Designing Home Security Monitoring System Based Internet of Things(IoTs) Model

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Abstract. The uninhabited housing situation is very vulnerable to the existence of theft activities. Anticipation using a variety of door locking system of the house also often can be overcome by various the perpetrators of theft. Information technology today is inseparable from the development of internet communication technology. The Internet today are an essential part of every society as a means of Information Source. Therefore, there needs to be integration of home security system which can be integrated with internet based information system as one of innovation in security system. The research objective is the design and manufacture of sensor-based home security system as a passive infrared motion detectors integrated with Internet-based information system with the concept of the Internet of things (IoTs). The research used Passive Infra Red Sensor as input data, Arduino Uno Microcontroller as Sensor Data Processor and Ethernet as Web Server. The research resulted in a series of home security information system prototype based internet information and has successfully accessed through an Internet browser in the form of home security information to detect the presence of an intruder without permission remotely via the internet.

Keywords: Home Security, Arduino Microcontroller, Ethernet, Web Application, Internet of Things (IoTs)

Abstrak. Keadaan rumah yang tidak berpenghuni sangat rentan akan adanya aktifitas pencurian. Antisipasi menggunakan berbagai macam sistem penguncian pintu rumah juga kerap dapat diatasi oleh berbagai pelaku pencurian. Teknologi informasi saat ini tidak terlepas dari berkembangnya teknologi komunikasi internet. Internet saat ini merupakan bagian pokok yang selalu ada di setiap masyarakat sebagai alat informasi. Maka oleh sebab itu perlu adanya integrasi sistem keamanan rumah yang dapat diintegrasikan dengan sistem informasi berbasis internet sebagai salah satu inovasi dalam sistem keamanan. Tujuan penelitian adalah perancangan dan pembuatan sistem keamanan rumah berbasis sensor passive infra red sebagai pendeteksi gerakan yang terintegrasi dengan sistem informasi berbasis internet dengan konsep internet of things (IoTs). Penelitian menggunakan Sensor Passive Infra Red sebagai data input, Mikrokontroler Arduino Uno sebagai Pemroses data Sensor dan Ethernet sebagai Web Server. Penelitian menghasilkan sebuah rangkaian prototipe sistem informasi keamanan rumah berbasis informasi internet dan telah berhasil diakses melalui browser internet berupa informasi keamanan rumah untuk mendeteksi adanya penyusup tanpa izin secara jarak jauh melalui internet.

Kata Kunci: Keamanan Rumah, Mikrokontroler Arduino, Ethernet, Aplikasi Web, Internet of Things (IoTs)

1. Introduction

Awareness and monitoring of the home environment is the only way to ensure the safety of property and family. Currently a variety of electronic equipments has been developed into a security alarm device in the form of a theft warning tool. However, the equipment developed

and marketed today is still as a local notification tool that is notification closely that is notification or home alarm with a note that residents are in the house. What if the incident of destruction occurs when a family member is not in place And how to monitor home circumstances remotely by identifying intruders into the house by using

Figure 1. Board Arduino Uno

Source : Apriansyah, Ilhamsyah, & Rismawan (2016)

motion detection technology with a detect pattern based on human body temperature based on PIR (Passive Infra Red) sensors and sending information about intruders via the internet to homeowners. Based on these problems it is necessary a monitoring system that can monitor home security and control household devices remotely via the internet with the internet of things (IoTs) concert.

The purpose of this article is to explain the research of building and designing the prototype of home monitoring system devices remotely using the concept of internet of things (IoTs).

2. Literature Review

2.1 Previous Research

Remote electrical appliance control system has been done by Iswanto, (2011) regard to the Implementation of Cell Phones as Remote Lights

Figure 2. Ethernet Shield

Source: Agussalim, Adnan, & Muhammad Niswar (2016)

Figure 3. Passive Infra Red Sensor

Source: Sadad & Iswanto (2010)

Control with the result that is a remote light system control device with this mobile network media to turn on and off an AC light. Fundamentally this tool will work when a mobile R (receiver) gets a miscalls call from another phone network so a light will light up. When you want to turn the lights off again simply by doing miscall once again. Furthermore, when a light is on, an LCD will display the words "on". When a light is off, an LCD will display "off".

While on other studies (Aryanta, Darlis, & Jaya, 2014) the Design and Implementation of a prototype of full electrical appliances via the Internet with the result that it is powered through the internet network and computer browser.

Next is the Design of a Remote Controlled Home Security System (Sumajouw, Najoan, & Sompie, 2015) with the result of a remote controlled home security system design. Where the use of ATMEGA 8535 microcontroller and

Figure 4. System Model

Figure 5. Circuit System Design

can trigger a fire, the presence of smoke and fire. And also coupled with communication equipment such as Bluetooth HC-05, modem GSM Siemens C55 which functioned as an SMS gateway as an intermediary between the home owner and control equipment. Also paired also IP camera equipment in a certain place that is connected with internet network equipment that allows homeowners to know the existence of the house.

In research conducted by Herwanto et al.(2014)

the implementation of wireless sensor network of monitoring the classroom as part of internet of thing. In this study resulted in long-distance room temperature monitoring via internet.

While the use of microcontroller with the concept of internet of things (IoTs) has been widely used in various fields such as in the use of disaster such as flood monitoring information system (Satria, Yana, Munadi, & Syahreza, 2017), fire information system (Dewi, Satria, Yusibani, & Sugiyanto, 2017). While in its use in the field of education is the school bell with the setting of a distance using web technology (Satria & Yanti, 2017).

2.2 Arduino Uno Microcontroller

Microcontroller is a complete microprocessor system contained in a chip. Microcontroller is different from the versatile microprocessor used in a PC, because in a microcontroller there are generally minimal microprocessor system support components, namely memory and I / O interface, there are even some types of microcontrollers that have ADC, PLL, EEPROM facilities in one package , while inside the microprocessor generally contains only the CPU only (Steven Jendri Sokop, Dringhuzen J. Mamahit, 2016)

Arduino Uno is a microcontroller board based on Atmega328. The Arduino UNO has 14 digital input / output pins (6 of which can be used as PWM outputs), 6 analog inputs, a 16 MHz oscillator, a U.S.B connection, a power jack, an ICSP header, and a reset button. Arduino UNO able to

Figure 6. Miniatur House For Testing

Figure 7. Overall System Circuits

support microcontroller, and can be connected with computer using USB cable (Mochtiarsa & Supriadi, 2016)

2.3 Ethernet Shield

Ethernet Shield as shown in Figure 2 is a module or device that can provide the ability to Arduino microcontroller to be a web server or network connected to a computer network or the Internet.

According to (Soleh & Susilo, 2016) that Ethernet shield is based on Wiznet W5100 ethernet chip. The Ethernet library is used in writing programs for Arduino board to connect to computer networks via IP (Internet Protocol).

2.4 Passive Infra Red (PIR)

Passive Infra Red Sensors: optical devices such as eyes that can “see” by detecting infrared energy changes. This sensor consists of a special material in the form of thin parts called pyroelectric ceramic (Sadam & Iswanto, 2010). In this study the sensors Passive Infra Red is used to mendteksi movement that breaks through the house.

3. Research methods

In general, research methodology conducted in the Home Security Monitoring System is a

waterfall method is a method that has several stages consisting of requirements, design, implementation, verification and maintenance (Bahagia, Satria, & Ahmadian, 2017). In the design stage is divided into several stages of the circuit design stage, program flowchart design, circuit assembly stage, programming and end with the testing phase of the system.

In general, the workings of Internet-based home security monitoring system of things begins with sensors detecting intruders entering one room of the house contained motion detection sensors. The data of successful movement in the detection is sent to the security monitoring data processing system. Processed data is sent to the internet via an ethernet device as a web server. then the user can access directly home state remotely in the form of web interface using internet browser.

The design of the system circuit that will be built consists of Arduino Uno microcontroller module, Ethernet Shield and PIR (Passive Infra Red) sensors. Each module is connected to Arduino Uno Microcontroller, such as data pin on sensor module for data pin on digital no.2 pin on arduino microcontroller while Vcc and GND pins are connected to Vcc and GND on Microcontroller. Whereas ethernet is connected to microcontroller through TX and RX communication line. On Ethernet there is an RJ-45 port that is connected to a wireless router that is integrated with GSM

Figure 8. Construction Site Test Result

Figure 9. Testing system

modem. The whole system set can be seen in Figure 4.

While simultaneous construction model simulator for testing using miniature house using carton box by putting PIR sensor on the upper side of the box and on the outside there is a series of box system as in Figure 6.

4. Results and Discussion

From the design of the circuit the system generated the whole circuit of the system as shown in Figure 7 and can be explained that the system as a whole has been built in accordance with the design in Figure 5. Figure 7 shows that there are component modules Arduino Uno, Ethernet Web Server, PIR Sensor and Wireless Router.

While the construction of the system testing

point can be seen in Figure 8. On the construction seen that the infra red passive sensor is placed on the top side of the box. While testing is done by inserting the hand into the box through the door as shown in Figure 9. The hand in this test is given as representing the sample of the person entering the house. This is because the sensor only detects body temperature and movement.

The results on the user-accessible interface can be shown in Figure 10. The final result is a web view that contains information on the condition of the house. At the time the detector system is in safe condition then the information transmitted displays the writing condition of the house in a state of SAFE with IP access system 192.168.0.4.

The results on the user-accessible interface can be shown in Figure 11. The final result is a web view that contains information on home conditions. At the time the detector system is in safe condition then the information transmitted displays the writing condition of the house in the condition of ADA PENYUSUP with IP access system 192.168.0.4.

From the results of the integration of a series of home security monitoring system remotely using the concept of internet of things (IoTs) technology, this research has succeeded in sending data of intruders movement online and real time which can be accessed through internet browser. testing is done using simulation in Local Area Network (LAN) environment and accessed

Figure 10. System View in Safe Home Conditions

Figure 11. System View in Unsafe Home Condition

through wireless router.

5. Conclusion

Based on the design and the results of the research it can be concluded that home security monitoring system remotely using the concept of internet technology of things (IoTs) has been successfully built and has been executed in accordance with the design that has been built. In addition, the application has been successfully accessed via ethernet web server in the form of home security information to detect the intruder without permission remotely via the internet. From the research that has been done still many shortcomings and needed further research to get more perfect results.

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