Surveillance System Based on IoT for Smart-Home Automation

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Abstract— House surveillance and automation are used to assist maintain pleasant living Conditions within a home. There are numerous sorts of comfort criteria for humans in their dwellings. The most important of these categories are thermal comfort, which is connected to temperature and relative humidity, natural light, which is related to hues and light, and hygienic comfort, which is related to air quality. A system may be put up to monitor these characteristics and assist keep them within acceptable limits. Furthermore, making the house smart entails intelligently automating the execution of many actions after evaluating the obtained data. The Internet of Things may be used to automate tasks (IoT). This grants the occupant access to specific data in the home and the capacity to remotely control some parameters The comprehensive design of an IoT-based sensing and monitoring system for smart home automation is presented in this study. The suggested architecture makes use of the EmonCMS platform to gather and display monitored data as well as remotely operate household appliances and devices. The chosen platform is extremely adaptable and user-friendly. The NodeMCU-ESP8266 microcontroller board is used to sense various variables within the house, allowing for real-time data sensing, processing, and uploading/downloading to/from the EmonCMS cloud server.

Keywords- IoT (Internet of Things), Home Automation System, Sensors Nodes, EMONCMS, Smart Home

I. INTRODUCTION

Improving energy efficiency measures technology becomes a priority for so many countries around the world, and their interest is growing. Institutions have participated in this technology advance through student competitions aimed at increasing student understanding. The appeal of IoT has grown rapidly to basic in-home apps and everyday routines. The use of IoT in the house is really for power management and savings while reaching and keeping a specific degree of comfort. As IoT-enabled smart things devices are divided into three primary components. The first component is the sensing and data gathering component. This is accomplished by strategically installing sensors or gadgets, often known as objects, throughout the home to measure and collect required data such as temperature, humidity, or luminosity.

The computational component is the system's second component. Sensors offer unprocessed data. Such data are transmitted to the CPU via a wired or wireless link. The information is subsequently translated into understandable values by the processor [1]. These data are sent to a smart device for intelligent automation and/or to the a user interface. The connection is the final component in IoT technology. Most system utilizes a server to post information after analysis so that the user may access it. The internet may also be used to remotely monitor data and operate equipment [2]. Automation systems can assist to save time, give an improved way of life in homes, and also save power by constantly performing multiple tasks. This article describes and examines the architecture of an IoTbased intelligent stand - alone photovoltaic electrical system that employs one or more of many ways. The following sections comprise the paper: Section 2 provides a brief assessment of the literature on Iot network in use for smartthings; Section 3 covers the design process; Section 4 shows the testing and findings; and Section 5 ends the article.

II. LITERATURE REVIEW

This article went over the standard setup of a smart home system employing an IoT platform.

Temperature, humidity, luminosity, and air quality (i.e. CO2 and dust levels) are frequently monitored characteristics in residences to maintain a good degree of comfort [3].Data is sent among sensors and processors only using or even more communication methods. Bluetooth, ZigBee, Wi-Fi, Ethernet, and GSM are a few examples. Bluetooth and ZigBee are popular in-home data transmission and control protocols that serve as a connection among devices as well as the central processor. These data transmission methods are widely used due to low energy usage and ease of implementation [4][5]. Furthermore, Wi-Fi has the benefit of flexibility, making it more prevalent for most devices. Wi-Fi uses more power than equivalents like Bluetooth or ZigBee. Decrease the incidence of data uploading to decrease power usage. A microcontroller, such as Arduino, Raspberry Pi, or NodeMCU, is typically used to analyse and handle the data collected in a home automation system. The Raspberry Pi is a single-board computer with a sole microcontroller. It can do more sophisticated tasks than some other controllers due to its larger RAM either 256MB or

512MB, depending on the version, and is mostly employed as a central processing unit for many devices. Most modern Raspberry Pi versions include USB and Ethernet connectors, making it simple to transfer data to the web [1][2]. Another possibility is to utilise the NodeMCU. It is an Arduino-based microcontroller with the ESP8266 Wi-Fi chipset added. This microcontroller contains 128kB of RAM capacity and 4MB of storage. It is often used for a single Internet of Things application or to avoid the requirement for a central processor. Because each component of the system may publish data to a server independently, the coding and communication chain are simplified [6]. The NodeMCU board has only single analogue input, limiting its uses to an individual data surveillance system. This disadvantage can be mitigated by utilising the ASD115, an analog - to - digital with 4 analogue input ports and a better conversion precision of 16 bits. Other method of control is via cellular GSM, which allows users to submit instructions in codes to the microcontroller via SMS. This control strategy necessitates the addition of a particular GSM module to a circuitry. Emails could also be used for this manner [7].

III. Development OF A SOLAR Home Surveillance System

As illustrated in Fig. 1, a circuitry was developed to integrate all of the sensors indicated. The weather service hub is housed in the container, which also houses the Micro controller, the ASD115, and a standby battery.

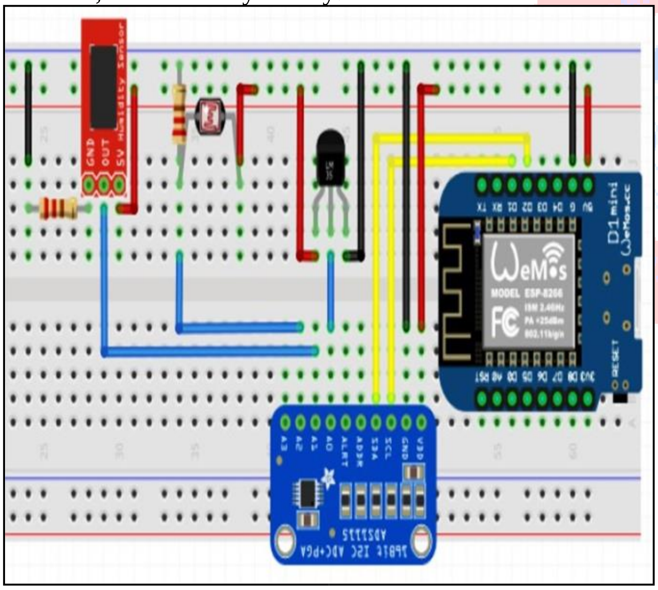

Fig.1. The weather surveillance hub's circuitry

The Microcontroller board is used to gather data out of each nodes. The data collected by all devices is continually transmitted & saved on the EmonCMS system. The EmonCMS is an IoT cloud used for data acquisition, with the possibility of displaying it via widgets that can be readily customised and changed to the user's needs. It is an accessible servers that is interoperable with a number of pre-configured physical devices, including the emonPi and emonTx, as well as the ability to connect to any other nodes or sensors to submit information to it. This one is accomplished by applying a given personalized API key to that same controller's code. This system was chosen as it was determined to become the best fit for with this project. This system also uses PV solar panels for additional power generation hence one of the potential disadvantage of IoT devices can be alleviated.

IV. Implementation and Results

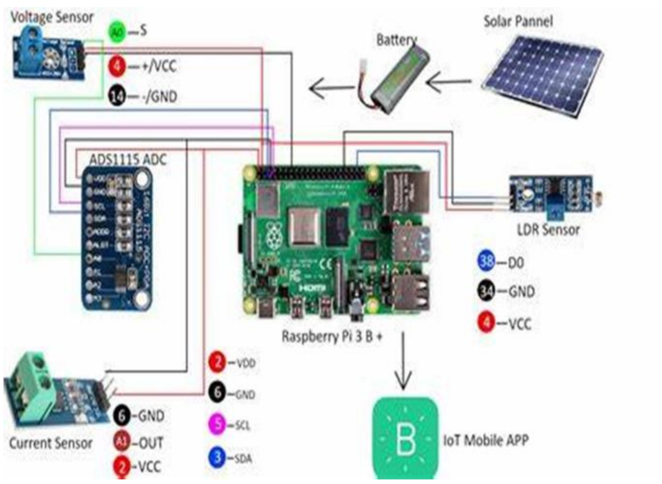

Fig.2.Design of the weather monitoring using solar panel

As illustrated in Fig.2, the suggested architecture of a Pv House surveillance system is employed for regulating the house's energy efficiency without compromising the minimal needed convenience standards. Whereas the sensors positioned within and across the home gather information continually, the information should be available at all periods and transferred to a remote server every several seconds for presentation, analysis, and preservation. A test was conducted to check that the information is transferred to the IoT EmonCMS remote server and displayed over the specified time period.

The temperatures, humidity, and illuminance values recorded by a EmonCMS input nodes are depicted in Fig. 4. Furthermore, as illustrated in Fig.3, those values are stored and displayed across period via an information dashboard inside the EmonCMS. Furthermore, Fig. 5 depicts the data shown for client on a Blynk app created specifically for this purpose.

Inputs

Node:	Key	Name	last updated	value
1	1	Temperature 1	2s ago	23.84
1	2	Humidity 1	2s ago	49.5
1	3	Lux 1	2s ago	233

Fig .4. Data Input Records

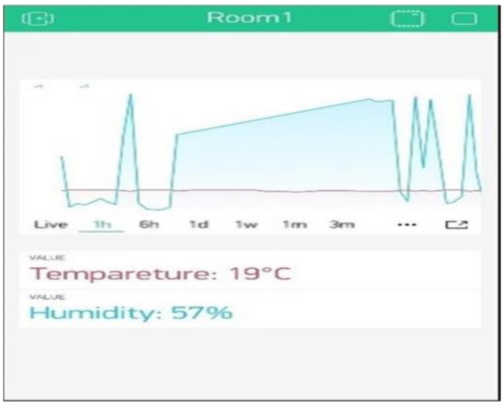

Fig. 5. Readings of Temperature and humidity displayed using Blynk app

V. Conclusion

This study described a straightforward and adaptable solution for solar home monitoring and automation. The EmonCMS platform was chosen because it employs a cloud server to gather data from the sensor nodes in accordance with the IoT paradigm. Data obtained can be presented, stored, or analysed before being utilised to operate devices in the home. The NodeMCU, in conjunction with the ESP2866, acts as the primary processing system, collecting data from sensors, analyzing it, and uploading this to the EmonCMS remote server. In addition to reading big quantities of information from the very same server, the NodeMCU may operate semiconductor switches. It is a comprehensive smart-home surveillance & management solution related to Iot technology. The suggested clever solar design is especially adaptable and may be readily enlarged and adapted to bigger structures by expanding the number of sensors, measurements, and control equipment. More capability and knowledge might be added to existing system and allow the based home automation system to develop, adapt, & evolve on one's own utilising sophisticated ai technology.

REFENCES

[1] Hayet Lamine and Hafedh Abid, "Remote control of domestic equipment from an Android application based on Raspberry Pi card", IEEE transaction 15th international conference on Sciences and Techniques of Automatic control & computer engineering - STA'2014, Hammamet, Tunisia, December 21-23, 2014.

[2] Vaishnavi S. Gunge and Pratibha S. Yalagi, "Smart Home Automation: A Literature Review", National Seminar on Recent Trends in Data Mining- RTDM 2016.

[3] M. B. a. W.Fincher, "Standards of Human Comfort: Relative and Absolute," The University of Texas at Austin, Austin, 2009.

[4] Archana N. Shewale and Jyoti P. Bari, "Renewable Energy Based Home Automation System Using ZigBee", IJCTEE Volume 5, Issue 3, June 2015.

[5] Ali Mohammed Al-Kuwari, Cesar Ortega-Sanchez, Atif Sharif and Vidyasagar Potdar, "User-Friendly Smart Home Infrastructure: BeeHouse", IEEE 5th 5th International Conference on Digital Ecosystems and Technologies, May31-June3 2011, Daejeon, Korea.

[6] Lamir Shkurti, Xhevahir Bajrami, Ercan Canhasi, Besim Limani, Samedin Krrabaj and Astrit Hulaj, "Development of Ambient Environmental Monitoring System Through Wireless Sensor Network Using NodeMCU and WSN Monitoring", 6th MEDITERRANEAN CONFERENCE ON EMBEDDED COMPUTING (MECO), JUNE 11-15 2017, BAR, MONTENEGRO.

[7] International Electrotechnical Commission, Internet of Things: Wireless Sensor Networks, Geneva, Switzerland: International Electrotechnical Commission, 2014.

[8] Grégory Nain, Francois Fouquet, Brice Morin, Olivier Barais, Jean- Marc Jézéquel, "Integrating IoT and IoS with a Component-Based approach", 36th EUROMICRO Conference on Software Engineering and Advanced Applications, 2010

[9] S. Jaffe, "DESIGN OF INEXPENSIVE AND EASY TO USE DIY INTERNET OF THINGS PLATFORM," Faculty of California Polytechnic State University, 2016.

[10] F. Touati, M. Al-Hitmi, and H. Bouchech, "Towards understanding the effects of climatic and environmental factors on solar PV performance in arid desert regions (Qatar) for various PV technologies," 2012 First International Conference on Renewable Energies and Vehicular Technology, 2012.

[11] Karpathy and L. Fei-Fei, "Deep visual-semantic alignments for generating image descriptions," 2015 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2015.

[12] Karpathy, S. Miller, and L. Fei-Fei, "Object discovery in 3D scenes via shape analysis," 2013 IEEE International Conference on Robotics and Automation, 2013.