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Intrusion Detection System for Smart Home Security

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Abstract: *The main problem in this research is the increasing prevalence of theft and burglary cases. This incident was caused by the busyness of every person in his daily life so that he forgot the security of his house. The IoT-based home security system that utilizes the Ultrasonic sensor as a human motion detector and then sends a notification in the form of notification via SMS or e-mail is one solution to overcome the problem that was previously proposed in previous research. However, to further clarify the warnings sent from the system, a home security system is needed that can attach images in the notification. In this study developed an IoT-based home security system. The IoT security system developed, can automatically send email alerts by attaching images when the Ultrasonic sensor detects human presence. The IoT system requires a Arduino UNO as a microcontroller that has been connected to the internet, a Ultrasonic sensor to detect human movement. Experiments in the study show that the IoT system can automatically send email alerts by attaching images when Ultrasonic sensors detect human presence in various light conditions with a range of 0-5 meters and the speed of sending email alerts affected by conditions of internet network connections and files size of image sent.*
This project uses regulated 5V, 500mA power supply. Unregulated 12V DC is used for relay. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

Keywords: IoT, Ultrasonic Sensor, Arduino UNO, Wi-Fi Module, LCD, Servo Motor

I. INTRODUCTION

The percentage of villages experiencing cases of theft during 2018 is in the range of11.42 – 73.76 percent of the total villages in Indonesia. Based on Data from the Central Bureau of Statistics, the most significant theft cases were in West Java Province with 27.76 percent present including theft or burglary. This incident can be caused by everyone's daily activities, which result in neglected home security. The solution to addressing home security issues has been done in previous studies, namely the creation of IoT-based security systems. Research explains the detection of human movement with the help of Ultrasonic sensors, IP cameras, and smart cam applications based on auto motion detect then sends an alarm in the form of an alarm, SMS notification and notification real-time e-mail to homeowners. It is just that the lack of an existing security system IP Camera is not used to take pictures when human movement is detected by the PIR sensor which is then attached to the email notification as an alert email. Another disadvantage is that there are no images sent to the SMS or e-mail notification.

Homeowners cannot see or distinguish the notification from people who do not know or known people. In IoT, everything is expected to be able to interact and communicate with each other, such as exchanging data and information related to environmental conditions. Thus, IoT reacts autonomously to events or events in the environment and provides services with or without direct human intervention. The development of IoT-based home security systems is a solution to address the shortcomings of previous research. The IoT security system makes it possible to control and monitor home conditions remotely in real time over the internet network. One of the challenges that will be solved is related to the

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development of IoT-based security systems, namely the process of automating sending email alerts by attaching images captured by Pi Camera when the PIR sensor detects human presence and knowing the things that affect the sending of email alerts that attach the image. Arduino UNO is a microcontroller used in this security system and also a server for sending alert emails. Utilizing email services in sending notifications is currently felt to be the most effective compared to the use of SMS services because users of SMS services are decreasing especially at Indosat providers while33.58 percent of the total Indonesian population is users of email services.

Internet of Things(IoT)

The term "Internet of Things" has come to describe a number of technologies and research disciplines that enable the Internet to reach out into the real world of physical objects. The Internet of Things, also called The Internet of Objects, refers to a wireless network between objects. From any time, any place connectivity for anyone, we will now have connectivity for anything!

Smart connectivity with existing networks and context-aware computation using network resources is an indispensable part of IoT. With the growing presence of Wi-Fi and 4G-LTE wireless Internet access, the evolution towards ubiquitous information and communication networks is already evident. However, for the Internet of Things vision to successfully emerge, the computing paradigm will need to go beyond traditional mobile computing scenarios that use smart phones and portables, and evolve into connecting everyday existing objects and embedding intelligence into our environment. For technology to disappear from the consciousness of the user, the Internet of Things demands: a shared understanding of the situation of its users and their appliances, software architectures and pervasive communication networks to process and convey the contextual information to where it is relevant, and the analytics tools in the Internet of Things that aim for autonomous and smart behavior. With these three fundamental grounds in place, smart connectivity and context-aware computation can be accomplished.

II. INTRUSION DETECTION

The development of IoT-based home security systems is a solution to address the shortcomings of previous research. The IoT security system makes it possible to control and monitor home conditions remotely in real time over the internet network. One of the challenges that will be solved is related to the development of IoT-based security systems, namely the process of automating sending email alerts by attaching images captured by Pi Camera when the Ultrasonic sensor detects human presence and knowing the things that affect the sending of email alerts that attach the image. Arduino UNO is a microcontroller used in this security system and also a server for sending alert emails. Utilizing email services in sending notifications is currently felt to be the most effective compared to the use of SMS services because users of SMS services are decreasing especially at Indosat providers while33.58 percent of the total Indonesian population is users of email services.

The Arduino UNO used is equipped with a Wi-Fi module, and another module is added, namely, the Ultrasonic sensor to detect human movement. As with the human senses, sensors can sense the environment. This Ultrasonic sensor can filter the wavelengths of passive infrared light between 8 to 14 micrometers, waves of passive infrared light produced from the human body range from 9 to 10 micrometers while those produced by nanometer- sized animals. Raspy is also equipped with a Pi Camera module to capture images when human movement is within the range of a PIR sensor at a distance of 0 to 5 meters.

Existing System

Ever since the wireless home security systems have become highly developed research in the field of International Intelligent Building, various approaches were proposed for designing such systems. In, an LED is used to monitor the home entryway and once intrusion occurs, the system enables house owner to change the passkey for the entrance. In, on account of intrusion, the system notifies the owner by sending SMS to the owner's registered phone number that is already preconfigured in the system. The owner can also remotely control his home by SMS using only his registered number. In, a system is proposed that comprises of IR sensors to recognize intruder, Raspberry Pi to capture intruder's picture, and a GSM modem to send SMS alongside the hyperlink of the picture. In, a robot is used to transmit live

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streaming of the home that can be viewed with a smartphone. The robot notifies the owner, on account of an intrusion, with the help of a temperature sensor that is integrated within the robot. In, GSM technology is used to alert the owner via mail once an intrusion is detected. In, a system is introduced that includes a raspberry pi and a camera to capture information and send to a smartphone that is used to remotely observe a specific location.

Proposed Method

The proposed system has been intended to overcome the drawbacks of the past surveillance systems and to enhance the security, adaptability, efficiency at whatever point required. Having a security camera system may infrequently be unimaginable because of the thorough expenses brought about in the course of the installation. The objective of our system is to make a smart surveillance system which can provide caution to the owner remotely by means of notification. It does this by sending an email the owner's smartphone when an intrusion is detected. The intrusion is detected using PIR motion sensor and is activated as soon as a motion is detected.

As the camera starts recording video, it first cross-matches the face of the person who enters the room. If it's a familiar face, for example, that of a family member, then the detection is completely ignored. In case the face doesn't match, indicating the detection of an intruder, the security guard of that apartment is notified with the help of a buzzer to generate continuous beeps and an LCD to display on which flat the intrusion has occurred. Furthermore, an image of the intruder is captured, instantly uploaded in cloud, and a notification is sent via an email on his phone for the owner to see who is inside his room. One interesting thing to note here is that the camera for recording video will be activated for short duration on an account of an intrusion and as soon as the time exceeds, it will be turned off. It will again be activated if another intrusion occurs but for a limited duration, thus making our system more efficient.

Software Employed

In the development of Intrusion Detection System for Smart Home Security, the Arduino Software IDE plays a central role. This open-source platform provides an intuitive interface for writing, compiling. and uploading code to Arduino-compatible microcontroller boards. Developers utilize the Arduino IDE to write code that interfaces with sensors, processes data, and controls other system components. Once the code is written, it is compiled into machine-readable instructions and uploaded to the microcontroller board, such as the Arduino Nano, via a USB cable. For data storage, visualization, and analysis Intrusion Detection System for Smart Home Security often integrate with Telnet, an IoT platform.

III. RESULT AND DISCUSSIONS

The developed IoT-based home security system was able to automatically send message alerts with Buzzer sound when the Ultrasonic sensor detected human movement. The system successfully operated in various light conditions within the detection range of 0-5 meters. The speed at which message alerts were sent depended on the internet connection quality and the size of the attached image files.

First connect to the mobile then LOCK the device if any suspicious intruder will appear by the movement of intruder the device will activate and it will give alert message and along with the Buzzer Sound.

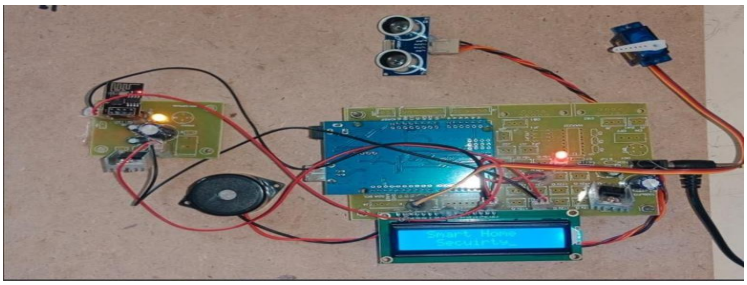

Fig 1 Device ON Condition

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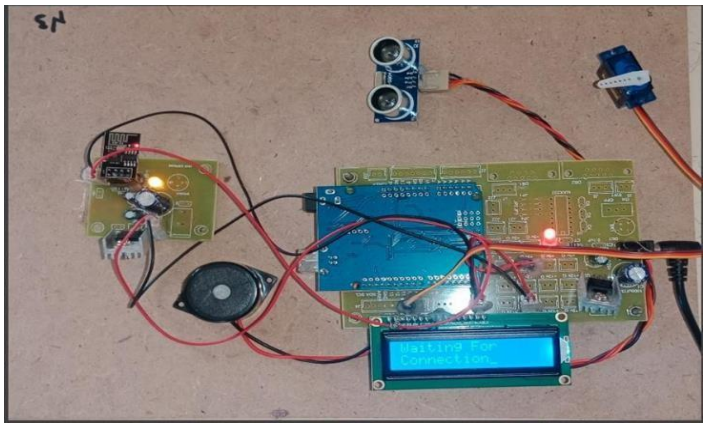

Fig 2 Device Connected to Mobile

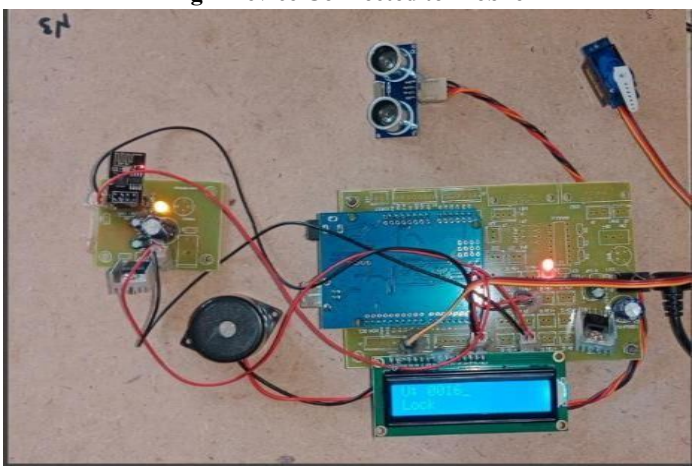

Fig.3 Device Locked

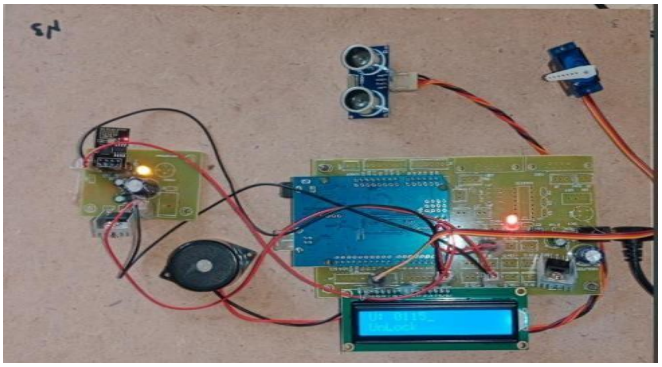

Fig. 4 Device Unlocked

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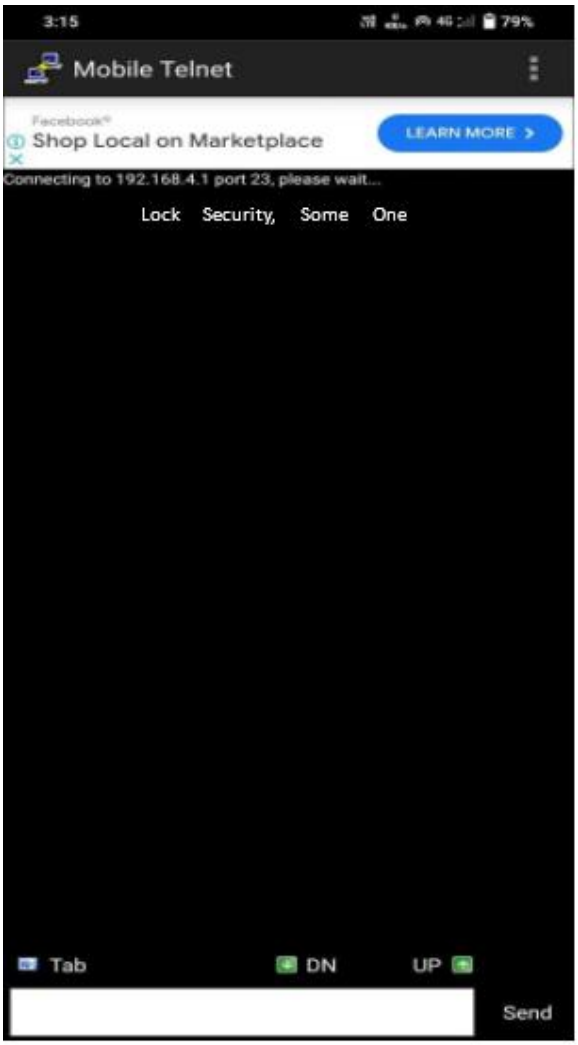

Fig. 5 Alert Message

IV. CONCLUSION

The Internet of Things based Smart Motion Detection System has been successfully implemented with the mechanism of sending email alerts automatically by adding the results of shooting when there is human movement. This system can work optimally at a distance between 0-5 meters with various light conditions, but it affects the quality of the captured image. The average duration of sending an email is 15 seconds depending on the quality of the image captured by Pi Camera. So that the response of this system is still categorized as real-time.

The weaknesses of this system are the quality of the image captured that is not clear and has not got the response yet from the email receiver towards the system when an email alert is received.

This final section of the report outlines some features that could potentially be implemented in future releases. The current set of features implement is a minimum to what a consumer would expect. In future, we can store the images with help database and we can also increase the processing speed with help of advanced board.

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