National Conference on "Recent Trends in Mathematical Modeling, Simulation Methods, Computations, and Physical Sciences"
(MMSCP-2019), Organised by Hislop College, Nagpur, Maharashtra, India
International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2019 IJSRCSEIT | Volume 4 | Issue 4 | ISSN : 2456-3307

Environmental Monitoring Using Wireless Sensor Networks(WSN) based on IOT

Madhav G Raut[1], Pradeep B. Dahikar[2]

[1]Department of Electronics, Hislop College, Nagpur, Maharashtra, India
[2] Department of Electronics, Kamla Nehru Mahavidayalya, Nagpur, Maharashtra, India

ABSTRACT

In recent years, we have seen a new era of short-range wireless technologies like Wi-Fi, Bluetooth , ZigBee, emerging in front of us. The project aims at building a system which can be used on universally at any scale to monitor the parameters in each environment. Raspberry-pi and sensors collects all the real-time data from environment and this real-time data is fetched by the web server and display it. User can access this data from anywhere through Internet. Raspberry Pi works as a base station which connects the number of distributed sensor nodes via zigbee protocol. Wireless Sensor Networks (WSN) has been employed to collect data about physical phenomenon in various applications such as habitat monitoring. The Internet of Things (IoTs) can be described as connecting everyday objects like smart-phones, Internet TVs, sensors and actuators to the Internet where the devices are intelligently linked together enabling new forms of communication between things and people, and between things themselves. In wireless sensor network system, the sensor node sense the data from the sensor and that data collects the end tags, end tags send its data to the router and router to coordinator.

Keywords : WSN, Arduino, Arm Microcontroller,WSN, Zigbee Module.

I. INTRODUCTION

The development in wireless sensor networks can be used in monitoring and con- trolling various parameters in the agriculture field, weather station field. The sensor network hardware platforms are basically low -power embedded systems with some different sensors such as onboard sensors and analog I/O ports to connect sensors. Like hardware, software should also be developed, including OS, sensor/hardware drivers, networking protocols and application-specific sensing and processing algorithms. The purpose or objective of environmental monitoring is different in different situations, but important aims to environmental monitoring to find risks to human and wildlife, scope to population migration from high density areas to low density areas and to restrict emission of gases. Wireless sensor network (WSN) is a low cost, low power wireless network made up of thousands of smart sensor nodes which monitor physical or environmental conditions, such as temperature, pressure, moisture, etc. at different area or different location. The Internet of Things (IoT) is an emerging key technology for future industries, and environmental monitoring. The Internet of Things (IoTs) can be described as connecting everyday objects like smart-phones, Internet TVs, sensors and actuators to the Internet where the devices are intelligently linked together enabling new forms of communication between things and people, and between things themselves. Building IoTs has

advanced significantly in the last couple of years since it has added a new dimension to the world of information and communication technologies.

II. INTERNET of TINGS (IOT)

The Internet of things (stylized Internet of Things or IoT) is the internetworking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society. “The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications. the vision of the Internet of things has evolved due to a convergence of multiple technologies, including ubiquitous wireless communication, real-time analytics, machine learning, commodity sensors, and embedded systems.

III. WIRELESS SENSOR NODE (WSN)

The main components of a sensor node are a microcontroller, transceiver, external memory, power source and one or more sensors. The controller performs tasks, processes data While the most common controller is a microcontroller, other alternatives that can be used as a controller are: a general-purpose desktop microprocessor, digital signal processors, FPGAs and ASICs. A microcontroller is often used in many embedded systems such as sensor nodes because of its low cost, flexibility to connect to other devices, ease of programming, and low power consumption. Transceiver Sensor nodes often make use of ISM band, which gives free radio, spectrum allocation and global availability. The possible choices of wireless transmission media are radio frequency (RF), optical communication (laser) and infrared. Radio frequency-based communication is the most relevant that fits most of the WSN applications. WSNs tend to use license-free communication frequencies: 173, 433, 868, and 915 MHz; and 2.4 GHz. The functionality of both transmitter and receiver are combined into a single device known as a transceiver. From an energy perspective, the most relevant kinds of memory are the on-chip memory of a microcontroller and Flash memory—off-chip RAM is rarely, if ever, used. Flash memories are used due to their cost and storage capacity. Memory requirements are very much application dependent. A wireless sensor node is a popular solution when it is difficult or impossible to run a mains supply to the sensor node. A wireless sensor node is a popular solution when it is difficult or impossible to run a mains supply to the sensornode.

IV. OVERALL ARCHITECTURE

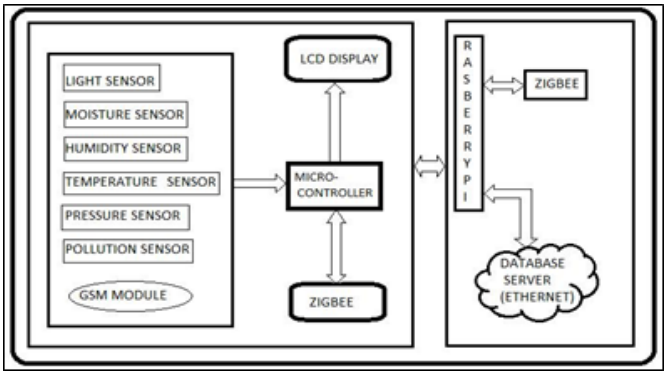

Figure 1

WORKING :

The figure shows the overall system architecture of environmental monitoring wireless sensor network

system Sensor node is a major part in this system it is responsible for information or sensor data. Raspberry pi manages multiple sensor nodes. Design and Implementation of Environment monitoring system using Raspberry-Pi which contains interfacing with various sensors (temperature, Humidity, CO2, Vibration). Real time data will be collected by all the sensors and will be fetched by the Webserver. the gateway node of wireless sensor network, that is raspberry pi (base station) consist of database server and web server in one single-board computer hardware platform, it reduces the cost and complexity of deployment. Sensor node sense the data from the sensor and that data receives the end tag, end tag search the nearest router if router in its range it immediately sends the data to the router, next router to coordinator, here coordinator is directly communicating with the base station. Base station sends all data to the cloud or Ethernet (Database server). The WSN is built using a coordinator node and several sensor nodes, a workstation and a database.

V. RASPBERRY PI

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. The raspberry pi is the cheapest ARM11 powered Linux operating system single board computer board. This board runs an ARM11microcontroller @1GHz and comes with a 1GB of RAM memory [16,17], as this model has better specifications as compared to other raspberry pi models such as raspberry pi B and B+ model [4]. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games. It supports 32GB external SD or micro SD card, the device consists a 4USB ports.

VI. ARDUINO PLATFORM

The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila. Arduino Mega, etc. I used Arduino Uno in this development. Arduino is based on ATmega328. The package contains a 16 MHz ceramic resonator, a USB connection, a power jack and ICSP header and a reset button. Instead of using the FTDI USB-to-serial driver chip our Arduino features the Atmega16U2 chip programmed as a USB-to-serial converter.

VII. XBEE MODULE

Zigbee is a high-level communication protocols used to create wireless networks. Transmission distances to 10–100 meters depending on power output and environmental characteristics, ZigBee devices can transmit data over long distances by passing data through a mesh network topology. The Zigbee transmission data rate is 250 Kbit/s [6]. Zigbee is an established set of specifications for wireless personal area networking (WPAN), i.e. digital radio connections between computers and related devices. For the wireless communication between sensor nodes and the gateway node ZigBee RF modules were used. All the ZigBee devices are based on ZigBee standard which has adopted IEEE 802.15.4 for its physical layer and MAC protocols. The wireless devices based on this standard operate in 868 MHz, 915 MHz and 2.4 GHz frequency bands having a

maximum data rate 250Kbps. ZigBee protocol layers are based on OSI model. When the pan is to use ZigBee, it is necessary to mention IEEE 802.15.4 standard. One of the finest characteristics about this standard is it allows user to use PHY and MAC layer defined by IEEE 802.15.4 and lets user to define the upper layers of the OSI model. Similarly, ZigBee also use the MAC and PHY layer of IEEE 802.15.14 standard.

VIII. CONCLUSIONS

Comparing with collection and forwarding information or data of traditional base station (gateway), this system has low-cost, low power consumption, and easy to maintain. This paper designs a wireless sensor network system using Raspberry Pi as a base station, XBee as a networking protocol, sensor node as combination of sensors, controller and zigbee. Hence, we can create sensor-logging application, location-tracking applications, and a social network of things with status updates, so that you could have your location parameter control itself based on your current location. One major advantage of the system lies in the integration of the gateway node of wireless sensor network, database server, and web server into one single compact, low - power, credit-card-sized computer Raspberry Pi, which can be easily configured to run without monitor, keyboard, and mouse. Such a system is very useful in many environmental monitoring and data collection

IX. REFERENCES

[1]. Kochlan, M.; Hodon, M.; Cechovic, L.; Kapitulik, J.; Jurecka, M., “WSN for traffic monitoring using Raspberry Pi board,” Computer Science and Information Systems

[2]. (FedCSIS), 2014 Federated Conference on, vol., no., pp.1023,1026, 7-10 Sept. 2014 C. Pfister, Getting Started with the Internet of Things. Sebastopol, CA: O'Reilly Media Inc., 2011.