Modellings Smart Home Security Based Internet of Things (IoT)

I Ketut Parti[1], I Nyoman Mudiana[2], I Ketut Darminta[1], Ni Wayan Rasmini[2]

[1] Department of Automation Engineering
Bali State Polytechnic, Indonesia
[2] Department of Electrical Engineering
Bali State Polytechnic, Indonesia
partigen@pnb.ac.id, mudiana08@pnb.ac.id, darminta@pnb.ac.id, wayanrasmini@pnb.ac.id

Abstract. Smart home security built on the Internet of Things (IoT) is a concept in which home security systems are constructed using IoT technologies. Through the interconnection of linked devices like cameras, motion sensors, DHT sensors, MQ-7 gas sensors, and door locks with the internet, real-time visual monitoring and remote access via mobile devices or other connected devices are made possible. Motion sensors enable for active home surveillance by detecting suspicious movements and alerting consumers via mobile devices. Users of connected devices can remotely regulate entrance to their houses using smart door locks. When emergencies, such as intrusions or possible risks, are recognized, an alarm system delivers audio alerts or notifications. These devices are linked to an IoT network, allowing for centralized platforms that enable direct data transmission and reception between devices and their home security systems as well as users online. Users can control and monitor through integration with third-party applications. With the help of internet connectivity, IoT-based smart home security provides advantages in the form of more efficient and convenient monitoring, control, and home security that can be viewed at any time and from any location.

Keywords: smarthome , scurity, Modelings, Internet, of Things.

1 Introduction

Important innovation in increasing home security is IoT-based smart home security. IoT enables effective communication and data exchange between devices by connecting various home appliances to the internet. This IoT-based security system offers major monitoring, control, and home security improvement advantages. [1]-[3].

The use of numerous connected devices, including security cameras, motion sensors, DHT11 sensors for temperature and humidity control inside the home, MQ-7 gas sensors for gas leak detection, flow switches for water flow monitoring, and camera sensors for home security monitoring, is a key component of IoT-based smart home security. Through mobile smartphones or other connected devices, these technologies

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enable remote access and real-time visual monitoring. Motion sensors enable active monitoring of activities going on around the house by detecting suspicious movements and alerting users [4][5].

Essential for safeguarding user privacy and preventing cyberattacks.[6]. In fact, maintaining network and device security is essential given the high degree of interconnectedness found in IoT-based smart home security systems. Strong passwords, regular software updates, and safeguarding the home Wi-Fi network are some examples of security precautions.

In general, IoT-based smart home security systems make monitoring, control, and home security through internet connectivity more efficient and accessible [1,2]. IoT-based smart home security is anticipated to increase the level of security and safety for its occupants as IoT technology continues to improve [1][2][3].

Such a system is built and integrated using a variety of techniques in implementation. Here are a few typical approaches:

1. Sensor utilization includes the use of IoT network-integrated sensors and connected devices. To detect events or changes around the house, sensors such as motion detectors, smoke detectors, door or window sensors, and others are employed. Home security can also be improved by using connected gadgets like security cameras, smart door locks, and alarm systems. To interact and exchange data, these sensors and gadgets are linked to an IoT network. [4][5]

2. Communication Network: In a smart security system, connected devices use a communication network to exchange data using the right protocols. Wi-Fi, Bluetooth, Z-Wave, Zigbee, and others are some of the protocols that are frequently used in IoT-based smart home security systems. Devices can exchange security information and communicate with one another over these communication networks.

3. The use of clouds In order to store, manage, and access data from smart home security systems, this solution makes use of cloud services. For processing, analysis, and storage, data from sensors and linked devices can be transferred to the cloud. Users can view their home security data through mobile applications or other linked devices from anywhere by using cloud computing.[6]

4. Mobile Applications and User Interface This approach entails the creation of mobile applications or user interfaces that allow users to manage their smart home security systems. Users of mobile applications can operate door locks, see footage from security cameras, get security alerts, and modify security system settings. To ensure users can easily engage with the smart security system, a user-friendly and clear user interface is essential.[4][7]

5. Data Security and Privacy, using this technology, data transported and stored within the smart security system are protected by security and privacy protections. Some actions that can be performed to preserve data security and prevent unwanted access include user authentication, the use of strong passwords, data encryption, and routine software updates.

6. Integration with Third-Party Services, this technique entails linking smart home security systems to outside providers of services like emergency alert systems or professional security monitoring. When the security system is integrated with these services,

it can alert or notify the proper authorities or emergency responders in the event of a security breach or other emergency situation.

2 Methods

The method used in this research is to build an Internet of Things-based smart home security modelling system, as shown in Figure 1.

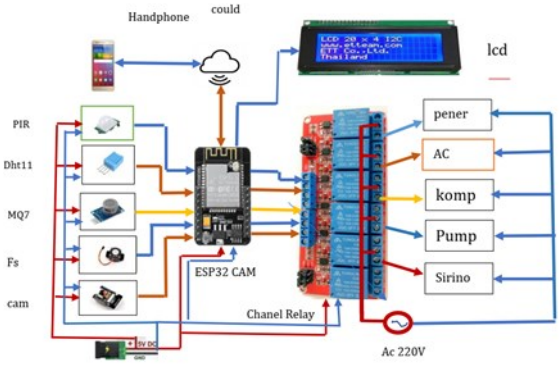

Fig. 1. Smart home security modelling based on the Internet of Things (IoT

Maintaining the Integrity of the Specifications

The PIR (Passive Infrared) sensor, DHT11 sensor, flow switch sensor, MQ-7 gas sensor, camera sensor, and employing ESP32 as an IoT controller make up the smart home security system based on IoT. It functions by the following principles:[10]

1. A PIR sensor detects motion by keeping track of alterations in its immediate environment. The PIR sensor monitors temperature variations caused by bodies or objects when they move through the space it is watching. [12]
2. The temperature and humidity in the house are measured using the DHT11 sensor. The sensor collects samples of the temperature and humidity before sending the information to the ESP32. [11]
3. The flow switch sensor will track the faucet's water flow and provide data to the ESP32.
4. The MQ-7 gas sensor will track gas leakage, particularly carbon monoxide (CO) leakage. The ESP32 will receive the sensor's data [14] [15][20]
5. Activity around the house is monitored using the camera sensor. When motion is sensed by the camera or in accordance with predetermined parameters, it can take pictures or films
6. ESP32: The ESP32 is a microcontroller module that acts as the brain or controller of the smart home security system. The ESP32 is responsible for receiving data from

the PIR sensor, DHT11 sensor, and camera sensor. It processes the data and makes decisions based on the programmed instructions [9]-[11].

7. Communication with the Server: The ESP32 sends processed data to the server through an internet connection. This data can include notifications of motion detection, temperature and humidity data, as well as images or videos from the camera sensor.

8. Remote Control: The smart home security system can be accessed remotely through an application or internet-connected device. Using the application, users can monitor and control the smart home security system from a distance. Users can receive notifications of motion detection, check temperature and humidity conditions, and access images or videos from the camera sensor [16]-[18].[19]

The smart home security system can automatically detect motion, track temperature and humidity levels, and keep track of activities inside the home thanks to this operating principle. Users can remotely manage and monitor this security system via an internet-connected application thanks to integration with the IoT system. [21][22][23]

3 Result and Discussion

The table below shows the results of testing the internet-based smart home security modelling of Things

Table 1. Measurements June 05 2023

Testing	Sensor DHT11 Suhu (oC)	Sensor DHT11 Humidity (Rh %)	Flow Switch Ltr/menit	Sensor MQ-7 (ppm)	Sensor Camera
1	26	50	8	12	good
2	26	60	6	6	nois
3	26	48	10	9	nois
4	25,5	55	12	15	good
5	27	53	5	3	good
6	27	49	6	7	good
7	25,5	47	10	12	nois
8	26	55	12	10	good
9	25,5	53	12	8	good
10	25	54	10	8	good

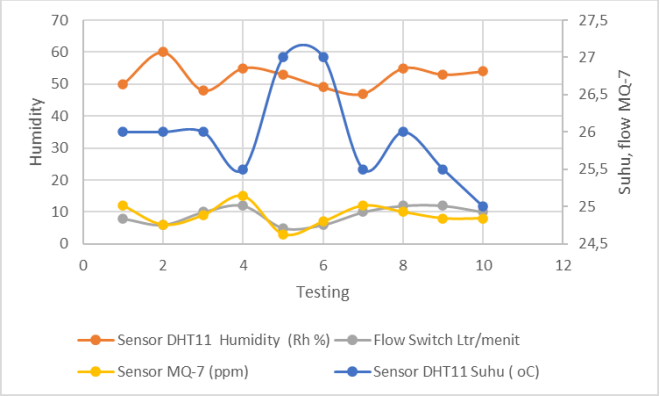

Fig. 2. Characteristics of DHT11, flow switch, and MQ-7

The parameters of the temperature-humidity relationship are shown in Figure 2, as a positive linear relationship. The relationship between temperature and humidity can occasionally be positive linear. This implies that humidity tends to increase in direct proportion to temperature increase and vice versa. The bottom-left corner of the graph will be connected to the top-right corner by a straight upward diagonal line.

The MQ-7 sensor and flow switch sensor, on the other hand, have changeable characteristics. The MQ-7 sensor will detect gas between 3 ppm and 12 ppm, which is regarded not yet dangerous, while the flow switch sensor will work when the water flow reaches 5 liters per minute. [8]

Table 2. Measurements juni 10- 2023

Testing	Sensor DHT11 (oC)	Sensor DHT11 (Rh%)	Flow Switch lt/menit	Sensor MQ-7 (ppm)	Sensor Camera
1	24	70	5	10	good
2	25	68	2	5	nois
3	26	66	10	8	good
4	27	60	0	15	good
5	28	58	15	3	good
6	30	56	10	7	good
7	31	55	8	12	good
8	32	55	10	9	good
9	34	55	0	6	good
10	37	55	10	11	no image appears

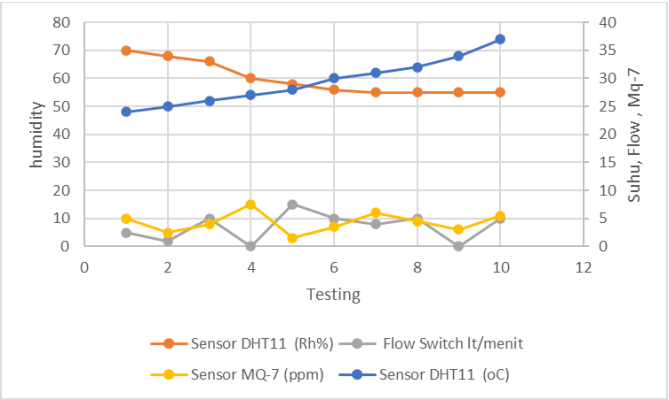

Fig. 3. Characteristics of DHT11, flow switch, and MQ-7

The characteristics of the positive and negative linear relationships between temperature and humidity are shown in Figure3: In rare circumstances, the linear connections between temperature and humidity can be both positive and negative. Accordingly, depending on the particular circumstances, humidity may either drop or increase when temperature rises. A diagonal line from the bottom-left corner to the top-right corner of the graph will be seen, pointing either upward or downward. With the DHT11 sensor, this characteristic is seen in the inverse connection between temperature and humidity.

The MQ-7 sensor and flow switch sensor, on the other hand, have changeable characteristics. The MQ-7 sensor will monitor gas levels starting at 3 ppm, while the flow switch sensor will activate when the water flow hits 5 litres per minute.

4 Conclusions

1. IoT-based smart home security systems that use sensors for gas, flow, camera, PIR, DHT11, flow switch, and other types of sensors as well as ESP32 as a microcontroller are capable of effectively increasing home security.
2. An all-encompassing solution to improve home security is IoT-based smart home security, which combines PIR sensor, DHT11 sensor, flow switch sensor, gas sensor, and cam camera sensor technology with an ESP32 microcontroller. With the help of this technology, homeowners can better monitor their home security systems, respond to emergencies quickly, and have more control over them establishes communication with a server or mobile application, and generates conclusions based on the collected data. Additionally, ESP32 can function as a connection between the home security system and the internet, enabling access to the raw data and control via mobile applications.

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