Development of an Anti-Theft Device using Motion Detection and Body Temperature

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Abstract –The researcher aimed to design, assemble and determine the performance of the anti-theft device using motion detection and body temperature. The study utilized developmental design to observe the functionality of the device. Study showed that the anti-theft device can detect motion from a moving object for those with body temperature like human being, animals. A signal from the sensor circuits will trigger the receiver circuit to produce an audible sound that served as alarm. It was also found out that the output of the study is accurate in terms of detecting moving objects with body temperature during day and night times. The researchers formulated an evaluation instrument to determine its performance. Results showed that the device had a good performance and acceptable in terms of functionality. It is strongly recommended that further studies be conducted to enrich the anti-theft device using motion detection and body temperature in a controlled environment like museum and banks to determine the effectiveness of the integration of the anti-theft device.

Keywords: Anti-Theft Device, Motion Detection, Information Technology, Body Temperature

I. INTRODUCTION

Theft of valuable objects is some of the never ending problem in the world. Several detecting devices are already available in the market today. Example of such is to provide an alarm which can be activated using a remote control. Unfortunately, these devices had no provision to automatically detect theft attempts by alarming the owner. Moreover, security system using alarms are expensive. Other known devices trigger an alarm when a motion sensing device detects movement of the protected article. Unlike the devices based on separation distance, motion sensing devices respond to an attempted theft instantaneously when the protected article is moved, but prior art motion sensing devices are prone to false alarms because they do not distinguish motion caused by the owner or an innocent passerby in a crowded environment from motion caused by a theft. There remains a need for a theft deterrent system that is convenient in use, relatively free from false alarms and does not require frequent user action to arm and disarm the system [1].

A sensor with a high sensitivity in detecting body temperature is suitable for use in security alarm at home and business establishments [2].

A computer-based controlled electronic bell was used by Saint Thomas Academy a secondary school located in Batangas. The project was composed of computer, computer program, switching circuit and a buzzer. Materials such as switch, resistor, diode, DB25 connector, printer cable, DC relay, C945 transistor and wires used for the project. [3].

The Security is the primary concern in the world. Knowing your home is protected provides peace of mind when you are far from it. Security is important even if you are in public places. A project that will make your house secure rather than just relying on others was one of the goals of this study. Motion detection on the other hand plays important role for the detection of objects. A surveillance camera was used to detect motion with the aid of Direct Draw Technology [4].

The task of motion detector is to detect a region of interest embodied in a region of awareness, where the region of awareness, or similar with the focus of the camera in the field of view, is defined as the portion of environment being observed. The region of interest is in the portion of the environment where activity monitored. Recognition-based detection is neglected to come up with a simple design. A region of interest can

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be a person, an animal, or an object without body temperature that is circumscribed with the moving objects [6].

The study of G¨achter [6] is utilizing an omnidirectional camera to be able to obtain a maximum region of awareness. A sensor provides the image stream essential for detection and tracking. The detection of moving objects is done by an appropriate procedure. The possible procedures are based either on a difference or a statistical method. If it is assumed that the omnidirectional camera is permanently installed elsewhere, the motion detection can be done by taking the difference between successive images or the difference between the current image and a modeled background image. Existing procedure are in form of different algorithm for temporal and background difference methods can be applied using the method presented in Haritaoglu [7], Huwer[8], Gonzalez [9], Sonak[10]. Often in applications, both methods are merged to maximize its advantages.

Security, application of technology and innovating low cost existing anti-theft materials are some of the reason why the researcher come up with the study. The related literature and studies discussed motion detection, switching circuits and security that were very useful in this research. This will also serves as the guide for the development of an anti-theft device utilizing motion detection and body temperature whose performance is acceptable in terms of functionality, availability, simplicity, cost and operation.

II. OBJECTIVES OF THE STUDY

The main aim of this study was to design, assemble, test and determine the performance of an anti-theft device using motion detection and body temperature. A body temperature sensor module was used to determine if the moving object has normal body temperature. The study was conducted at Barangay Saimsim, Calamba City in 2013. Specifically, the study was able to present the functionality, block diagram and procedure on how to implement the anti-theft device using motion detection and body temperature.

III. METHODOLOGY

The researcher used developmental method of research. Rapid application development model were also utilized in developing, testing and evaluating the device. The study was conducted in Calamba City, Laguna Philippines. The participants include households of the model house and the researcher.

A. Research Process
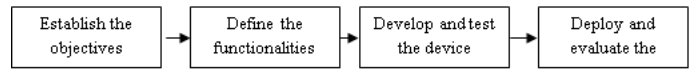The figure below presents the flow chart of activities

Fig. 1 Flow chart of activities

The figure revealed that the main objective of the research was to design, assemble, test and determine the performance of an anti-theft device using motion detection. Functionalities include the actual transmission and reception of signal at the time of detection. The body temperature sensor operation was also carefully examined with regard to the range of motion detection of body temperature. Furthermore, the anti-theft device using motion detection utilized body temperature sensor module from Alexan, 2-in-one wireless digital doorbell from CDR King, 9 volts power supply and switching circuit module. The device was installed on top of the door of the small poultry house..

B. Block Diagram
Figure below served as framework of the system. The microcontroller is the main components of the system. It serves as a controller of the entire process.
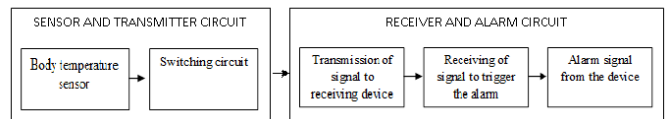

Fig. 2 Block Diagram of the circuit

C. Project Evaluation
The households and the owner of the poultry are the respondents of the study. The evaluation was conducted from August to December 2013. The researcher used some of the applicable criteria of ISO 9126 to examine and evaluate its performance. The evaluation process is composed of performance and functionality in terms of its operations. [5].

IV. RESULTS AND DISCUSSIONS

A. The Project
The developed anti-theft device using motion detection was shown in Figure 3. Two modules were the composition of the anti-theft device. The first device was the sensor and transmitter that was operated by 9 volts DC power supply installed on top of the door of the small poultry house. The second module was the

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receiver module of 2-in-one wireless digital doorbell from CDR King. This was operated by 220VAC. This could be installed anywhere in the house whose distance is at most 150 meters from the transmitter.

Fig.3 The modified body sensor and transmitter module.
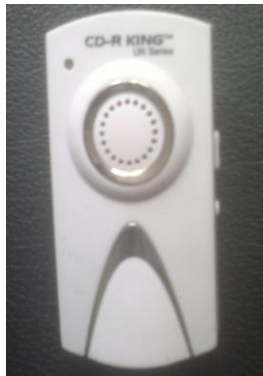(The Circuit was adopted from Alexan)

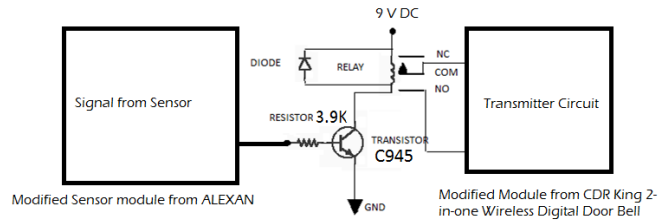Fig.4 The receiver module.
(The module was adopted from CDR King)

Fig. 5 The Switching module.

B. Functionalities

The anti-theft device can be used for 24 hours a day. The detection of objects was based from the concept of motion detection in addition of body temperature sensor to be certain to those who have body temperature. The body temperature sensor was set to human normal temperature. Once intruder was detected, the sensor and transmitter module will send radio wave signal to the receiver module. The receiver module will process the received signal by producing audible sound. The sound will alert the household that there is intruder. As part of the testing of the device, several trials were conducted to find out if certain objects will be detected other than human and 94% of the total testing were successful.

D. Evaluation Results

The researcher used some of the criteria of ISO 9126. The device was used from August to December 2013. And results showed that the detection is accepted in terms of accuracy, efficiency and reliability. For the purpose of cost, the device is only used during night time. Table below shows the summary of acceptability evaluation in terms of average mean, interpretation and rank of each level of acceptability measures.

Table 1. Result of Acceptability Evaluation

Level of Acceptability Measures	Explanation	Mean	Interpretation	Rank
1.Accuracy	The action was taken place of the sensor when movement of the person is detected	3.49	Accepted	2
2.Efficiency	The action was taken place if movement was detected in a fastest way	3.55	Accepted	1
3.Reliability	The action was taken place if an object with a body temperature was detected	3.44	Accepted	3
Average Mean		**3.49**	**Accepted**	

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Table 1 showed that the overall finding and evaluation of the anti-theft device has an average mean of 3.49 with an overall interpretation of accepted result. Efficiency ranked as first with the highest mean value of 3.55 followed by Accuracy with an average mean of 3.49. In terms of accuracy, reliability and efficiency, the output was rated with accepted which also implies that the households were satisfied on the developed system. Based on the results of evaluation, the researcher can conclude that the anti-theft device using motion detection and body temperature was acceptable in terms of accuracy, efficiency and reliability.

V. CONCLUSION AND RECOMMENDATION

The researcher aimed to design, assemble and determine the performance of the anti-theft device using motion detection and body temperature. The study utilized developmental design to observe the functionality of the device. The body temperature sensor was utilized for motion detection and the 2-in one wireless digital doorbell was also used for the transmitter and alarm. During the device operation, the temperature of the 2-in one wireless digital door bell had reached 40 degrees. Moreover, the transmitter can transmit the signal from the sensor for at most 150 meters. Based on the results of evaluation, the anti-theft device using motion detection and body temperature is acceptable in terms of accuracy, efficiency and reliability It is strongly recommended that further studies be conducted to enrich the anti-theft device using motion detection and body temperature in a controlled environment like museum and banks to determine the effectiveness of the anti-theft device.

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