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IoT- Based Smart Security System Using Infrared Sensor as Motion Detector

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Abstract — *Today's security system requires the support of new technology to make it easier to remotely monitor and maintain valuables stored at home in real time. Internet of things technology has now been widely developed with various types of electronic components applied . So, from these problems providing innovation with the development of a remote security system applied to the FC-51 infrared sensor and ESP8266 as it's control. The infrared sensor receives input signals in the form of objects detected and received by the ESP8266 to be sent information to the server to be notified of messages from the Blynk platform to mobile devices. The results of this study prove, that the smart security system with IoT – based infrared sensor is able to detect the optimal distance obtained < 30cm and the shape of different objects determines the level of accuracy of the sensor.*

Keywords— *Internet of Things, infrared sensor FC-51, ESP8266*

I. INTRODUCTION

The end This has Lots cases of theft victims goods valuable at home . At a minimum system security resulted level crime the more increase consequence lack of facility or system security still _ not enough under control . Security is very necessary in various field life moment this . Factor privacy too _ influence importance something system security . Security is one _ important aspect _ in environment public [1]. Factor security own very important role for man [1]. Various type tool supporters security , up to moment This has used For secure goods valuable such as ; key padlock , key chains , safes , lockers , and tools help security other . However , from the manual tools _ _ perpetrator thief Still own gap For steal with various the way they are do . Problems that occur in security House is No apply technology House clever [2]. Besides from side security theft , safety occupants House from hazardous gas leaks can cause poisoning until cause fire [3].

this _ cause progress technology needed For developed so system security become more ok . With utilise technology and systems new information , can _ produce system security For reduce risk crimes committed by people who are not known [1]. On research before , take advantage of arduino as microcontroller [1]. System security clever applied to the concept House clever with utilise microcontroller Arduino Nano and Arduino Leonardo [4]. Moment This utilization internet technology or called *Internet of Things* (IoT), is indispensable For security environment For can control and monitor from distance Far [5]. IoT has good view _ for the future against the internet as communication distance Far good in the field commercial nor House clever [6]. Application previously utilizes the HC-SR501 (PIR) sensor with ESP32-CAM as microcontroller that delivers information form pictures and videos [7]. Researcher [8] use the PIR sensor to detect radiance

infrared to radiation hot by humans . because _ it , writer develop A system security with utilise Nodemcu ESP8266 as controller information distance far and infrared sensor FC-51 as detector movement . Researcher [5]utilize the ESP8266 as control to system security with PIR sensor as detector movement .

II. LITERATURE REVIEWS

Technology moment This Lots need internet for make it easy access communication distance far . One of them applied to the system security of course need component supporting electronics _ such as sensors, *software* or component other .

A. Internet of Things

Internet of Things (IoT) is system communication distance far away _ developed on the device physical , vehicle , to A data processing , with different methods and consists _ from applied system _ such as sensors, actuators and components other [9]. IoT to be interest main in development technology and revolution industry 4.0 [10]. IoT to be very useful method For continuing technology _ develop moment this , so almost every the field of IoT is developed For minimize work man [11]. Objective of IoT makes it possible all something can connected When course , where course , with device whatever can internet [12]connected . With apply IoT technology , can control from distance Far To use make it easy work man with system *monitoring* via cellphone [5], [13].

B. SmartSecurity System

System security clever has Lots developed and applied to homes in particular support exists internet or _ term other House smart (*smart home*). Smart home term For technology home - applied information , with _ components used _ For can communicate through network local or internet [14]. Based on researcher [8], that system security and digital monitoring have Lots developed in accordance with each other's needs .

C. FC-51 infrared sensor

Infrared sensor is device emitting electronics _ radiation infrared on the object that is located around him . Study before , take advantage of application of the FC-51 infrared sensor to detect queue visitors place tour with Arduino Mega as microcontroller [15], [16]. FC-51 sensor detects distance to object with emit and detect ray radiation infrared For feel surrounding , so can utilized as tool cleaner hand (*hand sanitizer*) [17], [18]. Infrared sensor applied For machine sorter goods with method detect through conveyor [19]. System security clever applied For make it easy user monitor information security door House with utilizing the FC-51 [12]infrared sensor Based on researcher before , such sensors applied as detector *volume* trash on the spot sorter rubbish [20].

In researchers [21] utilizes the FC-51 infrared sensor as input (*input*) for purpose of calibration For move angle at point 0 _ automatically at an angle turn DC motor control . Based on researcher [10] applied For detect object as draft *smart parking* . Researcher [22] using these sensors as detector objects on existing objects _ in the A box . Then , with Utilize capable FC-51 sensors radiate infrared rays on objects that block it . Besides it , on the theme This writer add *buzzer* as alarm sound if there is exists something movement and information shipped through accepted Blynk applications _ form notification on *mobile* . So , got help owner House For monitor in a manner distance far .

D. NodeMCU ESP8266

The NodeMCU ESP8266 is one microcontroller that has module wifi with ability For connect to a TCP/IP network via any possible Wifi user For develop and program IoT devices . In researchers [13], NodeMCU make it easy For program with various Language programming based on API (*Application Programming Interface*). The ESP8266 makes things easy user For make creation new to device with distance Far through wifi or web [23]. Based on researcher [24] – [26], ESP8266 has affordable price _ For can enjoy feature wifi with system embedded (*System on chip*). NodeMCU ESP8266 can applied to the system security clever For detect thief in the House [5], [25]. With features they have module NodeMCU ESP8266, got utilized For develop various type IoT project .

III. METHODS

Study This use method *waterfalls* with the stages that have been formed in figure 1. The waterfall method is a design process that has channel from on to down (like a waterfall) with a number of phase [2]. Method This developed by Winston W. Royce which consists of the five phases which include analysis , design , implementation , testing , and maintenance .

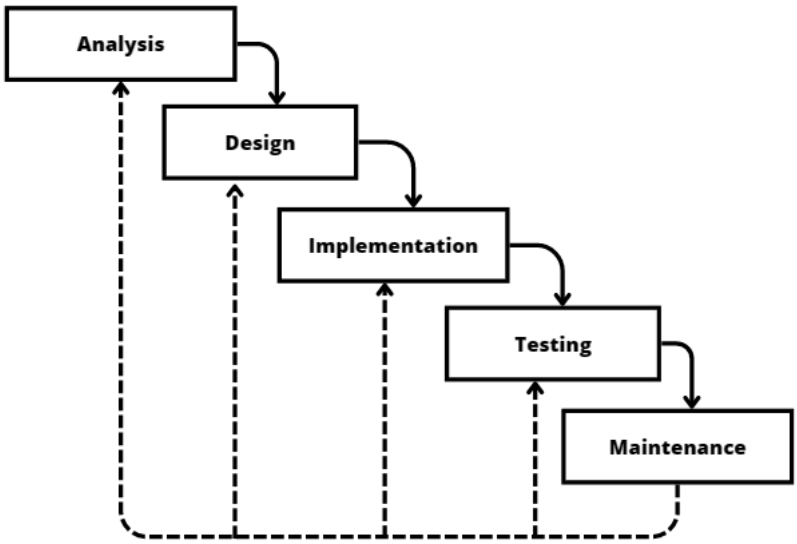

Figure 1: Flow scheme study method *waterfalls*

A. Analysis Need System (*Analysis*)

Stage This explaining the need main on the system with do studies literature and experiments with observe from lack tools that have There is before .

B. System Design (*Design*)

Writer designing appearance tool system security clever IoT- based on stage second This use future fritzing *software* will assembled For tested try like in *figure 1* .

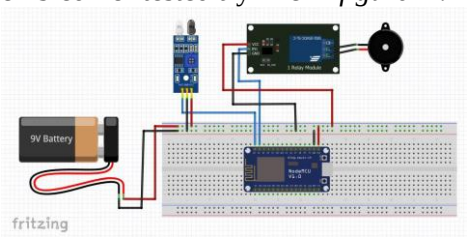

Figure 2. Architecture *smart system security*

C. Implementation (*Implementation*)

Implementation is stage preparation design Language programming use Arduino IDE *software* .

D. Tool and Program Testing (*Testing*)

Stage fourth as stage testing tools and programs for ensure No exists *error* in reading system from Language programming until quality component .

E. Maintenance (*Maintenance*)

Stage end Where data retrieval was successful done , then furthermore programming and tools saved , then will developed with update from before .

IV. RESULTS AND DISCUSSION

Draft tools on the system security This consists from NodeMCU ESP 8266, infrared sensor , buzzer, and relay (*figure* 3.).

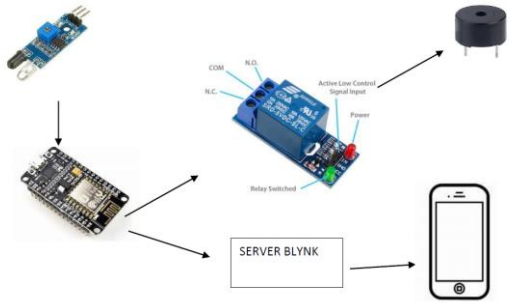

Figure 3. Work process *smart system security*

A. Tool Testing

Testing tool done with a purpose For observe component can Work with Good in accordance with function . Application of infrared sensors and NodeMCU ESP8266 within system security clever this , give control from distance Far with the internet through notification message to be delivered by Blynk platform and *buzzer* as notification sound . Observation done at a distance and level infrared sensor accuracy in detect object with give sample different objects . So , got know the advantages and disadvantages of the tool when work .

B. Tool Testing Results

Based on observation from results testing that has been collected , infrared sensor reading data obtained with experiment on each object and the specified distance from every given sample . _

Table 1. Infrared Sensor Test Results at a Distance of 5cm

Variable	Distance	Indicator	Blynk	*Buzzer*
Hand	0 - 5cm	detected	Accept message	Beep
Paper	0 - 5cm	detected	Accept message	Beep
Leaf	0 - 5cm	detected	Accept message	Beep
Styrofoam	0 - 5cm	detected	Accept message	Beep
Wood	0 - 5cm	detected	Accept message	Beep
Bottle plastic	5cm	detected	Accept message	Beep

Testing Table .1 is obtained , that the infrared sensor detect with well at a distance of 0 to 5cm and *the server* send message on Blynk as notifications on *cell phones* , as well *buzzer* beeps .

Table 2. Infrared Sensor Test Results at a Distance of 9cm

Variable	Distance	Indicator	Blynk	*Buzzer*
Hand	0 - 9cm	detected	Accept message	Beep
Paper	0 - 9cm	detected	Accept message	Beep
Leaf	0 - 9cm	detected	Accept message	Beep
Styrofoam	0 - 9cm	detected	Accept message	Beep
Wood	0 - 9cm	detected	Accept message	Beep
Bottle plastic	0 - 9cm	No detected	No accept message	No beeps

Table 3. Infrared Sensor Test Results at a Distance of 12cm

Variable	Distance	Indicator	Blynk	*Buzzer*
Hand	0 - 12cm	detected	Accept message	Beep
Paper	0 - 12cm	detected	Accept message	Beep
Leaf	0 - 12cm	detected	Accept message	Beep
Styrofoam	0 - 12cm	detected	Accept message	Beep
Wood	0 - 12cm	detected	Accept message	Beep
Bottle plastic	0 - 12cm	No detected	No accept message	No beeps

Table 4. Infrared Sensor Test Results at a Distance of 15cm

Variable	Distance	Indicator	Blynk	*Buzzer*
Hand	0 - 15cm	detected	Accept message	Beep
Paper	0 - 15cm	detected	Accept message	Beep
Leaf	0 - 15cm	detected	Accept message	Beep
Styrofoam	0 - 15cm	detected	Accept message	Beep
Wood	0 - 15cm	detected	Accept message	Beep
Bottle plastic	0 - 15cm	No detected	No accept message	No beeps

Table 5. Infrared Sensor Test Results at a Distance of 20cm

Variable	Distance	Indicator	Blynk	*Buzzer*
Hand	0 - 20cm	No detected	No accept message	No beeps
Paper	0 - 20cm	detected	Accept message	Beep
Leaf	0 - 20cm	No detected	No accept message	No beeps
Styrofoam	0 - 20cm	detected	Accept message	Beep
Wood	0 - 20cm	No detected	No accept message	No beeps
Bottle plastic	0 - 20cm	No detected	No accept message	No beeps

Table 6. Infrared Sensor Test Results at a Distance of 30cm

Variable	Distance	Indicator	Blynk	*Buzzer*
Hand	0 - 30cm	No detected	No accept message	No beeps
Paper	0 - 30cm	No detected	No accept message	No beeps
Leaf	0 - 30cm	No detected	No accept message	No beeps
Styrofoam	0 - 30cm	No detected	No accept message	No beeps
Wood	0 - 30cm	No detected	No accept message	No beeps
Bottle plastic	0 - 30cm	No detected	No accept message	No beeps

Sensor testing is carried out 6 trials _ with the same object and with different distance. on each table show results from every distance and indicator from tool work. Testing object from the sensors in Table .2 to Table . 6 obtained , that distance and shape object determine level infrared sensor accuracy For detect . So , blynk and *buzzer* accept information in accordance from the server on the control of ESP8266.

Figure 4. Testing *the Smart Security System* Tool

Figure 5. Display notification message Blynk on *cell phone*

On *figures* .4 and *figure* .5 is the system prototype security smart and shape appearance notification message to the Blynk server as form warning to user .

V. CONCLUSION

Based on results design and testing of data obtained , application of infrared sensors in the system security clever can useful and easy user For do monitoring in a manner distance Far use internet network through the Blynk platform for send message to user. The FC-51 infrared sensor has ability For radiate radiation ray infrared and capable applied outside _ room , so with distance obtained < 30 cm can easy detected . However, the most influential in testing the is object transparent like bottle sensor plastic does can detect exists object at a distance of 9 cm to 30 cm.

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