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Analysis of Three IoT Wireless Sensors for Environmental Monitoring

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ABSTRACT

This paper presents the functional design and integration of a complete WSN platform that can be used to remote environmental monitoring and target for IoT applications. The system of physical object devices, vehicles, buildings and other items embedded with sensors, electronics, software and network connectivity that enables these objects to collect and exchange data, this is called IoT. IoT is expected to generate large amounts of data from diverse locations. IoT is one of the platforms for today's smart city and smart energy management systems. Wireless Sensor Network (WSN) is used to monitor environmental conditions such as sound, pressure, temperature etc. The application requirements are long lifetime, low cost, fast deployment, low maintenance; high number of sensors and high quality of service are considered in the specification. Low-effort platform reuse is also considered for the specifications and design levels for a wide array of related monitoring applications.

Keywords: ***-ARM 7, Internet of Things (IoT), Sensor data acquisition, Bluetooth, WIFI.***

1. INTRODUCTION

Tracking the environmental parameters variation is essential in order to determine the quality of our environment. The collected data encompass important details for a variety of organizations and agencies. With the results of monitoring, governments can make informed decisions about how the environment will affect the society and how the society is affecting the environment. Wireless sensor networks (WSNs) [1] are becoming a global technology resulting from the development of low cost and low power wireless technology. WSN refers to a combination of distributed sensors for monitor and records the surrounding conditions of the environment and organize the stored data at server's database. WSNs compute environmental conditions like earth quake, rain falls, light intensity, smoke, fire, wind, and so on.

There are a multitude of applications for WSN. The majority of monitoring applications rely on WSNs, motivated by the indisputable advantages they bring: lower costs due to the replacement of cables, variable network topologies, scalability, and lower maintenance. Wireless sensors and sensor networks have been successfully used in the implementation of solutions belonging to various fields, including environmental monitoring, natural disaster prevention, current consumption monitoring in large buildings, monitoring systems for the dosimeter of radiology operators in healthcare applications, location tracking of people, assets or hazardous gases, gear condition surveillance and process control in industrial environments, also road traffic management in smart cities [2].

1.1 Wireless Sensor Networks:

While many sensors connect to controllers and processing stations directly (e.g., using local area networks), an increasing number of sensors

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communicate the collected data wirelessly to a centralized processing station. This is important since many network applications require hundreds or thousands of sensor nodes, often deployed in remote and inaccessible areas. Therefore, a wireless sensor has not only a sensing component, but also on-board processing.

Communication and storage capabilities. With these enhancements, a sensor node is often not only responsible for data collection, but also for in network analysis, correlation, and fusion of its own sensor data and data from other sensor nodes. When many sensors cooperatively monitor large physical environments, they form a wireless sensor network (WSN). Sensor nodes communicate not only with each other but also with a base station (BS) using their wireless radios, allowing them to disseminate their sensor data to remote processing, visualization, analysis, and storage systems [3].

1.2 Structure of Sensor Node:

Sensor nodes, as building blocks of WSN, are consisted of four basic elements shown in Figure 1 the sensor unit, processing unit, communication and power units.

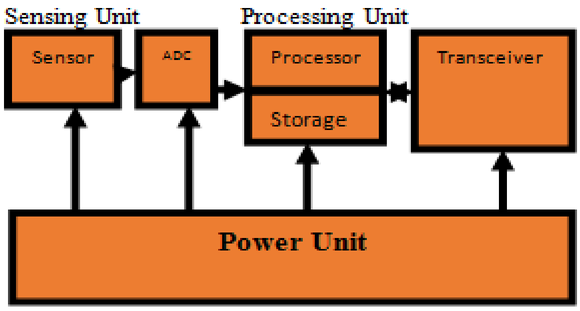

Fig 1: Typical sensor node architecture

The hardware of a sensor node generally includes four parts: the power and power management module, a sensor, a microcontroller, and a wireless transceiver. The power module offers the reliable power needed for the system. The sensor is the bond of a WSN node which can obtain the environmental and equipment status. A sensor is in charge of collecting and transforming the signals, such as light, vibration and chemical signals, into electrical signals and then transferring them to the microcontroller. The microcontroller receives the data from the sensor and processes the data accordingly. The Wireless Transceiver (RF module) then transfers the data, so that the physical realization of communication can be achieved. It is important that the design of the all parts of a WSN node consider the WSN node features of tiny size and limited power.

2. HARDWARE COMPONENTS:

2.1 Sensing Nodes:

A sensor is a device which is capable of converting any physical quantity to be measured into a signal which can be read, displayed, stored or used to control some other quantity. This signal produced by the sensor is equivalent to the quantity to be measured. Sensors are used to measure a particular characteristic of any object or device [4].

MQ6 Sensor:

This is a simple-to-use Carbon Monoxide (CO) sensor, suitable for sensing CO concentrations in the air. The MQ-6 can detect CO-gas concentrations anywhere from 20 to 2000ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC [5].

LDR Sensor:

Two cadmium sulphide (cds) photo conductive cells with spectral responses similar to that of the human eye. The cell resistance falls with increasing light intensity. Applications include smoke detection, automatic lighting control, and batch counting and burglar alarm systems.

Temperature and Humidity Sensor (DHT11):

DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component [8], and connects to a high performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness. When MCU sends a start

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signal, DHT11 changes from the low-power-consumption mode to the running-mode, waiting for MCU completing the start signal. Once it is completed, DHT11 sends a response signal of 40-bit data that include the relative humidity and temperature information to MCU. Users can choose to collect (read) some data. Without the start signal from MCU, DHT11 will not give the response signal to MCU. Once data is collected, DHT11 will change to the low power-consumption mode until it receives a start signal from MCU again [6].

3. METHDOLOGY

In this proposed architecture to reduce standby power consumption and to make the room easily controllable with Temperature & Other sensors to monitor the environmental parameters. To realize the proposed architecture, we proposed and designed the wireless communication. Wireless is a low-cost, low-power. The low-cost technology allows, WSN's can be implemented in wireless control and monitoring applications. The low power facility allows longer life with smaller batteries, Sensors continuously monitors the parameters. Microcontroller continuously monitors the Sensors input signal. The proposed system consists of sensors and wireless sensor network. The sensor performs the sensing functions that are collecting data from different sensors. Such as temperature, light, humidity, gas, rain etc. The processor [7] performs multiplexing i.e. multiplexing the data obtained from different type of sensors and send this data on the display in symbolic and mathematical form.

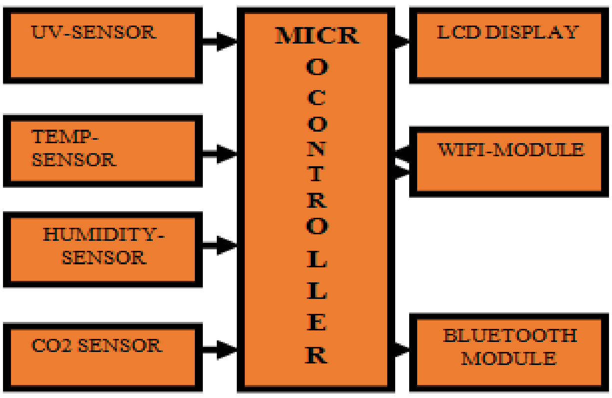


Fig2: Block Diagram of the System

3.1 To implement WSN interfaced with Processor.

1) Humidity Sensor.
2) Temp Sensor.
3) CO2 Sensor.
4) Light Sensor.
5) To implement IoT system to monitor sensor data.

3.2 System Specification

1. I/P Voltage (Battery):12V.
2.16×2 LCD Display.
3. GSM & LCD Voltage: 5V
4. Processor run at: 3.3V
5. Wireless Communication.
6. Compact Design.
7. IoT to assist in environmental protection.
8. Continuous availability of sensor data
9. Low power consumption.
10. IoT supports the interaction between things '& allow more complex structures

Flow Chart:

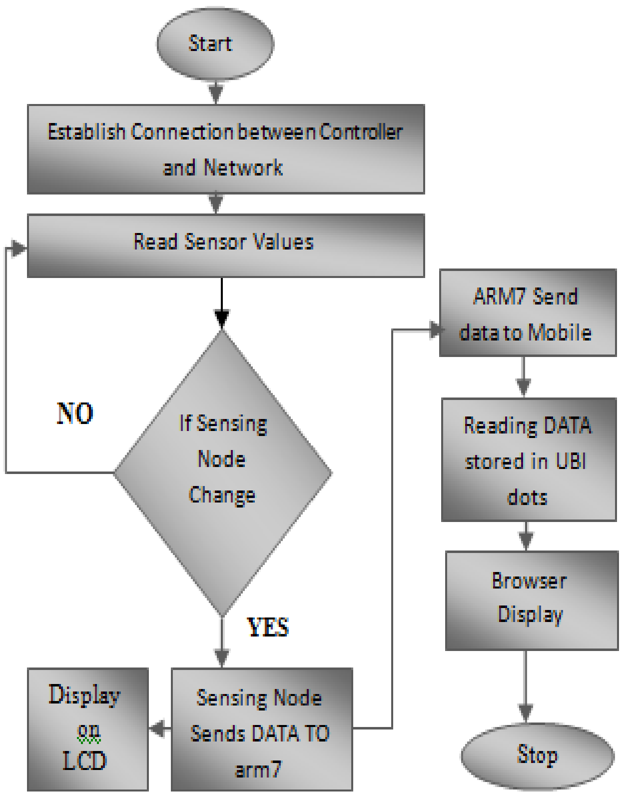


Fig3: Flowchart Representation

4. RESULTS

The amount of collected data in the Environment monitoring system project was large. A total of 1000 received packets were stored in the database. Based on this material, the researchers were able to analysis both the physical circumstances of the environment monitoring system and the reliability of the network.

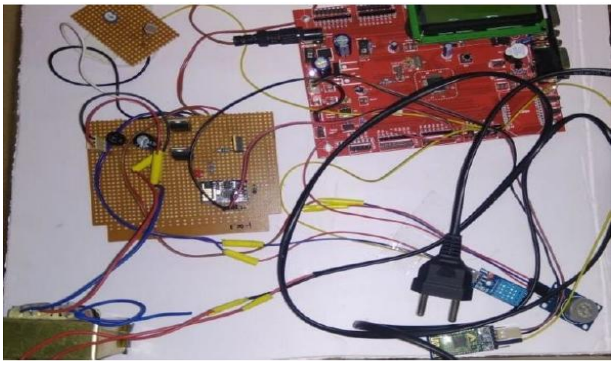
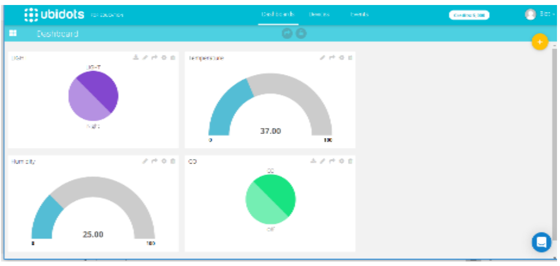


Fig4 Result Analysis with Kit

Fig5 Bluetooth OUTPUT

Case 1:

Here when the light intensity is low it showing as NIGHT MODE. TEMPERATURE and HUMIDITY readings are displayed and CO gas is not detected in this case.



Case 2:

In this case light intensity increased so, it showing as DAY MODE. And TEMPERATURE and HUMIDITY are changed. CO gas is detected.

OUTPUTS:

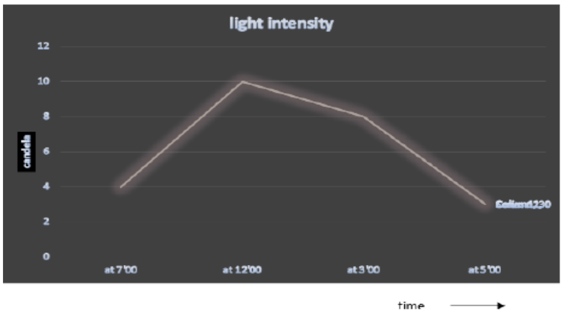


Fig6. Temperature at Different Times

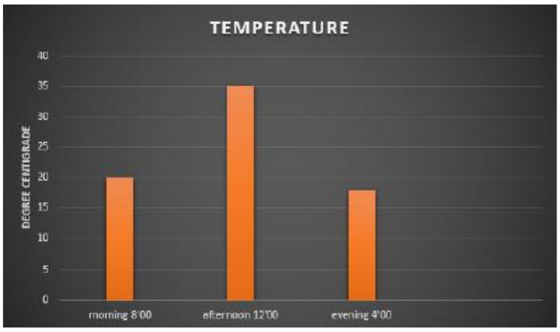


Fig 7. Light Intensity at Different Levels

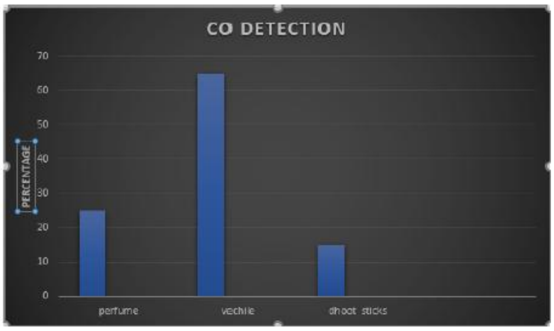


Fig8. Percentage of CO Detection

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FUTURE SCOPE

IOT is the buzz of communication industry today. The field of IOT communication is growing leaps and bounds day by day. There has been advancement taking place in the semiconductor industry leading to more and more advancements in IOT technology. The main aim of the project is to monitor the environment and to take precautions for control of temperature. Now a day's pollution has increasing with increasing sensor advancement we can check the percentage of pollution in particular area so, In future we can design many advanced technologies.

5. CONCLUSIONS:

The presented design can be used to remotely monitor weather parameters like daylight, rainfall, fire and gas leakage etc. The data can be stored online, which can be used to forecast weather and eventually analyze climate patterns, as well as for other meteorological purposes. All aspects of the WSN Platform are considered and discussed. WSN technology that will convert the way we compute, understand and manage the natural environment. For the first time, data of different types and places can be merged together and accessed from anywhere. Some significant progress has been made over the last few years in order to bridge the gap between theoretical developments and real deployments, but in proposed system all that mistakes and defect in existing system have removed.

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