IOT Based Environmental Monitoring System Based On A WSN Technology

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Abstract- *The Internet of Things (IoT) provides a virtual view,via the Internet Protocol, to a huge variety of real life objects,ranging from a car, to a teacup, to a building, to trees in a forest. Its appeal is the ubiquitous generalized access to the status and location of any ―thing‖ we may be interested in. The Internet of Things (IoT) is the network of physical objects, devices, vehicles, buildings and other items which are embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. WSNs are integrated into the ―Internet of Things‖,where sensor nodes join the Internet dynamically, and use it to collaborate and accomplish their tasks. Wireless sensor networks (WSN) are well suited for longterm environmental data acquisition for IoT representation. This paper presents the functional design and implementation of a complete WSN platform that can be used for a range of long-term environmental monitoring IoT applications.*

I. INTRODUCTION

For open nature fields, WSN for IoT environmental monitoring applications is challenging. High reliability, low cost, and long maintenance-free operation, is the some advantages of WSN. At the same time, the nodes can be exposed to variable and extreme climatic conditions. The Internet of thing (IoT) has technological changes in information industry. Wireless Sensor Networks (WSN) is based on advanced technologies in which we communicate with the environment by sensing the properties nature. The main application of WSN sensors are used to monitor physical or environmental conditions, such as temperature, pressure and sound etc. and pass their data through the network to a main location. To effectively collect and process the data and information at IoT end nodes, a low-cost data acquisition system is necessary in IoT based information systems .For long-term industrial environmental data acquisition uses WSN (Wireless Sensor Network) .The network of node that cooperatively sense and may control the environment, enabling interaction between persons or computers and the surrounding environment were described as a WSN.

In this project, a new method of environment monitoring system based on a WSN technology is proposed. A WSN can generally be described as a network of nodes that cooperatively sense and control the environment, enabling interaction between persons or computers and the surrounding environment. Today‘s WSNs includes sensor nodes, actuator nodes, gateways and clients. A large number of sensor nodes are implemented randomly inside or near the monitoring area (sensor field), with the help of self-organization. The collected data transmit along to other sensor nodes by hopping are done through sensor nodes. To get to the gateway node after multihop routing, and finally reach the management node through the internet or satellite, monitored data is handled by multiple nodes, all this process is done during transmission. The working of user is to configure and manages the WSN with the management node, publish monitoring missions and collection of the monitored data.

II. EXISTING SYSTEM MODEL

In today's world many pollution monitoring systems are designed by considering different environmental parameters.

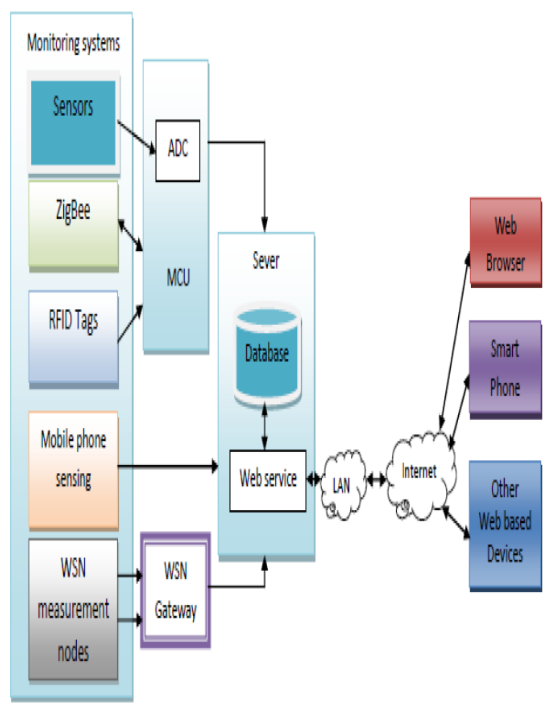


Fig: Existing System Model

Existing system model is presented in figure 1 uses Zigbee based wireless sensor networks to monitor physical and environmental conditions with thousands of application in different fields. The sensor nodes directly communicated with the moving nodes deployed on the object of interest which avoided the use of complex routing algorithm but local computations are very minimal.RFID is a means of storing and retrieving data through electromagnetic transmission to an RF compatible integrated circuit. It is usually used to label and track items in supermarkets and manufactories. Mobile phones or smart phones that are enabled with sensors are used for impact on social including how mobile technology has to be used for environmental protecting, sensing and to influence just-in-time information to make movements and actions environmental friendly.

Mobile phone sensors were deployed and used on urban areas for monitoring. A Wireless Sensor Network consists of many inexpensive wireless sensors, which are capable of collecting, storing, processing environmental information, and communicating with neighboring nodes. In the past, sensors are connected by wire lines.

The access method of WSN gateway node is convenient because data can be received from a WSN via the gateway at any time and any place. A server is an instance of a computer program that accepts and responds to requests made by another program; known as a client. Less formally, any device that runs server software could be considered a server as well. Servers are used to manage network resources. The services or information in the servers are provided through the Internet that are connected through LAN and made available for users via smart phones, web browser or other web browser devices to make the system more intelligent, adaptable and efficient.

III. PROPOSED MODEL SYSTEM ARCHITECTURE

The proposed model consists of a Microcontroller (Arduino Atmel) as a main processing unit for the entire system and all the sensors and devices can be connected with the microcontroller. The sensors can be operated by the microcontroller to retrieve the data from them and it processes the analysis with the sensor data and updates into the cloud through Wi-Fi module connected to it. Here we are using Arduino Due because it is compatible with 3.3v ESP8266 Wi-Fi module and it also contain more than one on chip UART's so we can connect more number of Serial devices.

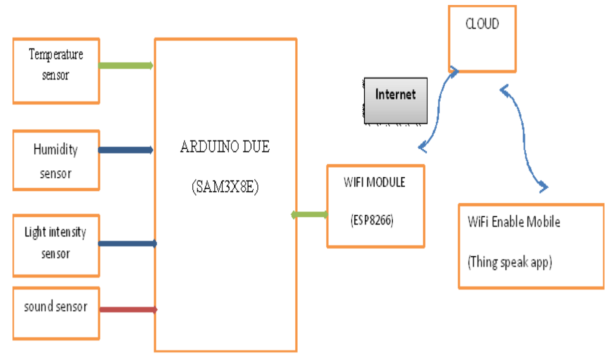
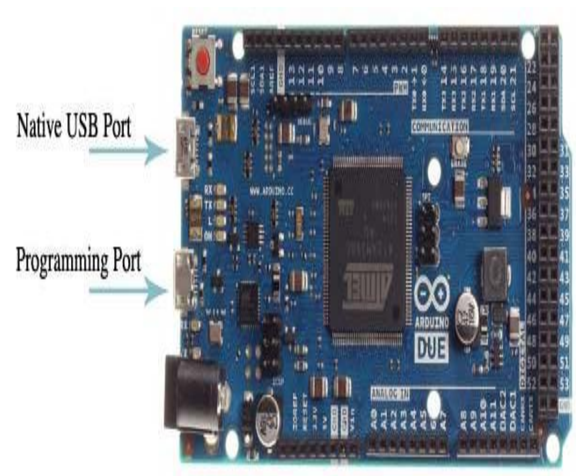


Fig: Block diagram of the Implementation model

Arduino Due:



The Arduino Due is a microcontroller board based on the Atmel SAM3X8E atmel Cortex-M3 CPU. It is the first Arduino board based on a 32-bit atmel core microcontroller. The basic features of the Arduino Due are:

- 54 digital input/output pins (of which 12 can be used as PWM outputs)
- 12 analog inputs
- 4 UARTs(hardware serial ports)
- 84 MHz clock
- USB OTG(On the Go) capable connection
- 2 DACs(digital to analog)
- 2 TWI(Two wire interface)
- Power jack
- SPI(Serial Peripheral Interface) header

The Due is compatible with all Arduino shields that work at 3.3V**;** the Arduino Due board runs at 3.3V. The maximum voltage that the I/O pins can tolerate is 3.3V.

IV. IMPLEMENTATION

In this implementation model we used Arduino Due board, Sensors and ESP8266 Wi-Fi module as an embedded device for sensing and storing the data in to cloud. Arduino Due board consist of 12 analog input pins (A0- A11), 54digital output pins (D0-D53), inbuilt ADC. Wi-Fi module connects the embedded device to internet. Sensors are connected to Arduino Due board. Its read the sensors and on chip ADC will convert the corresponding sensor reading to its digital value and from that values the corresponding environmental parameter will be evaluated. Here we are connected ESP8266module to 19 (Rx1) and 18 (Tx1) pins of Arduino Due ,DHT11 sensor to one of the digital pin of (PIN 5)Arduino Due ,LDR circuit arrangement is connected to Analog pin (A4) and sound sensor is connected to Analog pin (A2).

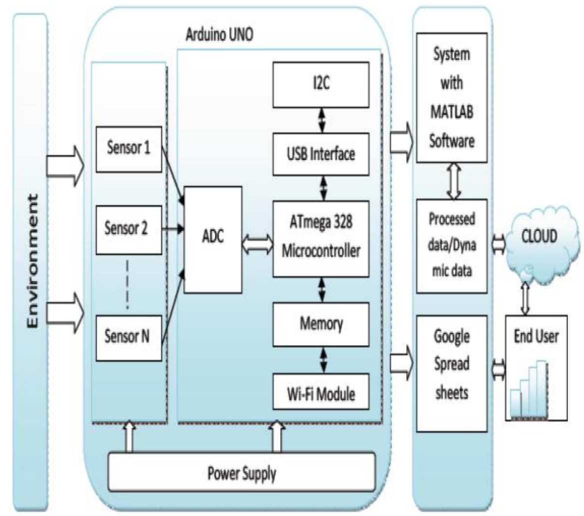
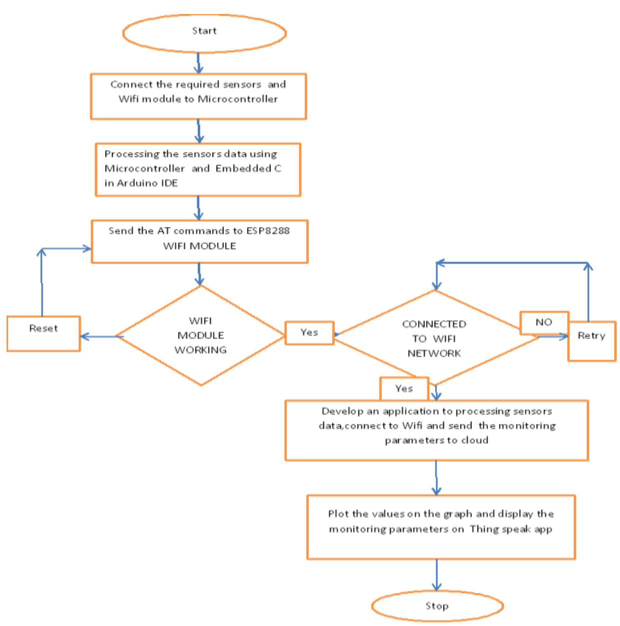


Fig: Schematic diagram of implementation model

The embedded device is placed in particular area for testing purpose. The sound sensor detects sound intensity levels in that area and DHT11sensor and LDR will record the Temperature ,Humidity and Light intensity in that region, if the threshold limit is crossed the corresponding controlling action will be taken (like issuing message alarm or buzzer or LED blink).All the sensor devices are connected to internet through Wi-Fi module.

V. FLOWCHART



The Wi-Fi connection has to be established to transfer sensors data to end user and also send it to the cloud storage for future usage.

VI. RESULTS

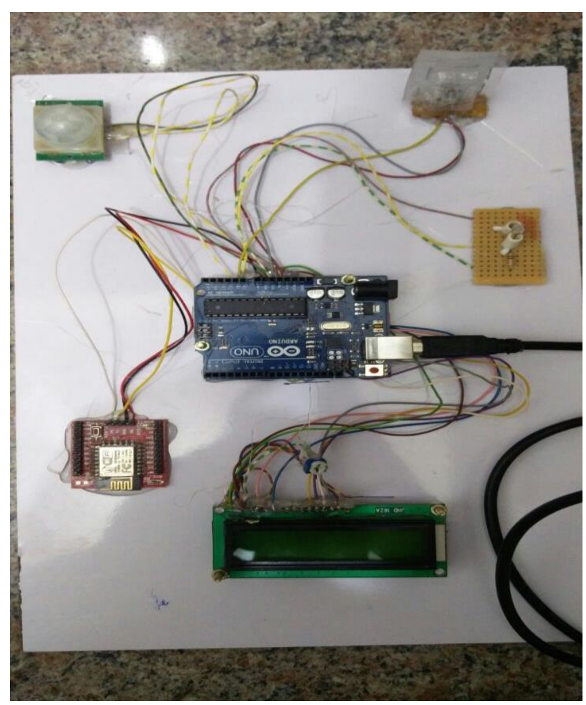


Figure: Hardware set up kit

VII. CONCLUSION

By keeping the embedded devices in the environment for monitoring enables self protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the Wi-Fi. The smart way to monitor environment and an efficient, low cost embedded system is presented with different models in this paper. In the proposed architecture functions of different modules were discussed. The sensors to cloud system with Internet of Things (IoT) concept experimentally tested for monitoring four parameters. It also sent the sensor parameters to the cloud (Thing speak). This data will be helpful for future analysis and it can be easily shared to other end users. This model can be further expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low cost solution for continuous monitoring of environment.

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