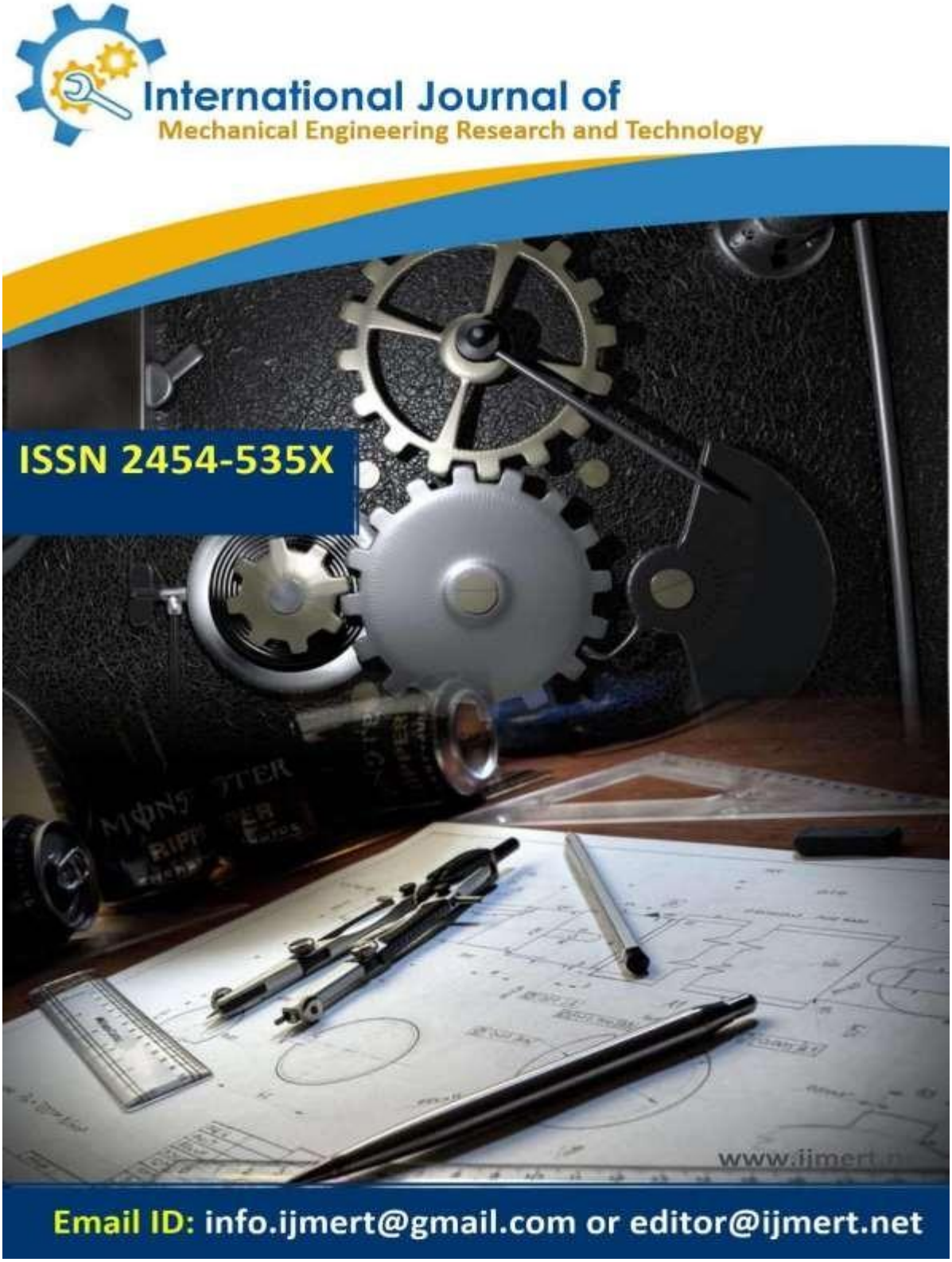
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IoT BASED THEFT DETECTION USING SMTP PROTOCOL

Project Guide
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Abstract. An ever-increasing number of theft and burglary incidents are the primary concern of this investigation. Everyone is so preoccupied with their everyday lives that they fail to pay enough attention to the safety of their own homes, which leads to incidents like these. An Internet of Things (IoT) home security system that uses a photoreceptor (PIR) as a human motion detector and then notifies the user by email or text message is one way to get around this issue. The system's warnings may be better understood with a home security system that includes picture attachments in the notice. In this project, we built a home security system that uses the internet of things. When the built-in PIR sensor detects the presence of a person, the Internet of Things security system may immediately send an email with an attached photo. A web-connected Raspberry Pi, a passive infrared (PIR) sensor to detect motion, and a Pi camera to capture photos of people as they come within range are all components of an internet-of-things (IoT) system. The study's experiments demonstrate that, in response to PIR sensor detection of human presence within a range of 0-5 meters in a variety of lighting conditions, the IoT system can automatically send email alerts with accompanying images. The study also found that the speed of sending these alerts is affected by factors such as the quality of the internet connection

Keywords: Image, Internet of Things, PIR sensor, Raspberry Pi, email alert

Introduction

Among Indonesia's total villages, 11.42–73.76 percent reported theft incidents in 2018 [1]. According to statistics compiled by the Central Bureau of Statistics, 27.76 percent of all thefts and burglaries occurred in West Java Province. Inattention to home security, which is a common consequence of everyone's everyday lives, may lead to this scenario [2]. Prior research has already solved the problem of home security by developing security systems that are based on the internet of things. Based on research [2, 3], [4, 5], and 6, smart cam programs can identify human movement using infrared sensors, IP cameras, and auto motion detect. When this happens, homeowners will get an alarm, SMS notice, and real-time e-mail alert. The problem is that there is currently no security mechanism in place. When a PIR sensor detects motion, it attaches the captured image to an email alert rather than using the IP camera to capture the image itself.

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Another drawback is that the email or text message notice does not include any visuals. Notifications from individuals homeowners do not know or recognize cannot be seen or differentiated by homeowners. Everything in the Internet of Things (IoT) is supposed to be able to talk to each other and share information, including data and information about the environment. Therefore, IoT responds independently to events or things that happen in nature and provide services either with or without the help of humans [6]. To remedy the problems of earlier studies, internet of things (IoT) home security systems have been developed. The Internet of Things (IoT) security system enables real-time remote control and monitoring of home conditions using an internet network [7] [8]. The development of security systems that leverage the Internet of Things presents a number of challenges. One of these is the automation of the process of sending email alerts with attached images. This involves using the Pi Camera to detect human presence, and understanding what factors influence the sending of these alerts. This security solution makes use of the Raspberry Pi (Raspy), a microcontroller that doubles as a server to send out email alerts [9]. Because the number of people using SMS services is declining, particularly among Indosat providers [10], and because 33.58% of the Indonesian population uses email services [11], it is now believed that email services are the most effective way to convey alerts. In order to detect human movement, an additional module—a PIR sensor—is attached to the Raspy, which already has a Wi-Fi module. Sensors are able to detect their surroundings in the same way humans can [12]. Passive infrared light with wavelengths between 8 to 14 micrometers may be

filtered by this PIR sensor. Passive infrared light waves emitted by humans fall within the 9 to 10 micrometer range, while those emitted by animals on the nanometer scale are also filtered [13]. Raspy also has a Pi Camera module that can take pictures when a person moves within a 0 to 5 meter range of a PIR sensor.

Related Work

According to studies [2], there is a connection between home security and some off-limits locations such government buildings, private residences, and military bases. In addition, the administrator or owner may set up email notifications. There is no way to see the camera-captured picture; all you get is an email alert. According to studies [3], you may use the camera to record items, the system can transmit alerts to your phone up to 5.5 meters away, and the buzzer will go off the second it senses motion. Shooting in the direction of movement is not possible due to the webcam's static feature. It would be beneficial to include a moto servo or use an IP camera with auto-tracking capabilities into the further development. According to studies [4] [14], a home security system that is internet of things (IoT) based may monitor the house's status by using a photoreceptor (PIR) to identify when people are inside and then notifying the homeowner via email. The PIR sensor in this investigation did not come with a built-in camera to record any human motion. Using the reporting capability of the SMS gateway, researchers constructed a security mechanism [5]. The homeowner, the security guard, and the administrator form the core of this system. Fire, theft, murder, and emergency are the four kind of reports that may be seen on the homeowner's screen. The technology is designed to notify the homeowner and security guard by SMS whenever a report is triggered. In this study, a smart home system was built to control all electrical devices, including TVs, fans, electric tubes, refrigerators, and washing machines. Instead of using a PIR sensor or camera to generate notifications, the data was taken from the application dashboard that originated at the owner's house and sent to the admin. Additionally, the system may

provide notifications to users about any errors or damage that occurs to the device by sending

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an email or SMS, but only give an alert such as a broken refrigerator.

2 System Design

The home security system for smart motion detection based on the Internet of Things (IoT) involves hardware and software. The system is designed to be able to send email alerts by attaching images automatically when human movement is within the range of the PIR sensor. Sending email alerts to the homeowner requires an internet network connection. In general, the relationship between devices and internet networks is illustrated in Figure 1.

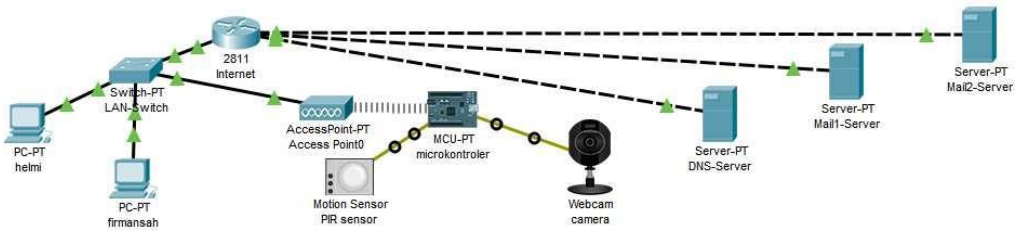

Fig. 1. Network Topology

Figure 1 illustrates the network topology in the IoT-based home security system developed. The microcontroller (raspberry pi) gets internet access from Wi-Fi networks that are already connected to the internet because raspberry pi by default is equipped with a wi-fi module. The protocol used for data communication uses the protocol of Transmission Control Protocol (TCP) on port 55, while the port used by SMTP to send email is port 587. The network security system is described in figure 2.

Based on figure 2, a firewall is used in the ICMP protocol, which is blocked by the ICMP protocol (ping blocked). Make sure the device configuration with other devices then configure the device with the internet network is done correctly so that the system can work properly. In general, the design of a home security system is presented in the figure 3 flowchart diagram so that it can be understood based on the sequence of steps from one process to another.

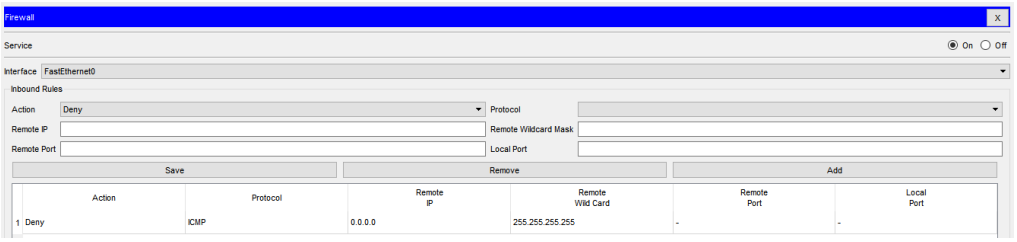

Figure. 2. Firewall

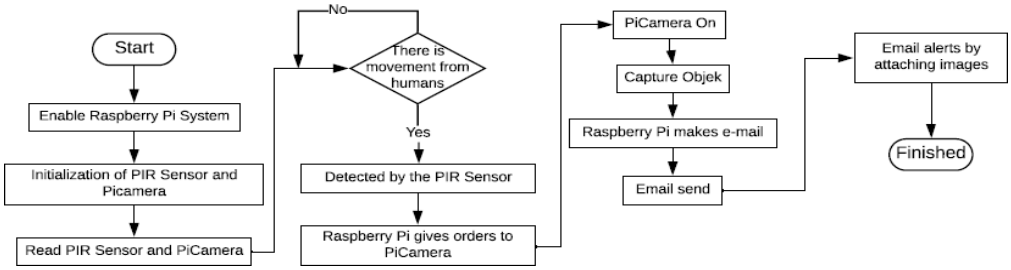

Figure. 3. Flowchart Diagram

Based on figure 3, the flow of the home security system starts with activating the raspberrypi system. The system will initialize the PIR and Pi Camera sensors and will read the connectivity with the PIR and Pi Camera sensors because the home security system uses a PIR sensor and Pi Camera that is connected to the Raspberry Pi. PIR sensors are used to detect human presence, and Pi Camera is used to capture images when their presence is detected. Every time there is a movement of people who come within range of a PIR sensor, the PIR Sensor will trigger the Pi Camera to take pictures via the Raspberry Pi. The Raspberry Pi sends commands to Pi Camera to click on images and save them. After that, the Raspberry Pi creates an e-mail and sends it to the mail address specified with the image you just clicked on. The email containsmessages and images of intruders as alert emails.

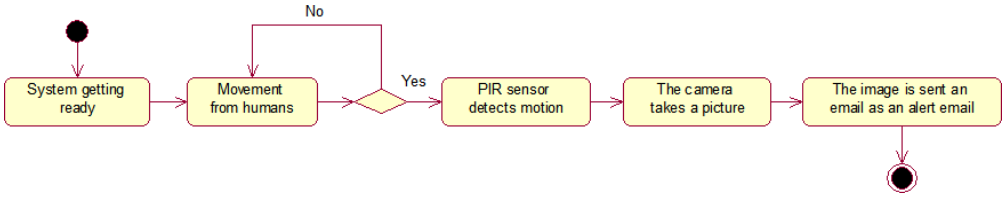

Figure. 4. Activity Diagram

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Based on figure 4, when the Raspberry Pi is supplied by electricity, the system is ready, or the system is active, then when there is movement of humans coming in at the PIR sensor, the movement will be a valuable input for the PIR sensor and the program will detect movement, every it happens, it will trigger the PiCamera to take pictures via raspberry pi, then the image is sent via email to the homeowner as an alert email.

3 Result and Analysis

There are four main stages carried out on research related to the development of this home security system, namely: hardware preparation, software preparation, system configuration, testing.

3.1 Hardware Preparation

This stage analyzes the hardware needed in the development of IoT-based home security systems. In general, the hardware requirements will be presented in table 2 and will be illustrated in figure 5, and the prototype can be seen in figure 6.

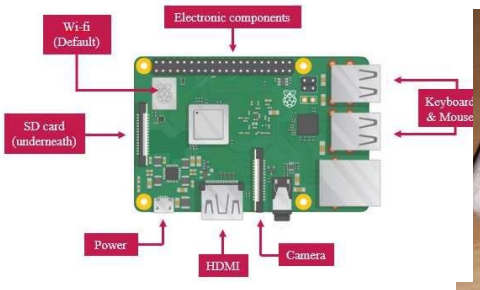

Figure. 5. Illustration of hardware design

Figure. 6. Hardware System Prototype

3.2 Software Preparation

This stage analyzes the software that is needed in the development of IoT-based security systems. In general, the software requirements will be presented in table 3.

Table 3. Software Requirements

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Software	Function
Operating System Windows 10	Running software or other applications.
Operating System *Raspbian Jessie* specific to the Raspberry Pi	The Operating System has been optimized and is

3.3 Testing

The testing phase is done to ensure that every function and every device on this system is functioning correctly. Tests carried out several variables from this Internet of Things based security system and their analysis. The design variables that will be tested include:

1. Testing the PIR sensor

Table 4. PIR Sensor Test Data

	Testing	Distance (meters) 1	3	5	5.1	5.2
1		Detected	Detected	Detected	Not Detected	Not Detected
2		Detected	Detected	Detected	Not Detected	Not Detected
3		Detected	Detected	Detected	Not Detected	Not Detected
4		Detected	Detected	Detected	Not Detected	Not Detected
5		Detected	Detected	Detected	Not Detected	Not Detected

Based on the test data in Table 4, namely PIR Sensor testing, testing distance of 1-5 meters PIR sensors can detect human movement while testing at a distance of more than 5 meters PIR sensors cannot detect human movement. In conclusion, the range of PIR sensor detection limits on movements of humans is 0 - 5 meters

The test results in table 5 human movement in bright conditions, dark conditions, and night conditions, but there is light. The test results show that the system can detect movement in various lighting conditions, but light conditions affect the quality of shooting. The parameters of bright and dark light conditions in this test refer to the results of the study [15].

2. Testing on several conditions

Table 5. Testing With Various Light Conditions

Light Conditions	PIR Sensor	Pi Camera	Email Alert
Light	Detected	Take a picture	Send email alert
Dark	Detected	Take a picture	Send email alert
Night but there is a light	Detected	Take a picture	Send email alert

3. Test the duration between sending and receiving emails when a human movement is detected.

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Table 6. Duration of sending and receiving emails

Testing	Time (hour: minute: second)			File Size	Dimensions Pixels (Px)	
	Sending	Received	Delay			Width (W) Height (H)
1	16:29:07	16:29:22	15 second	702 kb	1440x900	W:1440px H:900px
2	16:29:47	16:30:02	15 second	702 kb	1440x900	W:1440px H:900px
3	16:30:17	16:30:32	15 second	702 kb	1440x900	W:1440px H:900px
4	16:49:03	16:49:20	17 second	737 kb	1440x900	W:1440px H:900px
5	16:49:38	16:49:55	17 second	737 kb	1440x900	W:1440px H:900px

Based on the test data in table 6, conclusions can be drawn. Namely, the duration between sending and receiving email alerts on repetition to 1 - 3 is 15 seconds, while on repetitions to 4and 5 are 17 seconds. This difference can be influenced by different image size files and internet network connection conditions. When the internet access on the raspberry pi is off, PIR sensorand the pi camera still work, but the result of the image captured by the pi camera is saved firstand not directly sent as an email alert dan the image will be sent if raspberry pi has got the internet access.

4 Conclusions

It is now possible to automatically send email warnings including the results of shooting whenever there is human movement thanks to the Internet of Things-based Smart Motion Detection System. This device performs best at a range of 0–5 meters in a variety of lighting situations, but it degrades the clarity of the recorded picture. Depending on the quality of the picture obtained by the Pi Camera, the typical length of sending an email is about 15 seconds. To maintain the status of this system as providing real-time responses. Two of the system's flaws include the low-quality picture it captures and the fact that the email recipient hasn't responded to the system after receiving an alert.

References

Indonesia, Badan Pusat Statistik, "Statistik Kriminal 2018," Subdirektorat Statistik Politik dan Kemanaan, 2018.

"An Advanced Internet of Thing based Security Alert System for Smart Home," published in 2017 by IEEE, is written by S. Tanwar, P. Pately, K. Patelz, S. Tyagix, N. Kumar, and M. Obaidat... In "Sistem Pengontrolan Dan Keamanan Rumah Pintar (Smart Home) Berbasis Android," D. Yendri and R. E. Putri (2018) explain how to set up and maintain a smart home.

"Rancang Bangun Sistem Keamanan Rumah Berbasis IoT dengan Platform Android," Ejournal Kajian Teknik Elektro Vol.3 No.1, pp. 18-31, 2018, as cited in R. Khana and U. Usnul. "Prototipe Sistem Keamanan cerdas pada komplek perumahan," Jornal Pendidikan Informatika dan Sains, 2018, pp. 146-154, by Budianingsih and A. Riyanto.

Authors P. A. Dhobi and N. Tevar, "IoT Based Home Appliances Control," 2017 IEEE International Conference on Computing Methodologies and Communication, 648–651, 2017.

Proceedings of the 2015 International Conference on Intelligent Computing and Internet of Things, Harbin, China, 2015. "An Internet of things approach for motion detection using Raspberry Pi," by A. N. Ansari, M. Sedky, N. Sharma, and A.

International Journal of Mechanical Engineering Research and Technology

ISSN 2454 – 535X www.ijmert.com
Vol. 16 Issue. 1, May 2024

Tyagi.
"Smart-Home Automation using IoT-based Sensing and Monitoring Platform," Published in 2018 by IEEE, by M. Al-Kuwari, A. Ramadan, Y. Ismael, L. Al-Sughair, and A. Gastli.
"Smart Motion Detection System using Raspberry Pi," published in the 2016 edition of the International Journal of Applied Information Systems (IJAIS) by P. B. Patel, V. M. Choksi, S. Jadhav, and M. Potdar.
"Users in Indonesia Still Rely on Data Internet for SMS and Telepon," Cendana News, 24 May 2017. A. Rusli. [On the web]. The article may be seen at this link: https://www.cendananews.com/2017/05/pengguna-sms-dan-telepon-di-indonesia-beralih-ke-data-internet.html. (As of April 25, 2019).
"Statistik Telekomunikasi Indonesia," Badan Pusat Statistik, Indonesia, 2017, translated by S. S. K. d. T. Informasi.
"Fire Safety and Alert System Using Arduino Sensors with IoT Integration," ICSCA, 2018, by F. S. Perilla, G. R. V. Jr., and N. M. Castanindin.
"Sistem Pemantau Ruang Jarak Jauh Menggunakan Sensor PIR (Passive Infrared) Berbasis Atmega 8535," published in 2017 in Repositori Institusi USU, pages 5-7.
A study published in the International Journal of Engineering and Computer Science in 2015 by Chandramohan et al., entitled "Intelligent Smart Home Automation and Security System Using Arduino and Wi-fi," examined the use of Arduino in home automation and security systems.
In "Pengukuran Kecerahan Langit Malam arah Zenith untuk Penentuan Awal," D. Herdiwijaya (2016) pp. 95-102.