 VDC
- Communication **:** Capacitive Component
- Dimensions **:** 6.2 x 10.2 mm Diameter.
- Temperature range **:**-40 to 100 °C

3.3 GPS Module

The remote monitoring system is mainly focused on the environment parameters and device tracking. The sensors we mentioned earlier are used to read the values in the field source. The main issue is finding the device in the field because the field area contains more number of devices. To find the position of a particular device is achieved by using GPS (global positioning system). In earlier GPS system mainly used for vehicle navigation especially for seaways. The working principle of GPS is receiving the data from the satellites and exactly where it is placed. In this system u-blox 6 based NEO-6 series GPS module is used as shown in the Figure 4. It is a standalone GPS and interfaces using UART.

Figure 4.GPS Module

4. Proposed System

4.1 Block Diagram of Proposed System

In earlier days, we used the various types of microcontroller devices such as Arduino and raspberry pi. The raspberry pi device which is used to send the information to the receiver at a speed of 900MHz.While compare to raspberry pi here we connect the BBB to display the various sensor modules such as temperature, humidity, smoke and GPS module which will be transfer records to the server at a speed of 1 GHz which will alert the server very quickly. Here the installed OS is a debian Linux named it as a putty software which is used to support the python language.

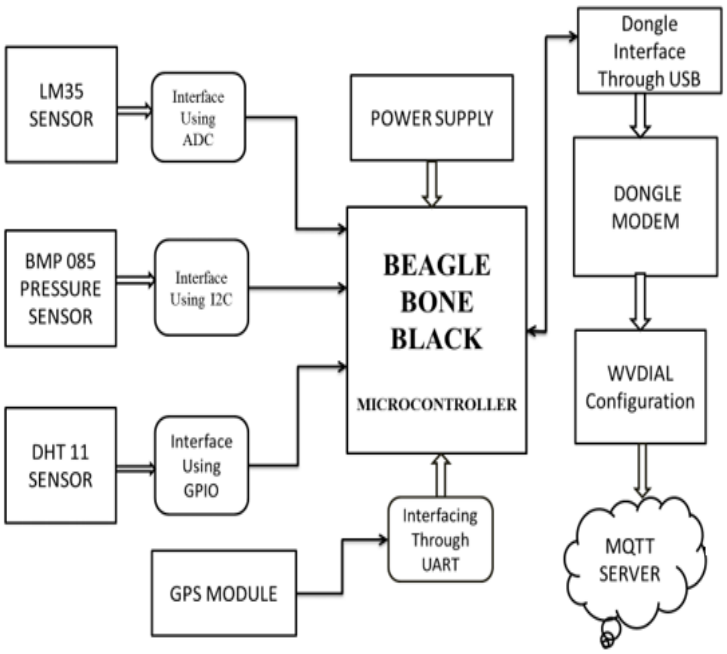

Figure 5. Block Diagram

From the above Figure 5 the various sensor such as IC LM35, DHT 11 and GPS module is attached to the beagle bone black. The temperature sensor is attached to the processor (AM 3358A) through ADC interfacing. In similar way the various sensor modules is attached to the beagle bone black board. Here the dongle modem is linked to the internet through the WV dial configuration. The Weave(WV) is a point to point protocol (PPP) and also which helps in making modem connection. Here the various sensor modules will send the information to the beagle bone black. In this work, a cloud based remote monitoring is proposed. This work involves get the sensors values through by means of beagle bone black, measuring the temperature value and relative moisture. Here GPS module is used in order to track the where it is placed and also it will have established a time and date.Finally, the board will transfer the records to the MQTT broker protocol using dongle.

4.2 Functional operation of proposed system

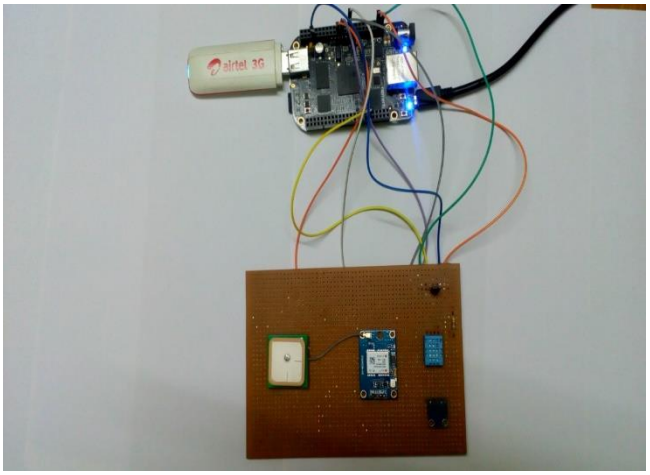

Figure 6. Sensor Connection

5.Results

After the connections are made to run the program by means of the following command python tmp36.py. The sensor provides the analog values in millivolts it is a raw data. To convert the raw data in the system. Here we had used the conversion formula in order to covert the raw data as shown in the Figure 7. The reference voltage is 1800 mv in the system it prevents voltage drops in the system. Now we had got only the temperature sensor readings.

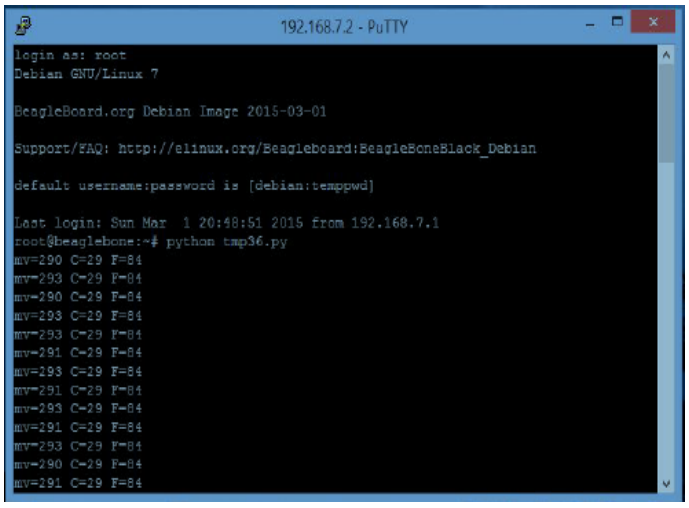

Figure 7. Sensor data value

In order to test the sensor values we used the glowing bulb is done near the LM35 temperature sensor. It will show the sensor values which contain the different readings as shown in the below Figure 8.

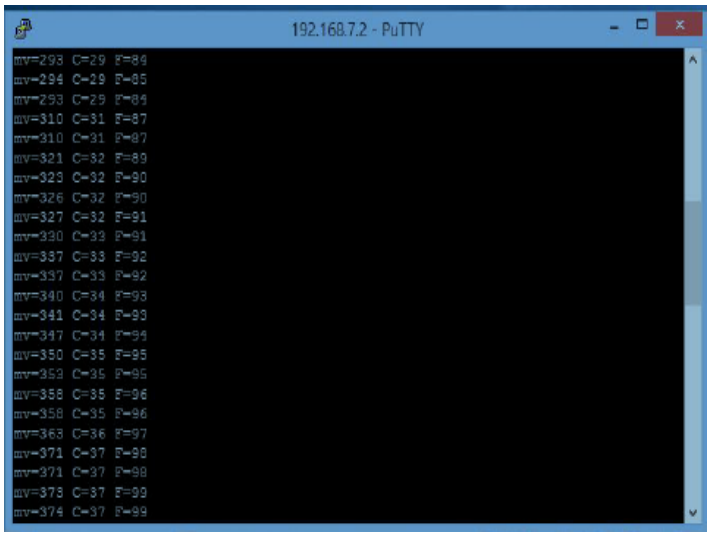

Figure 8. Sensor value differs

Using NMEA configuration we read five different values from gps module. For this project we need only gprmc value for location indentification purpose. The gps module connection is done through uart communication. Gps tracking system is a great achievement in remote monitoring operations. The GPS data values shows in below Figure 9.

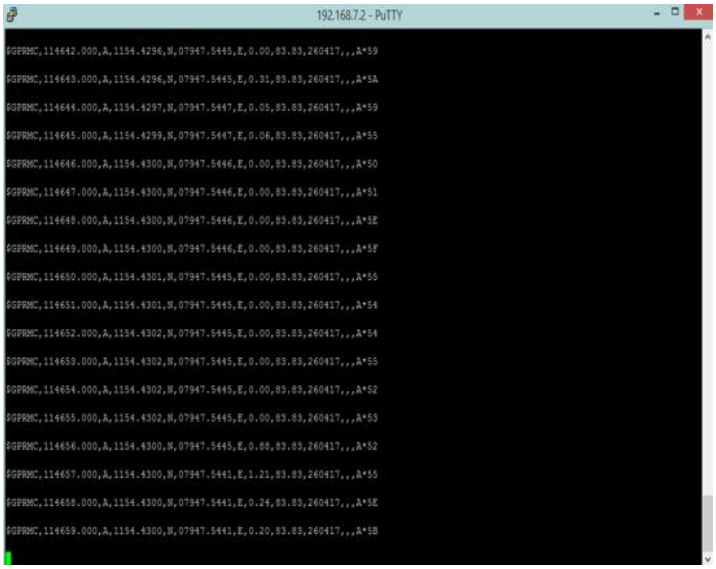

Figure 9.GPS Value

6. Conclusion

The successful implementation of sensors in beagle bone black will create a temperature alert system to send the sensor values to the server is achieved. Ethernet cable cannot be access to all regions in Non-IT assets. To solve the issues in the Non-IT assets platform is done using dongle. This project is a stepping stone to introduce the various features and possibilities available in Beagle bone black and opens up an avenue for researchers who wish to embark into this new embedded invention.

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