Section A-Research paper
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MONITORING OF PRESSURE, LIGHT AND PRECIPITATION IN ASMART CITY USING INTERNET OF THINGS

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ABSTRACT
The pressure, light and precipitation of a smart city can be monitored using an IoT- based environmental parameter monitoring system. Framework is sensor-based. A Raspberry Pi board was used containing three sensors attached to it, which are used to sense pressure, light and precipitation, and the board is connected to the internet. It was linked to a channel created on www.thinkspeak.com in order to put the prepared framework into action. The Raspberry Pi B3+ has been linked to the sensors, and data is being delivered to the www.thinkspeak.com channel. Sensors collect data, which is then sent to the client over the HTTP protocol. Via a USB dongle, the board is connected to the internet. The outcomes are shown graphically on www.thingspeak.com.

Key Words: IoT, Sensors, Raspberry Pi Board, pressure, light and precipitation.

Introduction

In India wide range of seasons is available. These seasons vary throughout the entire year. Since, many Indians work in many regions and the weather has a big impact on their jobs. Therefore, weather parameters monitoring and weather forecasting is very important in India. Many of the detrimental effects caused by natural disasters brought on by unfavorable weather in India could be avoided with the use of an accurate weather forecast. Monitoring the weather is an equally vital responsibility. In India, a variety of artificial and natural methods are utilized to monitor the weather. Modern technology has taken over, though, to make everything clear and precise. As a result, modern technology can also be utilized to monitor the weather. One of the most important technologies is the Internet of Things (IoT). It is a rapidly expanding technology that is significant in many fields. It has numerous applications in various fields, including the growth of urban communities, the organization of essential resources and frameworks, adaptability, transportation, and collaborations. The growth of IoT has revealed that an increasing amount of organized data is being examined, safeguarded, and communicated under various circumstances (Potu et al., 2016 **[1]** & Anonymous, 2022 **[2]).**

"IoT" stands for "Internet of Things". The entire network of physically connected gadgets is alluded to. Different gadgets can be connected with one another, the cloud, and other

physical things. The advancement of computer chips and fast internet bandwidth has made it possible to connect billions of devices together. In common, IoT-enabled products like cars, vacuum cleaners, and other gadgets, sensors are used to gather data and provide incredibly intelligent online user responses. The Internet of Things (IoT) can be used to collect and share meteorological data while accounting for various environmental and weather conditions.

Historical Background

Within the last ten years, the development of an IoT-based system for monitoring environmental factors began. In this context, Satyanarayana et al(2016) .'s [3] work is significant. They used a raspberry pi to create an IoT-based smart weather station. They asserted that the weather has a big impact on how we live our daily lives. It's crucial to learn about the local climate conditions in order to plan your home and your circumstances. It is now possible to gather information in-situ because to recent advancements in the Internet of Things. The study suggests a framework that adds information based on the client's demand while screening climate characteristics at a location. Through the internet, the customer can access this information at anytime, anywhere in the world. The suggested architecture uses a Raspberry Pi that has sensors attached to collect weather data. The obtained data is uploaded to the cloud for easier access.

In keeping with what was said earlier, Rao et al. (2016) **[4]** recommended a weather monitoring system powered by the Internet of Things. The system proposed in this study is a modified approach for investigating the environmental circumstances in a specific location and making the knowledge available elsewhere on Earth. The innovation underlying that is IoT, a cutting-edge and effective method for tying actual objects to the internet and putting the entire universe of things into a framework. Electrical equipment, sensors, and vehicle electronic rigging are all relevant in this situation. Temperature, relative humidity, light intensity, and CO level are just a few of the frequent parameters that the device utilises sensors to monitor and adjust. It then sends the information to a website and plots the sensor statistics as graphical estimates. The records recovered through the executed procedure are accessible online from any location on earth.

Rasal & Rana (2016) **[5]** working on a weather monitoring system based on a raspberry pi. They put a model for the framework of climate observation into practise. For the purpose of observing the current climate, it is highly beneficial to utilise the right sensors to calculate temperature, relative stickiness, and barometric weight. According to the findings of this study, a framework or model for monitoring climate has been created to record and show climate features such temperature, wetness, wind direction and speed, rain falls, and climatic weight. Several climate checking processes have been audited in this report. The data is recorded and stored by the gadget for further use. Customers get access to the system's saved data anytime they need it. The raspberry pi is the most contemporary and efficient radar, satellite, and microcontroller for remote climate observation.

Priya et al. (2017) **[6]** working on a system for monitoring the weather using IoT. The methodology proposed in this study offers a novel approach for investigating the environmental conditions at a particular location and making the findings understandable internationally. It is a cutting-edge and successful method for tying physical objects to the internet and integrating the entire universe of things into a framework; the development behind it is known as net of factors. Temperature, relative humidity, light intensity, and CO level are just a few of the usual factors that the device utilises sensors to monitor and modify. Once on the website's portal, the data is rapidly plotted as graphical knowledge. Anywhere in the planet can access the information recovered from the realized device through the internet.

Sudha et al. (2017) **[7]** worked on a thorough and quick IoT-based weather monitoring system and proposed a fantastic structure for online climate disclosure. The suggested structure accounts for online announcements of climatic parameter. It enables the general public to easily check the weather information online without the requirement for a weather forecasting office. Framework screens the climate and provides live delineation of the climatic measurements using temperature, moisture, and rain sensors. The system continuously monitors temperature using a temperature sensor, stickiness using a moisture sensor, and rain as well. The framework consistently sends this information to the microcontroller, which then organises it and sends it on through a Wi-Fi connection to the online web server. To be viewed on the online server structure, this information is continuously updated.

Satyanarayana et al. (2017) **[8]** worked on a mobile app and IoT-based smart weather station, which led to the conclusion that a framework must be established to correctly measure the environment parameters at the area of intrigue because climate conditions are changing everyday. This work developed a simple method for calculating climate dynamics without the need for human interaction. This proposed technique makes use of flexible applications and IoT innovation to enable the transfer of the collected temperature data in a remote area to the cloud and a specific portable application.

Alexopoulos (2018) **[9]** worked on the architecture and creation of a framework for industrial IoT to realize services in systems for industrial product service. The architecture provided by this framework makes it possible to build an Internet of Things framework for providing services across numerous industries. A thorough prototype that successfully shows data gathering, analysis, and reporting was produced. It also provides a variety of services to accommodate the demands of various roles. The key benefits of this strategy are the systematic information gathering, compilation, analysis, and streamlining of user information. Several graphs and figures are used to present the output to the users. Additionally, this framework may be used in a variety of settings and gives users extended usage.

Amodu et al. (2019) **[10]** studied the data security effects of public relations professionals using the Internet of Things. In the last six months, research has been done.

The online channels of public relations associations and organisations were used to entice participation. The data were collected by online data gathering. Using SPSS to analyse the data, it was found that the use of the Internet of Things by public relations specialists has raised some security issues.

Saif Allah et al. (2020) **[11]** stated that IoT can be used to monitor water quality parameters and worked on a real-time IoT-based water quality management system to lower or eliminate the cost of water quality tests outside of a lab. IoT can be used to maintain parameters relating to water quality. These characteristics are cleverly maintained using IoT and checked at the input.

Zhu et al. (2020) **[12]** conducted research on an IoT-based intelligent classroom management system for schools. In this study, they created a method for managing smart classrooms in schools that uses little electricity, is inexpensive, simple to use, and is likely to be well-liked. The storage model based on MySQL and NoSQL has been found to match the ideal system requirements. MySQL is simple to use and satisfies the needs of tiny data volume information. For the vast amounts of data the IoT generates, HBase offers reliable storage and quick data. The user can swiftly read data while taking readings while using that system.

Tariqa et al. (2021) **[13]** conducted a thorough analysis of the security issues and needs for smart IoT applications. and discovered that the research and industry have concentrated on a number of security flaws such device vulnerabilities and attain transit related with IoT devices. Due to its limited nature, smart IoT applications have a number of security issues that must be taken into consideration while creating security measures. The authors also discussed significant security challenges relating to IoT applications in smart cities, smart agriculture, and smart healthcare.

Hamdy et al. (2022) **[14]** suggested a strategy for implementing IoT in Warehouse 4.0 using Node-RED. In this study, a system using Node-RED and MongoDB has been suggested for the deployment of the IoT method in managing warehouses. In the research paper, It is described how implementing IoT in a warehouse might have advantages and avoid problems with existing management systems. A dataset has been used to show the enormous impact that IoT has on operations warehouse, especially on forecasting accuracy. By enabling real-time sight of everything in the warehouse, this system assists in boosting speed and efficiency, lowering labour requirements, and minimising counterfeiting and inventory shortages. This study gave warehouses a practical road map for enhancing their operations with IoT.

It has been found through the review of the literature that IoT technology is receiving very little attention when it comes to monitoring environmental indicators. IoT technology must be used to monitor environmental indicators as a result.

As a result, the current study is on using IoT technology to monitor environmental indicators. In this research, a framework for monitoring pressure, light and precipitation has been developed.

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Methodology

The framework developed for this study, which analyses pressure, light, and precipitation in the environment to forecast when it will rain or not, was made using three sensors for pressure, light, and precipitation monitoring. These sensors are integrated into a Raspberry Pi board, which continuously sends data to a cloud server so that users can view it hourly or at any other desired regular interval of time. Arduino serves as a typical analogue to digital converter by converting the data gathered from these sensors to cutting- edge forms and sending it to the Raspberry Pi. Moreover, a modem for signal conversion that converts analogue to digital and digital to analogue signals has been added. As a result, a straightforward framework with less complicated components and accessible portions has been created. With the sensors connected to the Raspberry Pi 3 B+ board, Framework is able to track changes in the values of environmental parameters. This data are then combined, and the memory chip on the Pi board, exactly like the memory chip on the liquid crystal display connected to the result display, stores the information obtained. The same has been accomplished using software tools and Python, a programming language. The Think Speak site is used to view the outcomes. It has been linked to a channel developed on www.thinkspeak.com in order to put the prepared framework into action. The Raspberry Pi B3+ has been linked to all the three sensors and data is being delivered to the www.thinkspeak.com channel. The Raspberry Pi b3+ board includes two operating modes on the framework side: web server and information security. Sensors collect data, which is then sent to the client over the HTTP protocol. The board has been linked to the internet either through a USB dongle. On www.thingspeak.com, the results are presented in a graphical way. All the three fields have been added to a single channel on www.thingspeak.com so that results can be displayed graphically.

Results

When a personal channel is signed in to www.thingspeak.com, results are shown graphically on the computer screen. The following are the outputs of the findings, as shown in Figures 1, 2, and 3:

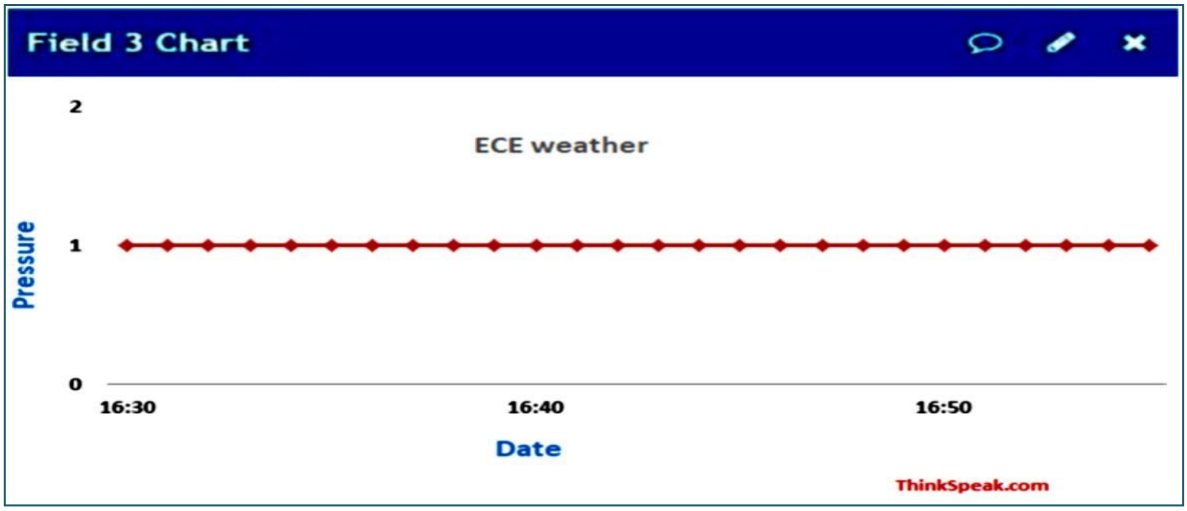

Fig. 1: Pressure Monitoring Chart

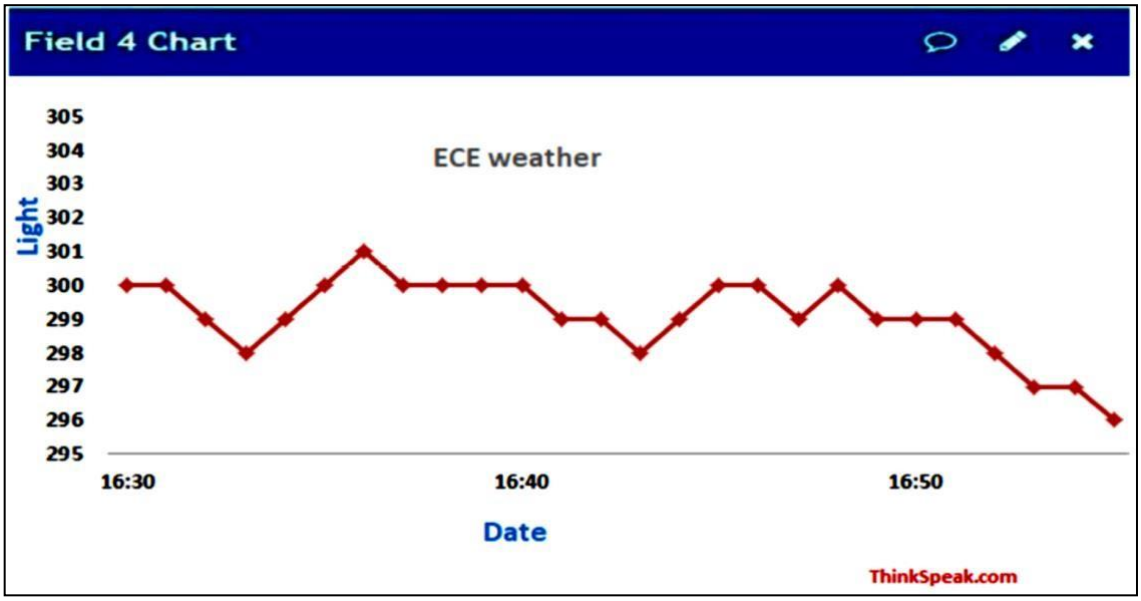

Fig. 2: Light Monitoring Chart

Fig.3: Precipitation Monitoring Chart

The aforementioned charts illustrate variations in pressure, light, and precipitation for the research area in relation to a half-hour time period. These graphs show that IoT technology is used to monitor temperature and humidity.

Conclusion

The framework that is now in place can monitor the pressure, light and precipitation in a specific area. IoT technology, combined with sensors and software, is the foundation of the framework. One of the key technologies employed today is IoT technology. The employment of this technology, together with sensors and software, may make any system intelligent. The current study has drawn the conclusion that intelligent systems can be created to monitor various environmental variables. Different frameworks can be created utilizing various onboard sensors to monitor various environmental factors. It is also possible to use the information gathered from these frameworks to forecast the weather and prevent environmental catastrophes. The IoT has the potential to greatly improve human life and create new commercial opportunities. This technology is always impeding our best attempts to develop smarter, more secure systems and gadgets.

References:

1. **Potu, A.; Jayalakshmi, & Umpathy, K. (2016),** "Smart Paper Technology a Review Based on Concepts of E-Paper Technology" *IOSR Journal of Electronics and Communication Engineering (IOSR-JECE),* **11(1-1):** 42-46.

2. **Anonymous:** https://aws.amazon.com/what-is/iot/ (Fetched on 18/05/2022)

3. **Satyanarayana, K. N. V.; Reddy, S.R.N.; SaiTeja, P. V. Y. N & Habibuddin, M. B. (2016)**, "IoT Based Smart Weather Station Using Raspberry-PI3", *Journal of Chemical and Pharmaceutical Sciences,* **10 (Special Issue):** 1-6

4. **Rao, B. S.; Rao, K. S. & Ome, N. (2016),** "Internet of Things (IoT) Based Weather Monitoring system", *International Journal of Advanced Research in Computer and Communication Engineering*, **5(9):** 312-319

5. **Rasal, M.V. & Rana, J. G. (2016),** "Raspberry Pi Based Weather Monitoring System", *International Journal of Advanced Research in Computer and Communication Engineering,* **5(10):** 119-122.

6. **Priya, V. L.; Venkatesh, P.; Pandey, M.; Gowthami, P. & Jilani, N. B. (2017),** "Weather Monitoring System Using Internet of Things (IOT)", *International Journal of Electronics and Communication Engineering,* **Special Issue17:** 200-204

7. **Sudha, T.; Udaya, D. K.; Sathya, T. & Sathiya, D. (2017),**" Detailed And High Speed Smart IoT Based Weather Monitoring System", *International Research Journal in Advanced Engineering and Technology (IRJAET),* **3(2):** 1667-1771.

8. **Satyanarayana, K.N.V.; Reddy, S.R.N.; Varma, K.N.V.S. & Raju, P. K. (2017),** "Mobile App & IoT Based Smart Weather Station", *International Journal of Electronics, Communication & Instrumentation Engineering Research and Development*, **7(4):** 7-14.

9. **Alexopoulos, K.; Koukas, S.; Boli, N. & Mourtzis, D. (2018)** "Architecture and development of an Industrial Internet of Things framework for realizing services in Industrial Product Service Systems", *Procedia CIRP*, **72:** 880–885.

10. **Amodu, L.; Odiboh, O.; Usaini, S.; Yartey, D. & Ekanem, T. (2019)** "Data on security implications of the adoption of Internet of Things by Public Relations Professionals" *Data in brief*, **27**: 104663.

11. **Allah, S.; Hassan, H. & Mourad, M. H. (2020)** "Real time IoT based Water Quality Management System, *Procedia CIRP*, **91:** 478–485.

12. **Zhu, Z. M.; Xu, F. Q. & Gao, X. (2020)** "Research on School Intelligent Classroom Management System Based on Internet of Things, *Procedia Computer Science*, **166:** 144–149.

13. **Tariqa, N., Khanb, F. A. & Asim, M. (2021)** "Security Challenges and Requirements for Smart Internet of Things Applications: A Comprehensive Analysis", *Procedia Computer Science*, **191:** 425–430

14. **Hamdy, W.; Al-Awamry, A. & Mostafa, N. (2022)** "Warehousing 4.0: A proposed system of using node-red for applying internet of things in warehousing, *Sustainable Futures*, **4:** 100069