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A Review: Environmental Monitoring

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Abstract: The challenges of climate changes day by day due to air and water pollution, leading to degradation of its quality. Amalgamation of different gases in air, temperature, humidity, rainfall, atmospheric pressure, light intensity, volatile organic compounds, also there are many types of infections spread which cause diseases which in turns affects the human health by reducing their immunity. Thus the recent changes in surrounding have increased the importance of environmental monitoring, keeping a record of hazardous environment which is harmful for humans.
Keywords: Environment hazardous parameters, Environment sensors

I. INTRODUCTION

The developments in the fields of technology are having a significant impact over the environment and have led to serious concerns. The importance of monitoring is existed in many aspects. The weather conditions are changed day by day so monitored to maintain the healthy growth in crops and to ensure the safe working environment in industries, etc. As technology grows, the process of reading the environmental parameters became easier compared to the past days. The most common parameters being monitored include the temperature, humidity, rainfall, atmospheric pressure, light intensity, air quality affected by pollutants viz.CO_2, CO, SOx, volatile organic compounds and many others.

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 and commissioning expenses. 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 building, monitoring systems for the dosimetry of radiology operators in healthcare applications, location tracking of people, assets or hazardous gases and process control in industrial environments, and many others. The most widely used protocols in applications having less tight latency and reliability requirements, such as environmental monitoring, consist of ZigBee (IEEE 802.15.4), Wi-Fi (based on IEEE 802.11), and Bluetooth (IEEE 802.15.1) . Being based on IEEE 802.15.4, a standard that offers low costs and low power at low data rates, ZigBee is extensively used in a wide range of monitoring and control application that require wireless connectivity.

ZigBee is extensively used in a wide range of monitoring and control application that require wireless connectivity. These solutions provide energy-efficient designs, but cannot comply with tight latency and reliability requirements and require additional hardware for packaging data and for transmitting them to the Internet. Wi-Fi is a popular networking technology based on the IEEE 802.11 set of standards that offers higher transmission range and throughput compared to IEEE 802.15.4, with the cost of higher energy consumption. By using internet connectivity we can easily measure environmental parameter for sending and receiving measurement data.

So that knowing the environmental parameter new system is designed which called Internet of Things (IoT), for transmission and management of huge amounts of data regarding to observe environmental parameters. In this context, the current work presents IoT-based wireless sensors for environmental monitoring: one employing User Datagram Protocol (UDP)-based Wi-Fi communication, one communicating through Wi-Fi and Hypertext Transfer Protocol (HTTP) by using Wi-Fi modules. According to this context, following review is undertaken.

II. LITERATURE SURVEY

One of the previous systems proposed by D. de Donno, L. Catarinucci, and L. Tarricone [1] was designed a radio frequency identification (RFID) augmented module for smart environmental sensing (RAMSES), which is a fully passive device with sensing and computation for RFID applications. RAMSES implements for RF energy-harvesting circuit designed for a dc-dc voltage booster in silicon-on insulator technology, an ultralow-power microcontroller, temperature, light, and acceleration sensors, and a new-generation I2C-RFID chip to wirelessly deliver sensor data to standard RFID, then preliminary RAMSES prototype, fabricated on a printed circuit board. Then results have demonstrated the ability of RAMSES to harvest the RF energy emitted by an interrogator placed up to 10 m of distance and autonomously perform sensing, computation, and data communication.

Second system designed by H. C. Lee and H. H. Lin, [2] they used open-source wireless mesh network module, which integrates the functions of network discovery, automatic routing control, and transmission scheduling. So that they proposed system which is based on open source mesh networking for environmental monitoring applications. Proposed system compare with XBee module. In presented system, WMN module is connected to the host processor via a GPIO, UART, SPI or I2C interface. The host processor reads data from its sensors (i.e., temperature, humidity, or air quality, etc.), and sends the collected data to the WMN module. The WMN module buffers the data and transfers it to the destination node in a wireless mesh network. The average package delivery ratio and standard deviation of the proposed WMN module and the XBee are 94.09%, 91.19%, 5.14% and 10.25%, respectively. By using open source wireless mesh network have the advantages of low-cost combined with high reliability and performance, and can be used in implementing monitoring applications without the complications of complex wireless networking issues.
J. Gutierrez, J. F. Villa-Medina, A. Nieto-Garibay, and M. A. Porta-Gandara, [3] was developed system for automated irrigation system to optimize water use for agricultural crops. The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants**.** They designed an algorithm was developed with threshold values of temperature and soil moisture that was programmed into a microcontroller-based gateway to control water quantity. The proposed system, automated irrigation system has two unit components
Wireless sensor units (WSUs) and a wireless information unit (WIU), which are linked by radio transceivers that allowed the transfer of soil moisture and temperature data for implementing a WSN that uses ZigBee technology. The WIU has also a GPRS module to transmit the data to a web server via the public mobile network. The information can be remotely monitored online through a graphical application through Internet access devices. The automated system was tested in a sage crop field for 136 days and water savings of up to 90% compared with traditional irrigation practices of the agricultural zone were achieved. It takes advantages of its energy autonomy and low cost, the system has the potential to be useful in water limited geographically isolated areas.
The system proposed by J. P. Amaro, R. Cortesão, J. Landeck, and F. J. T. E. Ferreira [4] for Disaggregated Current Estimation in Large Buildings to harvest power by using wireless sensor network. To monitor disaggregated consumption is presented, based on a contact-less power source for Zigbee nodes using a split-core toroidal coil current transformer (SCCT). The proposed device is able to power a battery-free wireless node estimating also the current drawn by the electrical load with a single SCCT. In this system uses LTC3108 as a bootstrap charge to store power. Then energy given to radio-frequency (RF) module as well as a low-power device manager. The RF module is implemented with a Zigbee device, while the system power manager uses microcontroller. It is able to estimate load current consumption while being powered through a single contactless electromagnetic power source using only one SCCT. The device acts as a wireless network node sending collected measurements through the network. The SCCT is successfully applied to power a battery-free wireless device running a complex communication software stack.
H.-C. Lee, Y.-C. Chang, and Y.-S. Huang [5]. proposed for Monitoring Mechanical Wear-Out of Parts using Wireless Sensor System. A ball screw is a typical mechanical part that experiences wear-out and is widely used in computer numerical control machine tools to control the movement of processing targets and spindles. These types of parts need frequent checks so that they are replaced before excessive wear occurs. In the proposed system collected the signals of the operating ball screw to estimate the state of wear. The sensing components are attached on the surface of a nut or the shaft of a ball screw. They are then connected by wires to transfer the data to the data server for further analysis. So propose a wireless sensor system that: emphasizes low-power and low cost in hardware design. logs the signals during the operation of a mechanical part that could experience wear. guarantees that all the logged data can be wirelessly delivered to the data server.
One paper by M. Collotta and G. Pau [6] Energy Management Approach for Smart Homes Using Bluetooth Low Energy. The installation of systems based on wireless networks can play a key role in the extension of the smart grid toward smart homes, that can be deemed as one of the most important components of smart grids. This paper proposes a novel energy management approach for smart homes that combines a wireless network, based on bluetooth low energy (BLE), for communication among home appliances, with a home energy management (HEM) scheme.
In paper M. Hulea, G. Mois, S. Folea, L. Miclea, and V. Biscu [7] This paper presents a complete solution for temperature and humidity monitoring using low-power wireless devices, called Wi-Sensors. The Wi-Sensors use a RN-131C Wi-Fi chip as the core microcontroller and 4 configurable digital input/output lines to which temperature sensors can be attached. The digital 1-Wire and DHT22 protocols had been implemented in the embedded application running on the device. Therefore, for temperature and humidity measurements, any of the sensors operating with one of these two protocols can be used. The existing Wi-Fi 802.11 infrastructure can be used in order to send measurement data to remote destinations. The proposed solution also incorporates a data

viewer and data processing application, which provides functionalities for alarming the users by email or by SMS in case previously configured limits are exceeded.

In a paper D. Dujovne, T. Watteyne, X. Vilajosana, and P. Thubert[8] present Industrial and IP-enabled low-power wireless networking technologies resulting in the Industrial Internet of Things. The solution based on Time- Synchronized Channel Hopping, a medium access control technique at the heart of industrial standards such as the WirelessHART and ISA100.11a, and IEEE802.15.4e. Through an important standardization effort at the IETF, standards such as 6LoWPAN allow low-power wireless devices. Closing that standardization gap is the goal of the newly created 6TiSCH working group ("IPv6 over the TSCH mode of IEEE 802.15.4e") at the IETF, dedicated to enabling IPv6 over the TSCH mode of the IEEE802.15.4e standard. 6TiSCH is standardizing mechanisms supporting different scheduling approaches, including centralized, distributed, and hybrid. With this effort, industrial applications are heading toward the integration of Information and Operation Technologies. The use of a common protocol stack to enable seamless communication between heterogeneous devices, from powerful data servers to tiny sensing nodes, has the potential to create a wide range of applications, including those based on Big Data storage and analysis engines.

S. C. Folea and G. Mois[9]present paper A low-power wireless sensor for online ambient monitoring, which develop a compact battery-powered system that monitors the carbon dioxide level, temperature, relative humidity, absolute pressure, and intensity of light in indoor spaces, and that sends the measurement data using the existent wireless infrastructure based on the IEEE 802.11 b/g standards.

The developed ambient wireless sensor, which measures the CO2 level in the air, the temperature, humidity, absolute pressure and light intensity and which sends the acquired information using theIEEE 802.11 b/g standards to a preset IP address. The acquired data can be displayed locally on an LCD with backlight, showing text on 2 rows and 16 columns, by pressing a button, or at a remote location, by using a specialized application or a web page and by using IoT sending short text messages using the Short Message Service (SMS) in case of alarms triggering.

G. Mois, T. Sanislav, and S. C. Folea[10],present a paper on cyber physical system that monitors the environmental conditions in indoor spaces at remote locations. This system using the existent wireless infrastructure based on the IEEE 802.11 b/g standards, a cyber-physical system, starting from the physical level, consisting of sensors and the communication protocol, and reaching data management and storage at the cyber level.

CPS used for monitoring the environment in indoor or outdoor spaces, where IEEE 802.11 b/g network coverage exists.The two main system components consist of the following.

1) Wi-Fi Sensors: Low-power wireless sensors based on the programmable system-on-chip 3 (PSoC 3) device and on the RN-131C/G wireless local area network (WLAN) module.
2) IoT Platform: A Beagle Bone Black embedded computer running the server application.

The experimental results show that the proposed system represents a viable and straightforward solution for environmental and ambient monitoring applications.

III. CONCLUSION

After reviewing all the prior facts, this encouraged the adoption of wireless sensor networks at a scale which was never encountered before. it is expected that future trend will not only continue but also become even more prominent. Furthermore, the development of IOT brought new demands and opportunities for the advancements of WSNs. The combination of advanced sensing, measurement and process control has utilization across a wide range of domains such as transportation, energy, civil infrastructure, environmental monitoring, defense, smart buildings, manufacturing and production, and others.

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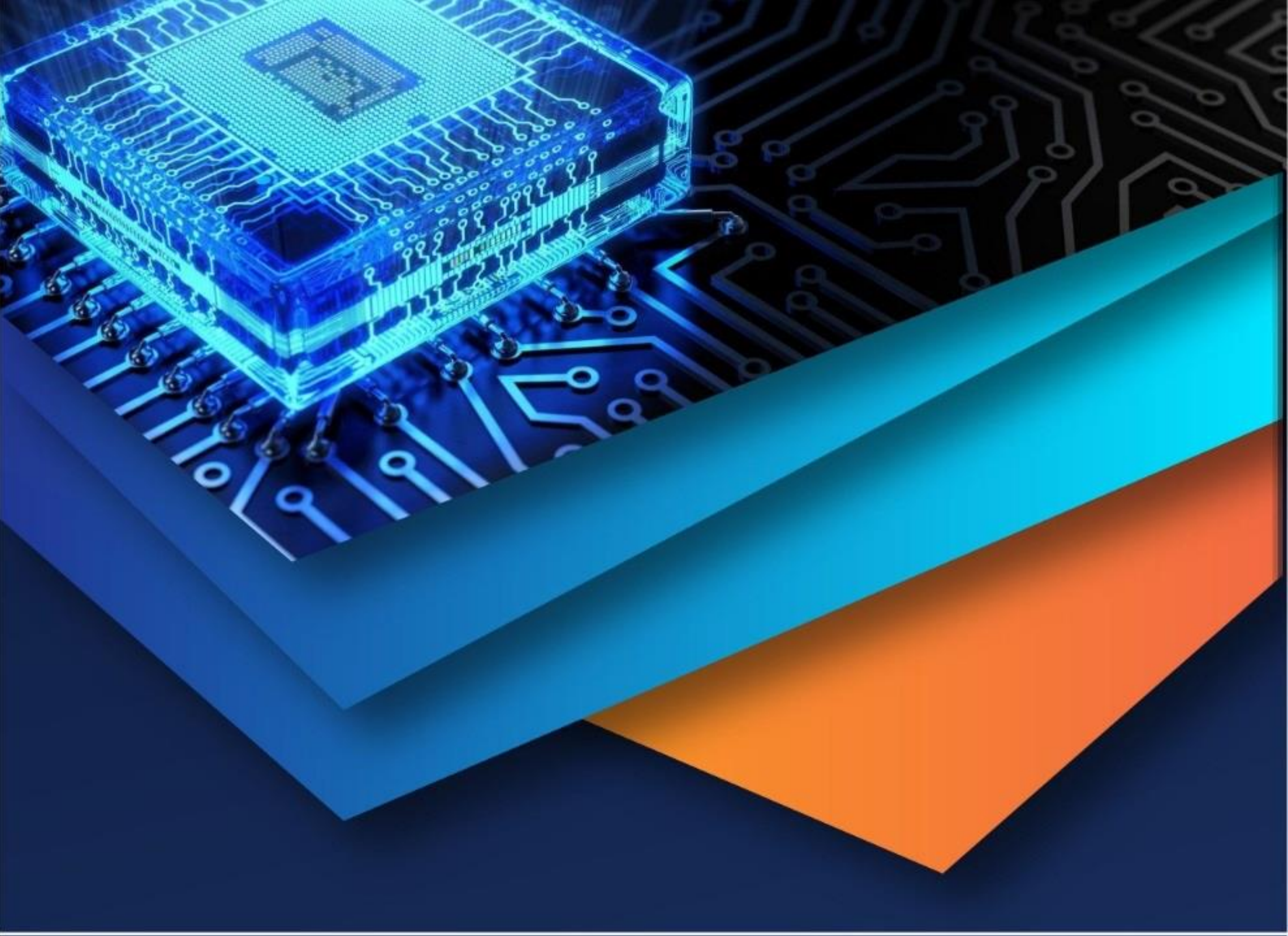

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