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# Prototype of home security system using passive infra red and vibration sensor based android

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**Abstract.** Home security system is a technology that has been developed at this time. One remote monitoring system to give homeowners a sense of comfort when leaving the house. Home security system that uses a raspberry pi, one security system that has become the solution into SmartHome system today. This system used android based smartphone is aimed for surveillance system. In this experiment designed a tool for remote monitoring system which is one of the home security system using the raspberry pi as a computational tool, PIR sensor and vibration sensor as a tool that gives input to the system is running, and camera pi as a tool to take a picture when certain conditions. In this system used the system webserver on raspberry pi and android applications that can connect using IP protocol path. The system name is RO system. The smarthome of results of this experiment are home security systems for remote monitoring using a smartphone. The RO system detects object up to a distance of 6 meter. Also the PIR sensor and vibration sensor has response time of <0.4 seconds and the sensor accuracy of 98.598 to improve the home security tools performance system.

## 1. Introduction

As a result of the economic crisis that hit Indonesia, the price of staple goods is getting higher, and many people are losing their jobs due to the reduction of employees made by many companies. Thus, increasing the rate of unemployment is high enough, the average crime rate increases, especially the theft / robbery that is increasingly done in housing complexes, homes and offices for reasons of economic pressure due to the lack of reliable jobs to meet daily needs. Many theft occurs when residents of the house are traveling or the community's busy work will cause a lack of attention to home security from the danger of criminal/theft, so there is a sense of worry when will leave home or office both in a long time and a relatively short time . To overcome this required a private security guard to maintain the security of housing complexes, houses or offices. With this step should be redeemed at a price that is expensive [1], and less effective because of very limited security capabilities [2-3].

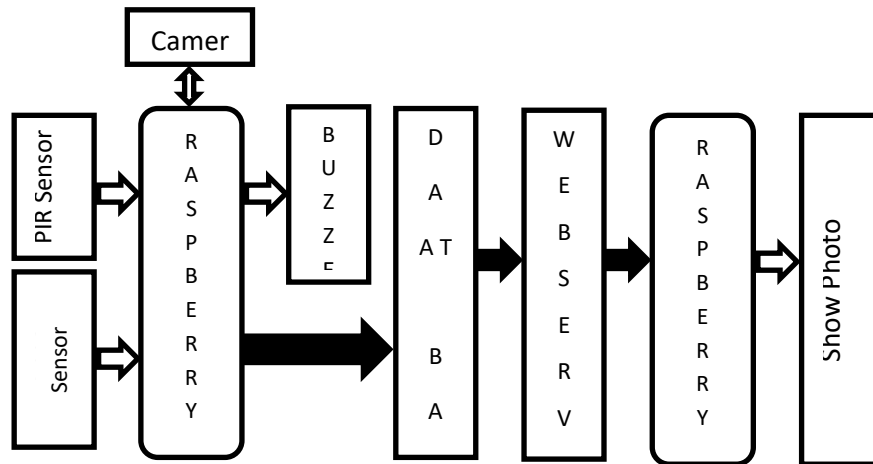
In this experiment developed home security system using passive infra red (PIR) which is assisted with the development of telecommunication technology based on android. In other research didn't use monitor the house directly [4] and only use glass breaker [5], so in this paper has system to monitor the house directly with glass breaker and smartphone in hand. To add a home security can be added the installation of vibration sensors on the door windows that can be connected directly to the buzzer. The function of the buzzer is to sound an alarm if the door and window are experiencing tremor when it is forced open.

## 2. Research method

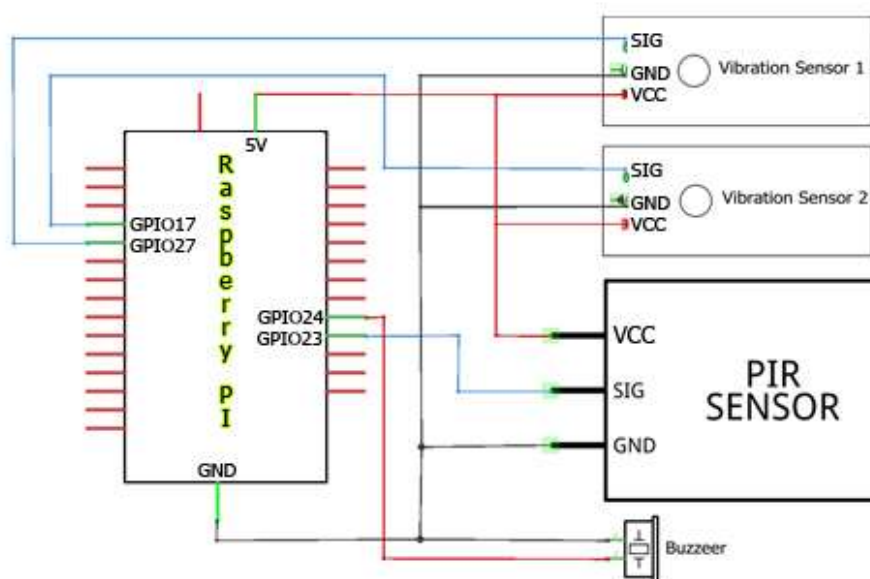
The stages of designing a home security system tool with passive infra red (PIR) and vibration sensors to solve the problem. The block diagram of the home security system design for surveillance



system in Figure 1.



**Figure 1.** The block diagram of the home security system



**Figure 2.** Schematic of hardware system

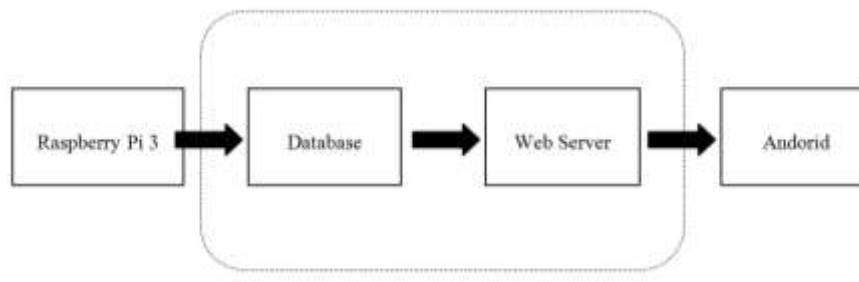
Stage of design for home security system:

a. Hardware design

For hardware design using raspberry pi 3 [6] with a schematic as follows in Fig.2.

b. Software design

For the design of the software consists of 3 designs are: system design on raspberry pi with python programming language, database design and webserver, and the design of android applications [7]. Fig. 3 describe about the software design connects to the Internet network [8-10]. The system name is RO system.



**Figure 3.** Scheme of Software System

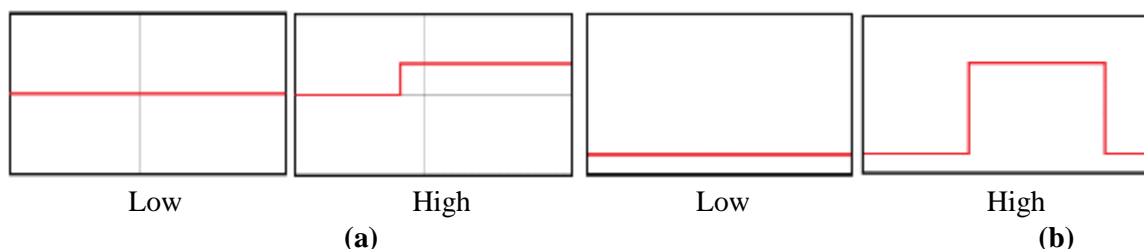
### 3. Simulation results and discussion

#### 3.1 Analysis of sensor

The sensors used in this device is a digital sensor [7], which has an output 0 and 1. Signal output of sensor is digital signal with low and high signal like in Fig.4. After some testing of sensors, the result is written on Table 1.

**Table 1.** Result of Experiment Sensors

Experiment	PIR Sensor		Vibration Sensor	
	Response Time (millisecond)		Response Time (millisecond)	Vibration
	Human	Animal		
1	263	269	332	34664
2	268	273	316	10862
3	271	271	327	13942
4	266	-	322	9717
5	269	-	330	10914
6	270	-	318	14696
7	264	-	321	7363
8	272	-	314	11907
9	263	-	320	9245
10	266	-	321	12416
Total	2672	813	3221	135726
Average	267,2	271	322,1	13572,6




**Figure 4.** Output Signal Sensors: (a) PIR Sensor, (b) Vibration Sensor

#### 3.2 Testing of camera

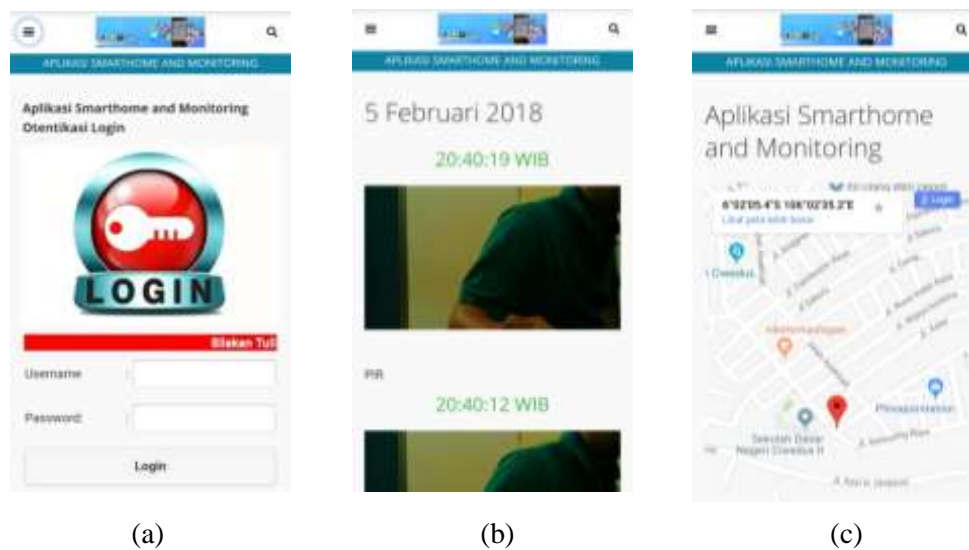
Testing of camera is done by placing an object in front of the PIR sensor to determine the camera work or not. from this test data obtained as Table 2.

**Table 2.** Result of Test Camera

Distance (Meter)	Logic of PIR	Photo	Information
1	1		Camera ON <b>Dimensions:</b> 1366x768 <b>Resolution :</b> 72 dpi <b>Size :</b> 190 KB
2	1		Camera ON <b>Dimensions:</b> 1366x768 <b>Resolution :</b> 72 dpi <b>Size :</b> 201 KB
3	1		Camera ON <b>Dimensions:</b> 1366x768 <b>Resolution :</b> 72 dpi <b>Size :</b> 267 KB
4	1		Camera ON <b>Dimensions:</b> 1366x768 <b>Resolution :</b> 72 dpi <b>Size :</b> 289 KB
5	1		Camera ON <b>Dimensions:</b> 1366x768 <b>Resolution :</b> 72 dpi <b>Size :</b> 214 KB
6	1		Camera ON <b>Dimensions:</b> 1366x768 <b>Resolution :</b> 72 dpi <b>Size :</b> 210 KB

### 3.3 Layout Android App

The android app display has multiple views such as login layout, monitoring layout, and map layout (Fig.5). Login layout is the view for home security system user login, users must login to use this home security android app. Monitoring layout is a view photos to capture of pi camera for monitoring the state of the house from a distance. Map layout is a view connected with google map to find out the home location of the installed home security system tool. Layout android app is designed to surveillance for home security based reference [11-12] .



**Figure 5.** Layout Android App: (a) Layout Login, (b) Layout Monitoring, (c) Layout Map

#### 4. Conclusions

From the analysis and the results discussed, it can be concluded the prototype home security system was successfully designed and work well, according to the supporting factors that have been analyzed to improve the performance of this tool, such as:

1. The PIR sensor and vibration sensor have a response time of  $<0.4$  seconds to improve the home security tool's performance system.
2. The PIR sensor will be optimal if the accuracy of the sensor is 98.598% and the error value is 1.402%.
3. The Smarthome RO system detects objects up to a distance of 6 meters.
4. The Smarthome-based RO android app is used to display monitoring results to improve RO Smarthome system performance.

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