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IOT Based Security System Using Raspberry-Pi

MD. Sana Meharaj, E. Malathi, CH. Keerthana, P. Harshitha, D. Mahesh Kumar
Jyothishmathi Institute of Technology and Science, Karimnagar, Telangana., India.
*Corresponding Author Email: sannusanameharaj@gmail.com

Abstract. In today's rapidly advancing technological landscape, the Internet of Things (IoT) has emerged as a prominent and thriving smart system. It entails the interconnection of various systems with the internet, presenting a multitude of possibilities. One such application lies in enhancing home security. This research paper focuses on the development of an IoT-enabled system that effectively alerts homeowners and registered members in the event of human intrusion near the home's entrance. The IoT-based home security system comprises several components, including a Raspberry Pi-3, a PIR sensor, a microphone, and an internet connection. When the system detects any suspicious movement in front of the door, it promptly sends message notifications, ensuring heightened security against intruders. By leveraging the IoT platform, this designed system provides an enhanced level of security and peace of mind.

1. INTRODUCTION

This chapter introduces the IoT-based security system using Raspberry Pi, providing an overview of the project design, relevant literature, and the environmental considerations. The thesis also outlines the organization of chapters and appendices at the end of this chapter. The current situation emphasizes the increasing importance of safety and security. With the advancement of modern technology, there has been significant progress in security systems. A modern house refers to a home equipped with wireless and digital technologies, which enable the implementation of an automated intelligent security system. This system incorporates surveillance cameras and multiple sensors, and the characteristics of these sensors define their functionality. The demand for video surveillance systems is rapidly growing, and people are interested in accessing their security systems remotely over the internet. In the past, security surveillance systems required constant monitoring by an individual stationed in a room. However, with the advent of Internet of Things (IoT) platforms, smart devices and systems have entered a phase of rapid growth, particularly in the field of home security. The Internet of Things (IoT) is a concept that aims to connect every device and system, such as internet TVs, smartphones, and sensors, to the internet, allowing them to be controlled and monitored remotely from anywhere and at any time. While there are existing home security systems available, such as microcontroller-based wired and wireless security systems and CCTV systems, they can be expensive and have limitations in terms of range and accessibility for the user. In this research work, a cost-effective home security system using Raspberry Pi and PIR (Passive Infrared) sensor is proposed. The system detects the presence of an individual in the absence of the owner by utilizing Raspberry Pi and switch sensors. When the motion of a person is detected, the sensor triggers an alert message to the owner. One advantage of using a piezoelectric sensor is its ability to withstand high temperatures (up to 500°C), unlike the PIR sensor. Additionally, the piezoelectric sensor used in this system is small in size and has a rugged construction. This home security system can be installed at the main door of a user's home or office, and the user can receive alert messages on their smartphone from the system anywhere in the world through the internet.

2. LITERATURE SURVEY

This paper provides a description of the reference papers used in the development of the system. It also discusses the existing technologies utilized and how the proposed system overcomes their limitations. The paper presents a taxonomy of an IoT-based fire monitoring and alerting system, specifically focusing on automatic fire detection processing, email alert functionality, the use of different sensors, and the transmission of sensor values to a web server. One of the referenced papers, "An IoT-based Fire alarming and authentication system for workhouse using Raspberry Pi 3" by Ahmed Imteaj et al. [1] in 2017, proposes a fire alarming system for garment factories that face frequent fire outbreaks. The system adopts a master-slave approach, where a single Raspberry Pi controls multiple Arduino microcontrollers equipped with temperature and light intensity sensors. The sensors collect data, which is then processed by the Arduino microcontrollers. The Raspberry Pi centrally manages all the microcontrollers. Additionally, a relay motor connected to a camera enables capturing images from various angles when a fire is detected. The system also includes mechanisms to cut off electricity during a fire outbreak and initiate fire suppression measures. The paper discusses a proposed system that utilizes flame sensor, gas sensor, and Passive Infrared (PIR) sensor for monitoring purposes. These sensors continuously collect data, and the gathered values are transmitted to a web server for periodic monitoring. By accessing the server, users can view and monitor the sensor information remotely from anywhere. In 2017, Tanwar et al. proposed an advanced and cost-effective home security system based on the Internet of Things (IoT) concept. This system addresses issues found in existing home security systems, such as delays in alert notifications via phone, text, or email during unfavorable situations. The proposed system detects intruders or unusual events in an unoccupied home using a PIR sensor and captures images of the intruders using a camera. To minimize processing delays in sending email alerts with the intruder's image, a Raspberry Pi is employed. This system enables users to monitor their homes more effectively and efficiently from a remote location. The paper highlights the versatility of the Raspberry Pi and its potential for various applications. On the other hand, in 2016, Gaikwad et al. proposed a fire monitoring and control system. This system not only detects fires but also utilizes a Global Positioning System (GPS) to determine the fire's location. It sends alerts to the fire station through messages and notifies people with a fire alarm. The system relies on sensors for fire detection due to their quick response time, ease of deployment, and cost-effectiveness compared to techniques like image processing. However, this system does not provide email alerts, and there is no information available regarding the sensor values or their states at the time of the fire, which could be useful for future investigation following a fire incident. In their 2017 study, Adil Hamid et al. [4,10] introduced a weather monitoring system for smart cities that is based on the Internet of Things (IoT). The system utilizes environmental sensors to gather data on weather conditions at a specific location and transmits this data in real-time to a web server. Users are able to access live weather reports, and the system also allows for the configuration of alerts based on specific weather conditions. If the monitored weather parameters exceed the predefined values, the system alerts the user accordingly. The paper provides detailed information on the sensors used, data acquisition methods, decision-making processes, and how the collected data is uploaded to the server. On the other hand, in a 2016 study by Mobin et al. [5,12], an Intelligent Fire Detection and Mitigation System called Safe from Fire (SFF) is proposed. This system integrates multiple sensors, actuators, and a micro-controller unit to create a smart fire extinguisher system. The system employs fuzzy logic with Z 13 integration to identify the location of fire outbreaks using input signals from various sensors. It can send messages and notifications through calls, providing crucial information about the fire. The study also presents techniques aimed at minimizing fire hazards. Additionally, the system not only sounds a fire alarm but also announces the location and severity of the fire, which can be particularly useful in situations where people may underestimate the danger and delay evacuation. In case of fire, the system breaks the electric circuit and releases extinguishing gas. The paper evaluates the overall performance and demonstrates the system's efficiency. However, it should be noted that this system does not capture images, and the sensor values cannot be monitored in real time.

3. BLOCK DIAGRAM

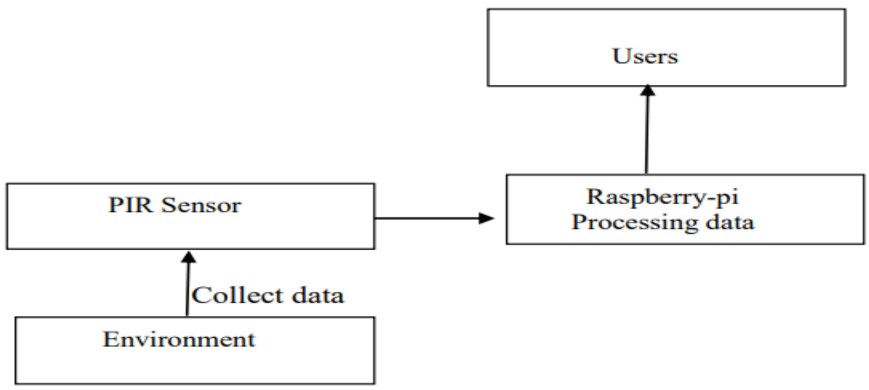

FIGURE 1. Block diagram of Proposed Method

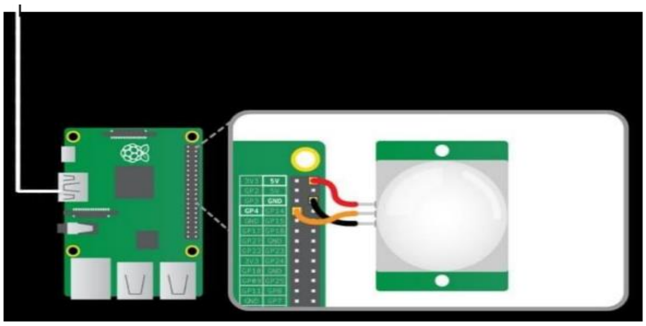

FIGURE 2. Circuit Diagram

3.1. Working

To complete this project, we will utilize the Raspberry Pi 3 model B along with a PIR motion sensor. Additionally, we will require three female-to-female jumper wires to connect the sensor to the Raspberry Pi. The PIR sensor consists of three pins: VCC, OUT, and GROUND. We will establish the following connections using the jumper wires:

1. Connect the GROUND PIN of the PIR sensor to the Ground pin of the Raspberry Pi.
2. Connect the VCC pin of the PIR sensor to the VCC (5V) pin of the Raspberry Pi.
3. Connect the OUT PIN of the PIR sensor to the GPIO (18) PIN of the Raspberry Pi.

Once the connections are established, we can power up the Raspberry Pi, ensuring it is turned on. Now, let's proceed to cayenne mydevices.com to add the Raspberry Pi to the platform. Afterward, we can add the PIR sensor to the Raspberry Pi by following these steps:

1. Click on "Add New" on cayenne mydevices.com.
2. Select "Device or Widget."
3. Choose the "Motion Sensor" option.
4. Select the "Digital Motion Sensor" and provide a suitable name for the widget.
5. Finally, assign the device to the Raspberry Pi.

We will utilize two GPIO (General Purpose Input/Output) pins, commonly referred to as GPIO. In this case, we will be selecting GPIO pin 18 as the connection point for our sensor's output pin. After selecting channel 18, we proceed to choose the appropriate widget, specifically the motion detector. Once selected, we add the sensor to our system. Now, we move on to adding a trigger for our motion sensor. To do this, we click on the trigger option and drag it onto the interface. From the available options, we select the digital motion sensor as our trigger, which will activate when the digital motion sensor is on. We then add an output bit and choose an action for it, such as sending a notification. In the example given, we click on "send a notification" and then select "send a text message." We input the desired phone number for the message recipient. After completing these steps, we save the trigger and assign it a name, such as "send message." Finally, we click on the save button to preserve our settings.

4. RESULT

5. CONCLUSION

The technology utilized can be implemented in various applications that require both a sensor and a device. The project has successfully developed a connection between a mobile device, like a smartphone or laptop, and a Raspberry Pi to create a door alert system. The primary objective of this endeavor is to establish a home security system using Raspberry Pi boards. By doing so, it aims to provide people with a sense of safety in their homes, even when they are away. This project utilizes the latest version of Raspberry Pi and is programmed using the C language. It is a cost-effective solution that can be easily managed. As homes continue to undergo their own transformations, integrating with networks that strive for improved energy management and comprehensive home automation, the primary focus remains on ensuring comfort, safety, and privacy.

5.1. Future Scope

While the end result of the product is highly effective in fulfilling its intended purpose, it is important to acknowledge that industrial products, such as this model, require further considerations to establish a thriving market. Several aspects necessitate improvement, including the device's dimensions, the expense of the power supply equipment, and the range of contact. Presently, the size of the raspberries is too large to fit into conventional, easily accessible electricity units. However, there are numerous potential avenues for enhancing these aspects in the future. For instance, employing surface mount device (SMD) components significantly reduces the overall size of the component.

REFERENCES

[1]. R. Rani, S.Lavanya, B.Poojitha, “IoT Based Home Security System Using Raspberry Pi with Email and Voice Alert” International Journals of Advanced Research in Computer Science and Software Engineering ISSN: 2277-128X (Volume-8, Issue-4), April 2018, pp. 119-123.

[2]. Ruby Dinakar, Deepthi U Singh, Mir Mohammed Abbas, Mir Riya Alex, Abhishek Yadav , “IOT Based Home Security System Using Raspberry Pi”, International Journal of Innovative Research in Computer and Communication Engineering, Vol. 6, Issue 4, April 2018, pp. 3835-3842.

[3]. [3]. ShreeyashGhodke, Pushkar Chaudhari, Neha Chumbalkar, Arpit Gupta,ShilpaLambor, “IOT Based Home Security System Using Raspberry Pi”,Vol. 6, Issue 12, December-2017, pp. 22830-22835.

[4]. Shaik Anwar,D.Kishore., “IOT based Smart Home Security System with Alert and Door” International Journal of Engineering Research & Technology, ISSN: 2278-0181,Vol. 5 Issue 12, December-2016,pp504-509.

[5]. Tanaya, K.Vadivukarasi, S.Krithiga “HOME SECURITY SYSTEM USING IOT” International Journal of Pure and Applied Mathematics Volume 119 No. 15 2018, pp.1863-1868

[6]. Taryudi, Davin Bagas Adriano, Wahyu ApsariCiptoning Budi “IoT-based Integrated Home Security and Monitoring System”, IOP Conf. Series: Journal of Physics: Conf. Series 1140 (2018) 012006.

[7]. Madhavarapu Chandan, Sanakkayala Sri Venkat Sumanth ,Garapati Samhita , Kathi Priyanka Reddy , “Design & Development of a Home Security System Using IOT”, International Journal of Engineering & Technology, 7 (2.32) (2018) pp.374-376.

[8]. N. Umapathi, S. Teja, Roshini and S. Kiran, "Design and Implementation of Prevent Gas Poisoning from Sewage Workers using Arduino," *2020 IEEE International Symposium on Sustainable Energy, Signal Processing and Cyber Security (iSSSC)*, 2020, pp. 1-4, doi:10.1109/iSSSC50941.2020.9358841.

[9]. Umapathi N., Sabbani S. (2022) An Internet of Things (IoT)-based Approach for Real-Time Kitchen Monitoring Using NodeMCU 1.0. In: Sivasubramanian A., Shastry P.N., Hong P.C. (eds) Futuristic Communication and Network Technologies. Lecture Notes in Electrical Engineering, vol 792. Springer, Singapore. https://doi.org/10.1007/978-981-16-4625-6_4

[10]. Umapathi N., Sabbani S., Poovarasan S. (2022) Person Location Tracking Using Global Positioning System and ESP8266 with Internet of Things. In: Sivasubramanian A., Shastry P.N., Hong P.C. (eds) Futuristic Communication and Network Technologies. Lecture Notes in Electrical Engineering, vol 792. Springer, Singapore. https://doi.org/10.1007/978-981-16-4625-6_21

[11]. N. Umapathi, C. Vyshnavi, K. Srilekha and V. Sahithi, "Monitoring of Crop Growth Parameters using Arduino and ESP8266," *2022 2nd International Conference on Emerging Frontiers in Electrical and Electronic Technologies (ICEFEET)*, 2022, pp. 1-5, doi: 10.1109/ICEFEET51821.2022.9848009.

[12]. Anitha A, “Home security system using internet of things”, IOP Conf. Series: Materials Science and Engineering 263 (2017) 042026.

[13]. NasimuzzamanChowdhury ,ShibleeNooman, SrijonSarker “Access Control of Door and Home Security by Raspberry Pi Through Internet”International Journal of Scientific & Engineering Research, Volume 4, Issue 1 November -2013,ISSN 2229-5518 pp.550-558

