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Monitoring of Taif University Campus by using The Internet of Things Techniques

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Abstract

As defined by the International Telecommunication Union (ITU) definition of the Internet (IoT) concept, it is a global information society infrastructure that enables the provision of advanced services by linking (ICT-based) material and virtual objects to the concept of the Wireless Sensor Network (WSN) Sensors operating on radio frequencies

The proposed system was implemented based on the deployment of a sensor network using Zigbee technology which collects and monitoring different types of measurements that reflect the energy consumption and environmental condition of buildings. These include temperature, humidity, air temperature, CO2 concentration, and air quality. Wireless sensor networks (WSN) are increasingly being used in applications where low energy and low-cost power consumption are key considerations. We have designed a high-speed algorithm to transmit analogue signals from the sensors and send them through the sensor network on the premise of sending real-time signals through routers to the sensitive node called a coordinator, which is sent data through the device Arduino to the Internet or any smart phone.

We have done our result of this project to Help decision-makers make the right decision and thus we managed to provide live information through Cayenne application and we got this application for free from Google play, which can be download on any mobile.

English Keywords: Internet of things(IoT) , ZigBee, humidity, temperature, CO2, WSN, Sensor and Monitoring System.

INTRODUCTION

Wireless Sensor Network (WSNs) technology provides valuable information in application domains, it is essential that WSNs perform in a reliable and robust fashion. We believe that, wireless sensor network has proved its usage in the future in computer technology especially in distributed computing environment. [1, 2].

The applications for WSNs are many and varied. They are used in commercial and industrial applications to monitor data that would be difficult or expensive to monitor using wired sensors. Typical applications of WSNs include monitoring, tracking, and controlling, object tracking, fire, motion detection, door access system, traffic monitoring and so on.[3,4].Other major current application of WSN include environment monitoring and applications such as flood detection , weather prediction , forecasting and commercial applications like seismic activities monitoring and prediction. Many weather forecasting websites use WSN technology for retrieving weather details in remote inhibited areas. [5,6]

Sensor networks are increasingly being used in Health applications for monitoring changes in patient's health, behavior and heart rate. By continuously monitoring the progressive disease, opportunities for actively prevailing to aid the patient to be identified.[7,8].In this paper, we discussed concepts of security in Wireless Sensor Networks (WSN's). Design criteria for WSN and how it matches basic security principles. Then we overviewed few architectures and routing protocols suitable for IoT and ongoing research work of network management architectures which can be applied to IoT .[9].

DESIGN OF PROPOSED ARCHITECTURE SYSTEM

Before we build our proposed architecture system we need to have our own policy mechanism that we can use in the future , we will address many things in our policy such as how the end-user agreement documents must be signed in and how to follow the system]10]. The architecture should also take into account the Authentication and Encryption schemes to be used, so they going to be driven based on local requirements but having them documented should allow for the possible reuse of some of these components across multiple WSN installation [11].

Figure 1 shows a common wireless sensor network architecture for monitoring marine Environments, which consist of sensor nodes, sink nodes, a base station,a server and user terminals. Sensor nodes can sense and monitor the environmental parameters such as temperature can transmit the collected data to sink nodes via wireless communication using ZigBee or some other communication protocol. Communication between sensor nodes and a sink node is shown in Figure (1)

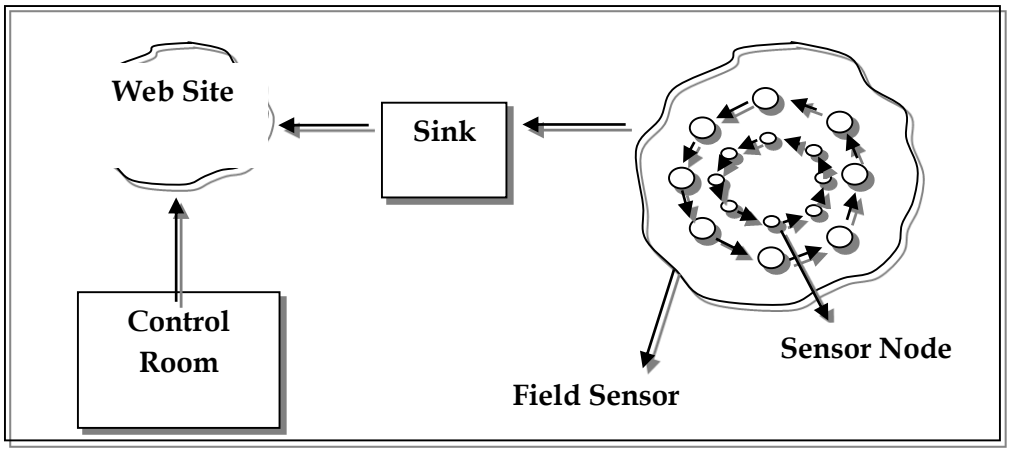


Figure 1: Design of Wireless Sensor Network (WSN)

LITERATURE REVIEW

We try to do smart work using IoT Technology which give good result in real time, also easy to obtain data from sensor a similar work has been already done by many people around the world

1 In literature [10] the IoT refers as intelligently connected devices and systems to gathered data from embedded sensors and actuators and other physical objects. IoT is expected to spread rapidly in coming years a new dimension of services that improve the quality of life of consumers and productivity of enterprises, unlocking an opportunity. Now this time Mobile networks already deliver connectivity to a broad range of devices, which can enable the development of new services and applications. This new wave of connectivity is going beyond tablets and laptops; to connected cars and buildings; smart meters and traffic control; with the prospect of intelligently connecting almost anything and anyone

2 The author in [11] describes the concept of sensor networks which has been made viable by the convergence of microelectro-mechanical systems technology, wireless communications. Firstly the sensor networks applications and sensing task are explored, and according to that the review factors influencing the design of sensor network is provided. Then the algorithms and protocols developed for each layer and the communication architecture for sensor

3. Deploying wireless sensor network:

The presented wireless sensor network is in stage of realization. Only expected experimental works will give clear answer if theoretical calculations are going to meet practical measurements of WSN is primary designed for monitoring of illegal visitors in protected areas.

1) Microcontroller (Arduino uno)
2) Memory Card ;
3) Xbee S2 or SC2;
4) A power supply module.
5) Various Sensors

Sensing module is usually composed of several probes and sensors (with associated amplifiers and A/D converters) to sense and monitor the physicochemical parameters of University environment as mentioned above. A central processing module normally includes a CPU and memory to process and store the collected data. A wireless transceiver module mainly consists of a RF transceiver and an antenna to send the collected data and receive instructions from the sink node. A power supply module usually contains energy storage devices (rechargeable batteries .For demonstration proposed model we have done two scenarios: point to point and point to multi-communication i.e. 2 XBee modules namely one Coordinator module (which is connected to the central computer for further processing) and the other is Router module.

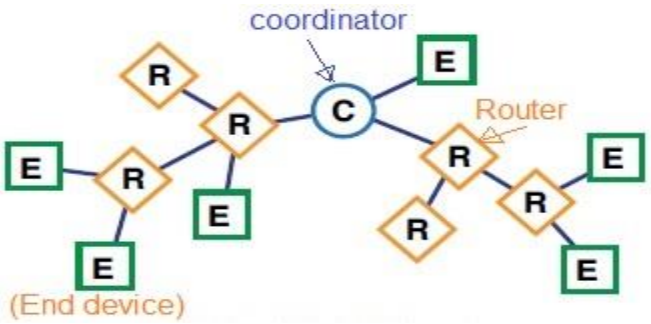


Figure 2: Mesh Network

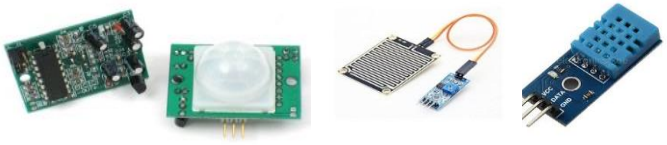
Mesh network

A mesh network offers redundancy and is reliable. If one node can no longer operate, all the rest can still communicate with each other, directly or through one or more intermediate nodes. Mesh networks work well when the nodes are located at

distributed points that do not lie near a common line as mentioned below:

- Only one coordinator is needed to form XBee network. It stores all the critical information about the Xbee network including encryption keys.
- Routers are intermediate nodes which help in relaying data between devices.
- End devices are of two types reduced function devices and full function devices

Here we try to describe the used sensors as follows



Smoke Detector | PIR | RAIN SENSOR | DHT11

1.PIR sensor

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors

2. DHT11 : Temperature and Humidity Sensor

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and provides a digital signal on the data pin (no analog input pins needed).

3. Rain Sensor

This module allows the measurement of moisture through analog output pins and it provides a digital output when a threshold of moisture is exceeded. The module is based on the LM393 op amp. It includes the electronics module and a printed circuit board that "collects" the rain drops.

4. MQ-2 Smoke detector

MQ2 | LDR

The MQ2 is one of a series of gas detectors and will detect flammable gasses and smoke.

5. LDR photo-resistor Sensor

his is a very small light sensor . It is called light sensor or photocell or LDR (light dependent sensor) or photo-resistor. A photocell changes resistance depending on the amount of light it is exposed to. These little sensors make great ambient light triggers.

4- Procedure and Experiments :

Various sensors as mentioned above are connected to the XBee Router node (like, LDR sensor for light sensitivity, Temperature sensor , Humidity Sensor, Motion detection sensor, Rain Sensor).The data is collected and processed by the sensors at the Router Node. These data is then send through the mesh network topology to the coordinator node(connected to the PC).

The coordinator further process the data and send it over online through the new phenomenon called IOT(Internet of Things). This is the currently demanding technology used in various walks of lifeas you can see in photo -1and 2.

photo -1 Router Setup

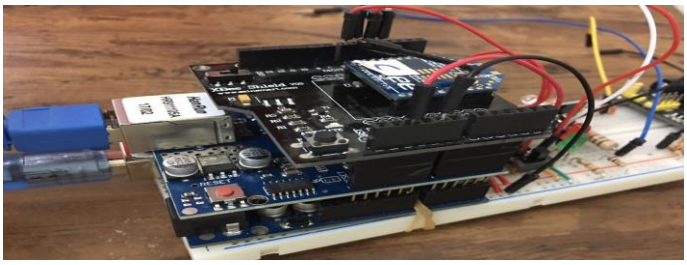


photo -2 Coordinator Setup

Finally we was conducted the real dream of IoT which means to send data form base sensor nodes direct to whom may be concern through website or cloud

We are very lucky in our search for how we can find any way to send our data from WSN to decision maker through very account from any free web site (www.cayenne.mydevices.com).

We have just log in Cayenne Platform with our free account (free website for all users) to pass Sensors data to Internet of Things system dashboard, which can be kept in the cloud system to show the current running values on the sensors, that are remotely obtained life in some part of the world. The following picture shows the output obtained over Cayenne Dashboard of various sensors. We come to comparison method of full-function device, simplified-function devices own simpler protocol stack and smaller memory, and it can only mainly concentrated in: Industrial control, wireless sensor detection, personal monitoring equipment, low-power wireless as our proposal model of our University campus which we developed WSN system prototype, that equipped with many Sensor and microcontroller units, and xbee gateway

Here we can see how we have been obtained the data from the Temperature sensor placed on a Router node placed remotely, the XBee coordinator collects the sensor data and places it online through Cloud computing technology , which possible to use cloud computing model to make real-time dynamic management and intelligent analysis . see photo 3& 4.

Photo—3

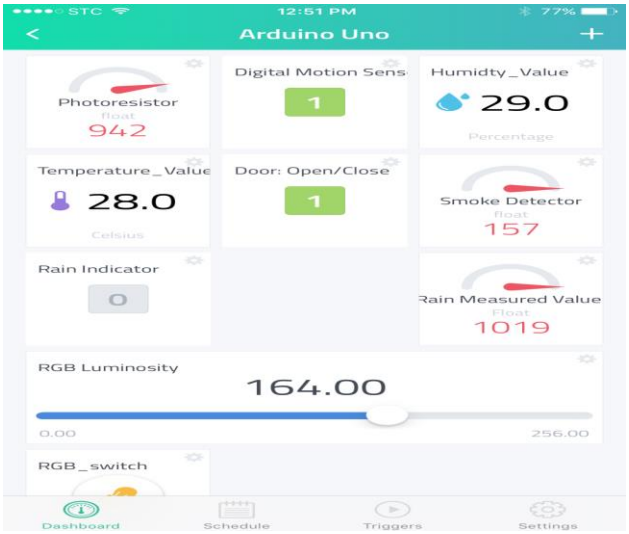


photo- 4

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CONCLUSION

In summary, the wireless mesh network was built successfully in a basic way. There are three nodes in this network and the communication which explained the initial study of Xbee-based wireless mesh networks. We developed two main performances parameters: one on AT mode (Transparent Mode) ,when just the message data itself is sent to the module and received by the remote controller. The other is API mode (Application programmable Interface) which help to work in unicast communication.

The advantages of this project is that it is simple, inexpensive, economic flexible and easy for installation. First we need just to build a simple WSN. Secondly, to deploy fast communication protocol, finally we need to access to the available cloud system (charged or free).last we recommended to established strong partnerships between researchers, vendors, and university.

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