NEWTON: Networking and Information Technology
Vol. 2 No. 2 October 2022, Page. 84 - 88
E-ISSN: 2797-0728

Office Window Security Monitoring System Based on The Internet of Things (IoT) in Unwaha

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ABSTRACT
Currently, the crime rate in the office environment is increasing for both types of crime and other crimes. Then a security system is needed to maintain office security. Security systems using IoT are an option that many people are interested in. Therefore, this study aims to help employees know the condition of window security, which can be monitored from anywhere. The system is monitored using the NodeMCU microcontroller and Magnetic Sensor, and the blynk application, which can then be used as a tool to find out whether all windows have been closed or not. conditions if the window is open or closed.

Keywords*: monitoring system, Nodemcu , Sensor Magnetic, Blynk .*

INTRODUCTION
Crime or criminality has been happening lately, one of which is the theft that occurs in companies (Putra, et al., 2020; Chitnis, et.al, 2016). This is caused by several things including urgent economic needs, social level, education, and environmental influences (Kansil & Kansil, 1994 in Putra, et al., 2020). Crime is the biggest threat to human security, considering that every human being needs security guarantees. Therefore, various kinds of developments in the field of technology are designed to provide safety and comfort (Mentaruk, et al., 2020). One way that can be done is to create an Internet of Things (IoT)-based home security system (Kurniasih, et al., 2016; Abu, et.al., 2018), which can be operated remotely via a computer network (Kurniasih, et al. 2016; Jidin, et.al., 2016). In terms of security, IoT technology can be maximized to become a system that functions as a monitor for office conditions (Avianto, et al., 2021). IoT is a new form of technology, one of the benefits of which is to provide a new concept in creating security and comfort for homes and companies (Prasetyo, et al., 2018). Noviani & Riyanto's research (2021), shows that the tool created can take pictures, detect body temperature, and send notifications containing the results of taking pictures and body temperature on the home owner's smartphone. Mentaruk Research, et al. (2020), shows that the implementation of an IoT-based security system using the blynk platform can detect the movements of other people who enter the house without the owner's permission and send notifications to shop owners using the blynk application and email that has been installed on the shop owner's smartphone. Based on the background description, the researcher is interested in developing an IoT-based office window monitoring system at KH. A. Wahab Habullah Jombang. The purpose of this research is to make it easier for security officers to monitor the state of the campus from anywhere because it uses internet data as a network connection. The monitoring system was developed using the NodeMCU microcontroller and magnetic sensors. The way this tool works is to provide information in the form of notifications on smartphones when there are windows that have not been closed or locked .

METHOD
The development of an IoT-based window security monitoring system was carried out at KH University. A. Wahab Hasbullah uses the R & D (Research and Development) method which is used to produce and test the effectiveness of a product being developed (Ningsih, 2020). The model used in this study is the waterfall (Classic Life Cycle). This model is the most widely used model in Software Engineering (SE) (Danang et al., 2022), because each stage carried out must wait for the completion of

the previous stage, in other words, each stage must be carried out sequentially. The software used in this research includes Windows operating system, Arduino IDE and Blynk. The hardware used in this study includes an AMD A9-9425RASEON R5 processor, 225 GB SSD, 4 GB RAM, keyboard, and a smartphone.

Hardware design and manufacture

The hardware design uses the NodeMCU ESP8266 microcontroller as a system controller because it supports WIFI connections (Mentaruk, et al., 2020). The ESP3266 NodeMCU is then connected to a magnetic sensor as the main controller. The connection of the ESP8266 NodeMCU with the magnetic sensor is done by connecting the minus (-) pin on the magnetic sensor with the Gnd pin on the ESP8266, where the minus (-) magnetic sensor pins 1, 2, and 3 are connected to Gnd on the breadboard provided by the MCU node. Then the positive (+) leg of the magnetic sensor 1 is connected to pin D5, the positive (+) leg of the magnetic sensor 2 is connected to pin D6, the positive (+) leg of the magnetic sensor 3 is connected to pin D7. The schematic of the magnetic sensor circuit with the NodeMCU ESP8266 can be seen in Figure 1.

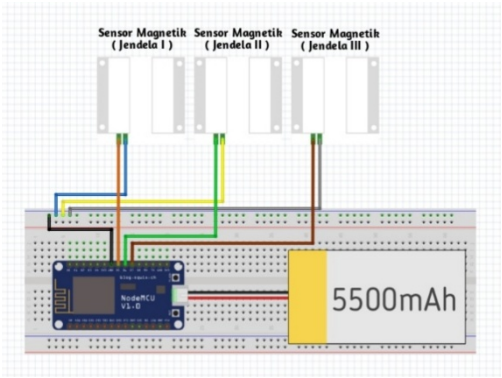

Figure 1. Magnetic Sensor Circuit Schematic with NodeMCU ESP3266

Software design and development

Software design aims to provide clear stages in making hardware control programs. The software design is described in the form of a flowchart which can be seen in Figure 2. Flowcharts are generally used to facilitate the resolution of a problem, especially problems that need to be studied and evaluated further (Mentaruk, et al., 2020). The workflow of this application starts with the connection of the NodeMCU ESP8266 with a WIFI network. If it is connected, the magnetic sensor will send status to the Bylnk server if the magnetic sensor is not within magnetic range. After that, the code is generated so that the sensor can work properly without errors.

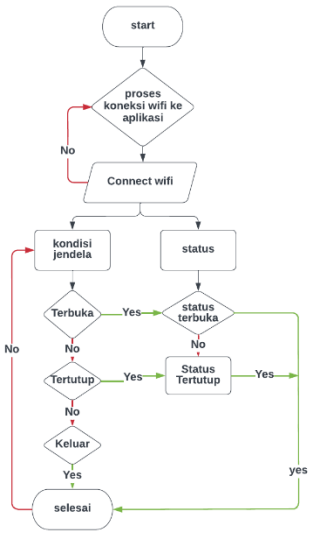

Figure 2. Series of System Flowcharts (Source: processed data, 2022).

RESULT AND DISCUSSION

Results

Hardware Testing

Hardware is a physical component capable of processing data (Hogan, et al., 2001). Hardware testing is carried out by connecting the NodeMCU ESP3266 microcontroller to a USB connection PC (Personal Computer) using a USB cable. If the LED on the NodeMCU ESP8266 blinks once it indicates that the NodeMCU ESP8266 is working. Next, a magnetic sensor test is carried out using electric power and a 186500 series battery. If the window is closed the two parts of the magnetic sensor are close together (less than 5 cm), the permanent magnet attracts the red switch contact so that the red switch is connected (on), otherwise if the window is open (more than 5 cm), then the effect of the magnetic force weakens or disappears completely so that the red switch is open (off) (Artha, et al., 2020). The next stage is testing the NodeMCU ESP3266 software. Testing is carried out by uploading the default Arduino IDE software program with the name "Project TA" as shown in Figure 3. The NodeMCU ESP8266 microcontroller is declared to work if the LED flashes according to the program command that has been uploaded (Mentaruk, et al., 2020).

Figure 3. Program Upload Process on Arduino IDE (Source: Personal Documentation)

Software Testing

Software testing is carried out by testing the Blynk platform using an Android smartphone. The data obtained from the magnetic sensor will be sent to the Blynk server. After that the data will be displayed on the project according to the auth token obtained when logging in to Blynk. The data is obtained from a magnetic sensor in the form of a window condition. Window condition data is displayed on the Image Gallery widget as shown in Figure 4).

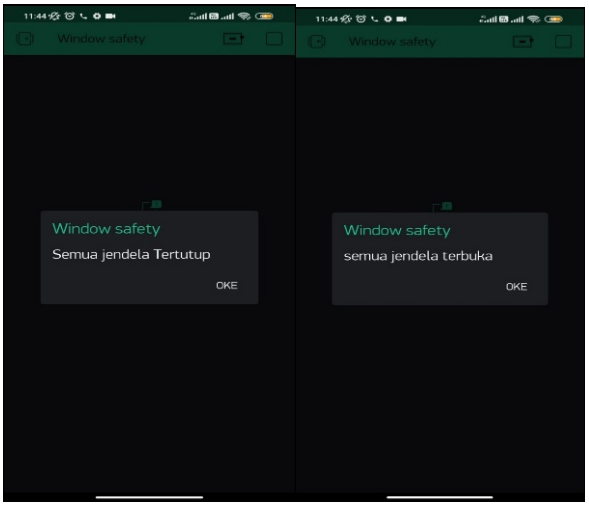

Figure 4. Image Gallery Display When Window Opens and Closes (Source: Personal Documentation)

Discussion

Tool testing is carried out to ensure the functionality and performance of the tool (Satoya & Sulaksono, 2021). The tool testing phase begins with operating the tool, which then analyzes the performance of each component of the tool (Mentaruk, et al., 2020). The schematic of the tool prototype circuit can be seen in Figure 5. Tool performance analysis is carried out by matching the data on the serial monitor with data on the IoT platform, so that later the effectiveness of the tool performance can be determined. The IoT platform used in this research is the Blynk platform. Analysis of tool testing can be seen in Table 1.

Figure 5. Tool Prototype (Source: Personal Documentation)

Table 1. Analysis of Tool Testing

Condition	Execution	Delay
All windows open (Separate magnet)	NodeMCU ESP8266 send notification to Blynk (All Windows Open)	< 3 Seconds
All windows closed (Magnetic fused)	NodeMCU ESP8266 sends notification to Blynk (All windows Closed)	< 3 Seconds
Window opens (Separate magnet)	NodeMCU ESP8266 sends notification to Blynk	< 3 Seconds
Closed window (Magnetic fused)	NodeMCU ESP8266 sends notification to Blynk	< 3 Seconds

(Source: Data processed, 2022)

Table 1 shows if the magnets are separated then all windows are open, otherwise if the magnets are fused it means that all windows are closed. This is in accordance with the research of Artha, et al. (2021), which shows that when the window is closed the two parts of the magnetic sensor are close together (less than 5 cm), the permanent magnet attracts the red switch contact so that the red switch is connected (on), on the other hand, if the window is open (more than 5 cm), the effect of the force on the magnetic field weakens or disappears completely so that the red switch opens (off). This monitoring system uses the ESP8266 Node to reduce system costs and power consumption which was developed by reducing the wireless router as a connecting device while providing a monitoring mechanism via smartphones (Hutabarat, et.al., 2018). Table 1 also shows that NodeMCU ESP8266 sends Notifications on smartphones with a span of 3 seconds. According to Hutabarat, et.al. (2018), the sending limit is still within reasonable limits, because the delivery of notifications depends on the network used by the user.

CONCLUSION

The development of a window security prototype was carried out at KH University. A. Wahab Hasbullah based on the Internet of Things (IoT) using a magnetic sensor and NodeMCU ESP8266 as a

microcontroller. The data obtained from the magnetic sensor is then sent to the Blynk server using the NodeMCU ESP8266 microcontroller which is connected to a WIFI connection and a smartphone hotspot. On the Blynk platform, the data sends a notification to the user when the magnetic sensors merge and separate. The data sent by the IoT platform has an interval of 3 seconds. The length of time the notification is sent is also affected by the network connection.

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