# INTEGRATED HOME SURVEILLANCE SYSTEM (IHSS)
## via SMS TECHNOLOGY

By

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FINAL PROJECT REPORT

Submitted to the Electrical & Electronics Engineering Programme

in Partial Fulfillment of Requirements

for the Degree

Bachelor of Engineering (Hons)

(Electrical & Electronics Engineering)

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# CERTIFICATE OF APPROVAL

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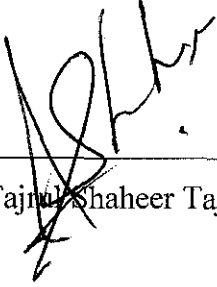Universiti Teknologi PETRONAS
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June 2007

# CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

Tajrul Shaheer Tajudin

# ACKNOWLEDGEMENTS

# ABSTRACT

There has been a rise in the home breaks in Malaysia. Recent statistics shows 27000 cases of home break in have been reported in the year 2006. Most of the victims reported were from the middle class residents. Although people are starting to realize the importance of home security systems yet many are reluctant to equip their home with one. On the other hand, the high class residents are always finding ways to better secure their homes due to their social background as well as their financial background. Threats have been always significant in their daily life, which leads them to secure their homes. Threats are also there to the middle class residents where a survey conducted on 50 Universiti Teknologi PETRONAS undergraduates from middle class family with their parents' combined salary between RM 3500 to RM 4000, proves this point. The survey was conducted to understand the factors that prevent the middle class residents in equipping their home with security system. The survey results show that there are three factors that contribute to the hesitation of middle class residents to secure their home with any form of security system; the implementation costs, post implementation costs and complexity of the security system which needs the home owner to have some level of technical knowledge. The objective of this project is to create home security system that is affordable, efficient, technologically sophisticated yet requires minimal technical knowledge in implementing the system. The proposed solution, the Integrated Home Surveillance System (IHSS) is designed to provide a security system that suits the middle class home owners.

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# CHAPTER 1

# INTRODUCTION

This chapter discusses the evolution of security systems, the problem statements as well the objective of the project.

## 1.1 Background of Study

The term security can be traced back to security profession that became a popular service since the 1960s and 1970s when security personnel were recruited from the law enforcement field. Security personnel were mainly used to guard properties as well other assets. Companies as well home owners utilized the security personnel services to safe guard their property from external threats. As the technology advanced, the term security entered the electronics world when the digital dialer technology was created to enable reliable transmission of emergency signals to law enforcement departments and also remote locations. Then followed the Hollerith and Wiegard card systems which provide the personal identity management.
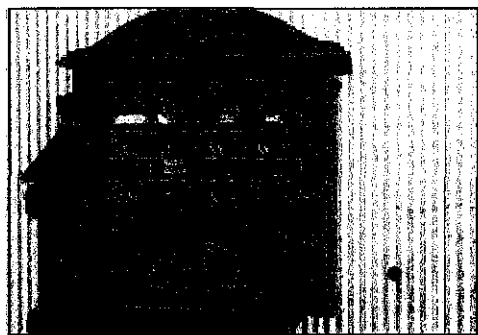


**Figure 1.1: Fire alarm systems during the early days**

The CCTV camera system followed the evolution. Although the first CCTV camera was installed in the year 1942, it only became popular in the early 1980s. Close Circuit Television utilizes the television to transmit a signal to a specific and limited set of

monitors. The first CCTV system was installed at Test Stand VII in Peenemuende in 1942 to allow better viewing of the lunching of V2 rockets [2].

The utilization of these technologies didn't mean the security personnel were no longer needed. The security personnel were slowly moved to managing the security systems. The personnel gradually involved themselves in the filed of technology where the security personnel were trained to manage the security systems apart from providing their normal routine services which the scope has been reduced to facility management [2]. The electronic security equipment reduced the services of the security guards as it has been most cost effective compared to the latter. Electronic security equipment was utilized in almost every aspect of a building. From securing the all the access points to a building to monitoring activities in the building. There was specific electronic security equipment for each type of threat. This caused the production companies to integrate each of the equipment into one that would be feasible as well as cost effective to consumers. Also, companies realized integrating systems into one is a way to reduce production costs.

Information Technology (IT) soon took part in the integration of the security systems. Wires are replaced with wireless technology and big structure control stations soon started to take shape in as computer based managements. The control panels soon became software based systems. Wireless middle such Bluetooth and Infrared connections, GPRS as well the latest connecting middle, 3G connectivity system replaced the wired bound systems. The hardware components of the systems became smaller and smaller. As the technologies advances, the components sizes are shrank to fit the shrinking system sizes. Production companies produced security systems that are small in size, efficient, feasible yet technologically sophisticated.
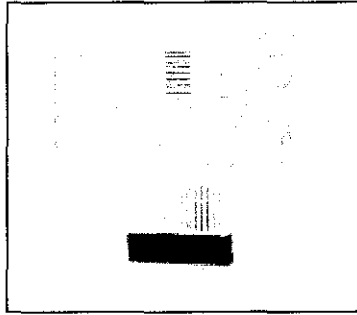
**Figure 1.2: Modern alarm systems**

The retail price of each system became more and more expensive as the demand for home security systems started to shoot up. Costs were not a deciding factor for the wealthy ones as they have the money to purchase them. The deciding factor for this class of people is the efficiency and the reliability of the product. Knowing this, production companies elevated the retail price of the systems as the systems got more sophisticated day by day. The middle class residents were never a targeted consumer due to their financial status and social positions.

The more sophisticated the systems becomes, the more technical knowledge is needed to manage and maintain the systems. The additional fees that needed to be paid to the systems providers add up to the costs of implementing the systems. The service providers provide technicians in installing the security devices and monthly or annual fees is needed to be paid for this services that is provided by the support technicians. Again, this will not be a deciding factor for the upper class residents as the costs of maintenance is not important deciding factor for them. But, it is for middle class residents. These people will have no choice but to rely on the technicians on maintaining the systems. They can't rely on themselves to maintain the system as complex technical knowledge is needed in doing the tasks. It is not their fault not to equip themselves the knowledge since they are not from that background.

The main reason behind the production of all these security systems in the earlier days was to provide maximum protection to all class of people. For the current generation of people, wealth is the most important factor that decides whether one has the right to be protected or otherwise. Security systems that are affordable yet technologically advanced to provide maximum protection to the middle class residents has to be created to enable this class of people to feel safe and protected.

## 1.2 Problem Statement

Companies world wide are constantly coming up with security systems that are suitable for multiple environments. The newer the technology, the more sophisticated the system becomes. This requires specific technical knowledge to install and maintain the system. Companies producing the systems train technicians to do the specific task of installing as well to do the maintenance. This indirectly increases the already high costs of the product. There is no option for the customers to install and to maintain the system by themselves. Thus there is no Do It Yourself (DIY) element.

DIY element is important to some consumers. Some consumers, besides trying as much as possible to reduce costs of implementation of the system, they would also expect some privacy during the installation of the security system. There is no guarantee that the company technicians themselves will not disclose the relevant information of the customer's house to other would be burglars. There is no guarantee on the integrity of the technicians. In fact, they themselves could be the burglars. Having to be able to install the system by the customer themselves will give the customer better satisfaction as well mental peace. Another element that lacks in the current security system is the portability of the system. The hardware of the product needs to be installed in the desired area and fixed. The same goes to the control box of the system where usually it is fixed in an area where it is not exposed to non-residents of the house. There could be a point of time where the home owner could feel the current location is no longer safer. The customer cannot unfix the system and move to other area as a lot of wiring. The need of a portable system is vital in safe guarding the safety of the system as well the home.

## 1.3 Objectives

The objective of this project is to design a reliable and efficient home security system. The system design will be such that it will require minimal technical knowledge to implement and maintain the system. The costs of implementation and maintenance will be minimal and Do It Yourself (DIY) element will be emphasized. The system will incorporate the Short Messaging System (SMS) technology capabilities to design an effective and efficient security system. Also, home management system features will be added in the system to make the system as a 2 in 1 product. These features will help the home owners to manage home systems such as lights, televisions and etc via SMS. Not only these features will add in to current features of the security system but these features can act as distractions to prevent any possible home break-in attempts. Situations in which home owners tend to forget on switching on the lights and etc can be easily solved by just sending SMS. Thus, IHSS is not only a home security system that is affordable and technologically advanced but also a system that incorporates home management system to enhance the capability and the features of the security system.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 The Modern Technology

The technology advances so fast that many companies are coming up with different types of security systems to suit multiple environments. The components of a security system have specific functions. The following stand alone sub-systems will cover the components available in the market. In this project, a new method of integrating these components to build an effective security system is proposed.

### 2.1.1 Lights Controlling Motion Sensor
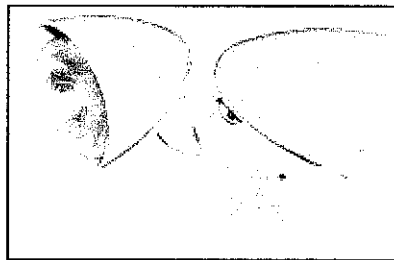


**Figure 2.1: Light controlling motion sensor**

This motion sensor is a component that detects movement of human beings and lights up the hallway or the pathway. It usually used in offices to save electricity and it is becoming a common component in residents as well.

## 2.1.2 Glass Break Sensor



**Figure 2.2: Glass break sensor**

Glass break sensors are very sensitive to glass breaking sounds. It is usually placed near glass doors as well at windows. It design makes the detector one of the most low profile sensors in the industry. When it detects the glass breaking, the sensor opens its contact. Advanced piezo transducer technology powers the sensor, so no power is needed from the loop. Instead, the piezo generates its own electricity when it bends as the glass breaks. They are a perimeter device because they catch a burglar attempting to make entry into your home or business as opposed to walking around the interior and being picked up by a motion detector. They are available in both hardwired and wireless versions. The detector mounts in a wall or ceiling and listens to an area approximately 35 feet in all directions. They do not hear through walls or around corners or into a room because the door is open.

## 2.1.3 Motion Detector
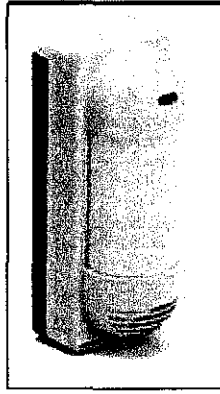


**Figure 2.3: Motion detectors**

Motion detector is a sensor that detects the motion of human being. The system is intelligent enough to differentiate whether the moving object is human being or animal. The detection method used is Passive Infrared (PIR) technology. It uses the infrared ray to detect motions.

## 2.1.4 Electronic Vibration Sensor
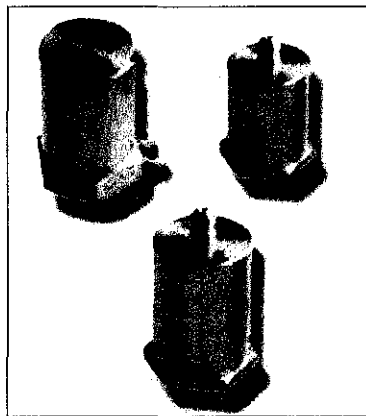


**Figure 2.4: Electronic vibration sensor**

This device is intended for the detection of a forced entry by breaking through a window or door. The knocks and the bangs inevitably involved generates sound speaks strong enough for such a detector to trigger.

## 2.1.5 Webcam
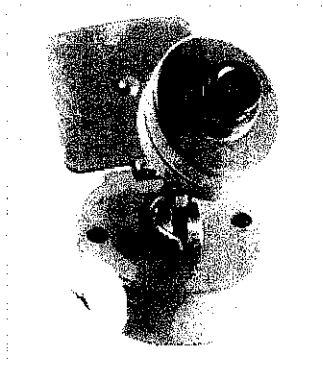


**Figure 2.5: Webcam**

Instead of CCTV camera, home security systems are equipped with webcams to monitor the surrounding. The advantage of webcam is that it enables home owners to connect to their mobile phone or PC to view the camera. IP camera is the latest addition the types of webcams which enables the feature of mobile viewing using portable viewing device.

## 2.2 Security System Providers

Some of the home security system comes together with the support of the service provider as well. The service provider will provide system maintenance as well system monitoring. The security system that is placed for monitoring the house will be directly linked to the service providers service centre. Below is an example of a well known security system provider.

## 2.2.1 ADT in Malaysia

ADT is the world's largest provider of electronic security, protecting over two million people in homes and businesses throughout the world. ADT provides sophisticated security systems for major commercial facilities such as banking institutions, airports and large corporations as well as protecting homes and small businesses.

ADT is dedicated to providing reliable, quality service with a personalized approach. As the industry's leading electronic security company, ADT offer significant customer benefits, including:

- The best value in affordable, quality home and business security systems
- Installation by trained and authorized security professionals
- Personal service from our Customer Service Centre
- State-of-the-art security monitoring, 24 hours a day, seven days a week
- Access to the most advanced security products and systems available internationally.

## 2.2.2. Centralized Security System

This system is usually provided by private security companies by assigning security guards to secure homes. Condominiums and smart home nowadays are equipped with this system. Centralized intercom system connecting to the guard house and automatic gate system is some of the components in the system. There is not much of surveillance provided by the system. The system lacks the necessary security element and it is very much dependant to the guards who monitors the system. There is a monthly fee to be paid to the security companies in maintaining the system. No other functionalities that could be added on to the system and it's placed at one particular location in the condo.

## 2.3 Home Management System Service Provider

Pacific Control Systems, the global leader in automation, is a company that provides the service of email Enabled (E-enabled) residential building system. Their "The Waterfront" project, located at the Dubai Marina is the world's first full fledged e-Enabled residential building system. The system provides the "total" automation of the building by implementing Web-enabled Home Automation Systems in all the apartments of the luxury tower and integrating it with the Building Management System (BMS). Each home has a Web-enabled Home Automation System that is integrated with the Building Management System (BMS) providing comfortable lifestyle management combined with security and ease-of-use [15].

# CHAPTER 3

# METHODOLOGY AND PROJECT WORK

## 3.1 Procedure Identification

This project was completed step by step based on the flow chart shown in Figure 8. The project was initiated with extensive research and studies conducted based on books, articles, journals as well understanding of already available prototypes in the market. A survey was conducted to study and understand the hesitation of middle class residents in equipping their homes with home security or surveillance system. A sketch design was created after thoroughly understanding the feedbacks provided from the survey. After studying the disadvantages and loopholes studied from already in the market security system products, a counter-product was designed to provide a better service to consumers. The basic concept of the system is designed using flow chart to give a clearer picture of the proposed system and suitable program was developed. As part of the enhancement of the project, the parallel or the serial port connection was an optional implementation on the project, the hardware section of the project. Apart from that, software enhancement of the project was also done. Last but not least, the program was tested and compiled as an executable file.

```
┌─────────────────────────┐
│ Literature Review        │
│ -Types of Security System│
│ -Current security products in│
│ the market               │
│ -Advantages & disadvantages│
│ of current systems       │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Conduct survey to understand│
│ the middle class residents'│
│ point of view on security│
│ systems                  │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Analyze & identify the   │
│ requirements for an ideal│
│ security system          │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐              ┌──────┐
│ The proposed security system│◄──────── │  NO  │
│ concept is designed      │              └──────┘
└─────────────────────────┘                  ▲
            │                                 │
            ▼                            ◇─────────◇
┌─────────────────────────┐            ◇ Successful? ◇
│ The software is designed │ ───────►   ◇─────────◇
│ according to the proposed│                  │
│ design                   │                  ▼
└─────────────────────────┘              ┌──────┐
            │                            │ YES  │
            ▼                            └──────┘
┌─────────────────────────┐
│ Integrated Home Surveillance│◄──────────────
│ System is created        │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐                      ┌──────┐
│ Parallel/Serial port circuit to│               │  NO  │──►( Debug )
│ trigger the circuit      │                      └──────┘
│ (OPTIONAL)               │                          ▲
└─────────────────────────┘                          │
            │                                    ◇─────────◇
            ▼                                   ◇ Successful? ◇
┌─────────────────────────┐  ───────►           ◇─────────◇
│ IHSS enhancement:        │                         │
│ Home Management System   │                         ▼
└─────────────────────────┘                     ┌──────┐
            │                                    │ YES  │
            ▼                                    └──────┘
┌─────────────────────────┐◄────────────────────
│ HMS is incorporated with │
│ IHSS                     │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐              ┌──────────────────────┐
│ Final Year Project       │ ─────────►   │ IHSS via SMS technology│
│ Completed                │              │ executable (*.exe) file is│
└─────────────────────────┘              │ computed.             │
                                         └──────────────────────┘
```

**Figure 3.1: Project workflow**

### 3.1.1 Survey

Home security system is an important element that should be installed in every possible in every home. Yet the middle class residents are reluctant to secure their home with one. A survey consisting 50 UTP students, all from middle class residents (combined monthly salary of RM 3500 to RM 4000) was conducted to find the cause behind the hesitation. The survey took almost half a day to be completed and the data gathered has been redefined into a bar chart.
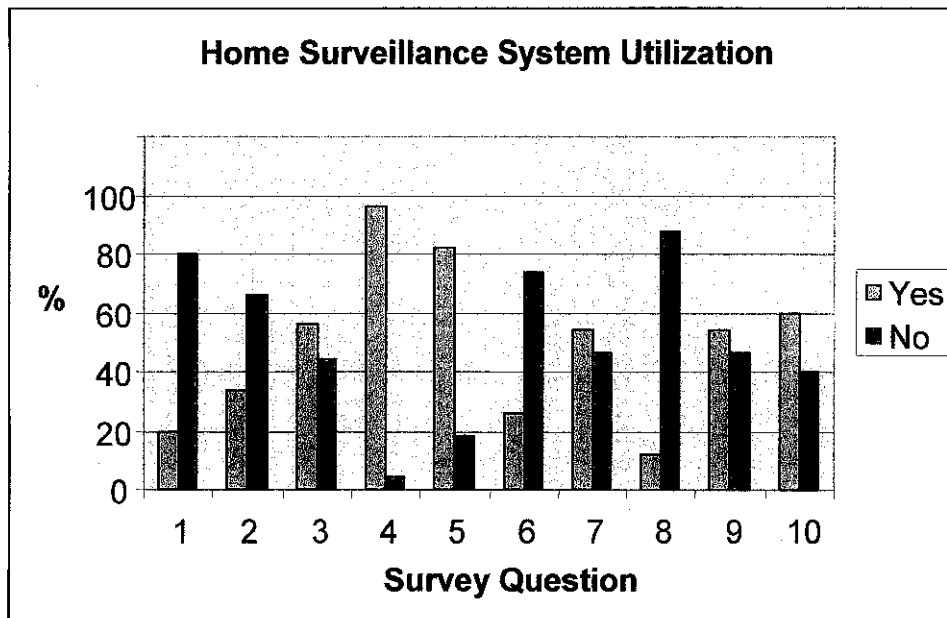


**Figure 3.2: Survey results**

As displayed in the bar chart Figure 3.2, more than 62 % of them consider the home security systems as waste of money. About 82 % of them think that managing a home security system requires technical knowledge. The middle class residents have a strong understanding that home security systems are expensive to be installed and maintained and it is the main reason that they are reluctant to equip their homes with the system. Around 94 % of the total subjects agree that home security systems are expensive. The three main points that summarizes the reasons behind the ignorance of middle class residents on implementing home security system are:

- Implementation Cost
- Post Implementation Cost or Maintenance Cost
- Technical Knowledge in managing the System

Another point that seems to be important is the lack of Do-It-Yourself (DIY) element. It takes the product's technicians to come to home an install the systems which directly increases the installation cost as there is some installation fee to be paid to these technicians. At the end of the day, points taken from the survey as well the additional points added, there are 4 main reasons the home security system has not been the most desired gadget to be acquired by the middle class residents

## 3.1.2 Final Design of Proposed System

After analyzing through all the feedbacks given by the middle class residents through the survey, a security system design that is simple, efficient, technologically advanced, and complex yet low in cost (for both pre and post implementation) and incorporates DIY element. Shown in the next page is the final design of the proposed system.

Parallel/Serial
Connections

Door
Sensor

Web-Cam

Porch
Lights

Security Breach Detected.
Respond Please:
-Receive Images (RIMG)
-Intruder Alarm (INTA)
-Alert Owner#2(AOWR)
-False Alarm(FALM)
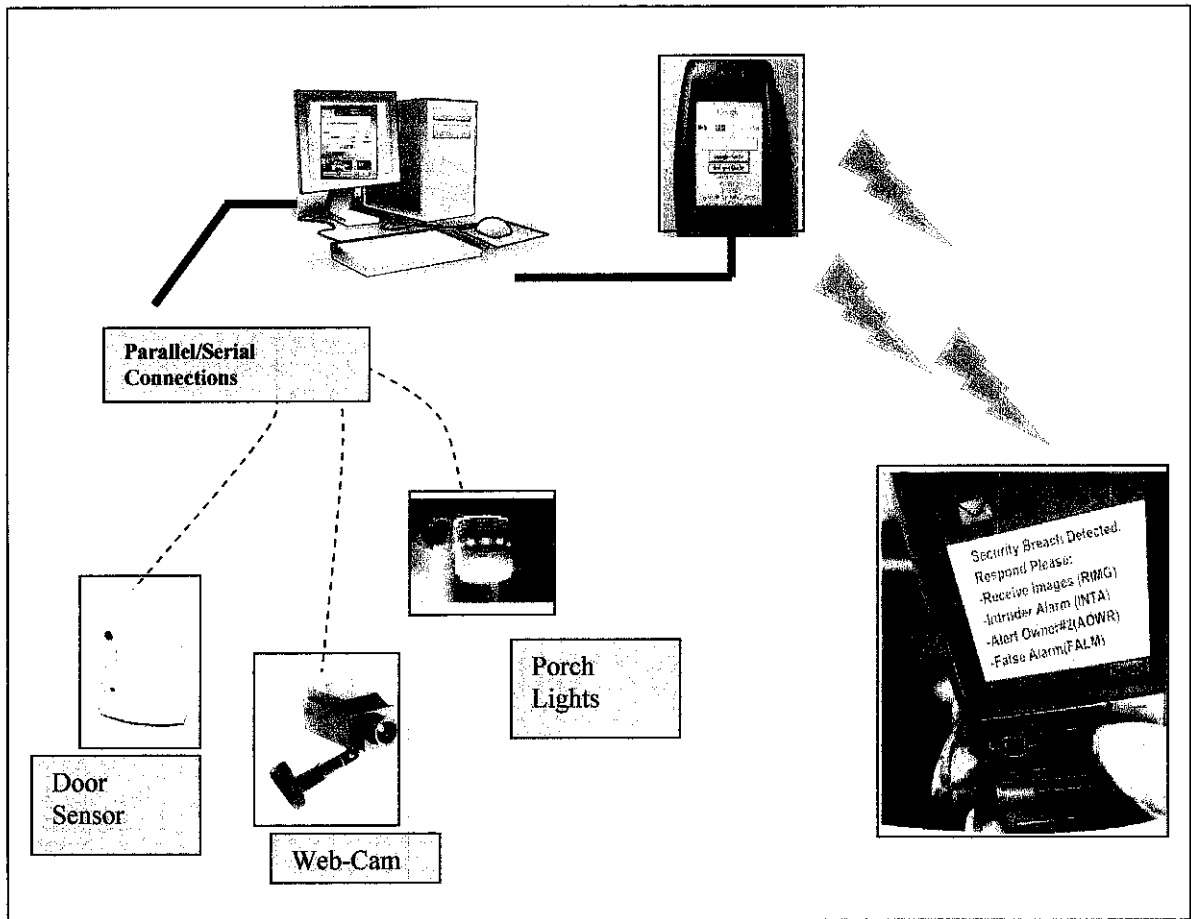
**LEGENDS**

Wireless transmission

Wired transmission

High powered transmission cable

**Figure 3.3: IHSS System design concept**

## 3.1.3 System Design Flow Chart

The diagram below shows how the IHSS operates whenever an intrusion or incident occurs.

```
                    ┌──────────────┐
                    │  INCIDENT    │
                    └──────┬───────┘
                           │
                           ▼
                    ┌──────────────┐
                    │   Sensors    │──────────┐
                    └──────────────┘          │
                    ┌──────────────┐          │
                    │   Web-Cam    │────────  │
                    └──────┬───────┘          │
                           │◄────────────────┘
                           ▼
                    ┌──────────────┐
                    │     SMS      │
                    └──────┬───────┘
                           │
                           ▼
                    ┌──────────────┐
              ┌─────│   Owner #1   │────────┐
              │     └──────────────┘        │
              ▼                             ▼
      ┌──────────────┐          ┌──────────────────┐
      │ Fails to react│         │ Successfully     │──────┐
      └──────────────┘          │ reacts           │      │
                                └──────────────────┘      │
   ┌──────────────┐                                       │
┌──│  Owner #2    │──────┐                                ▼
│  └──────────────┘      │              ┌────────────────────────────┐
▼                        ▼              │ MENU                       │
┌──────────────┐  ┌──────────────┐      │ -Receive Images (RIMG)     │
│Fails to react│  │ Successfully │──────│ -Intruder Alert (INTA)     │
└──────┬───────┘  │ reacts       │      │ -Alert Owner#2             │
       │          └──────────────┘      │ -False Alarm (FALM)        │
       ▼                                │ -TV-PL-LR                  │
┌──────────────────────┐               └────────────────────────────┘
│ Local Law Enforcement│
│ Department           │
└──────────────────────┘
```
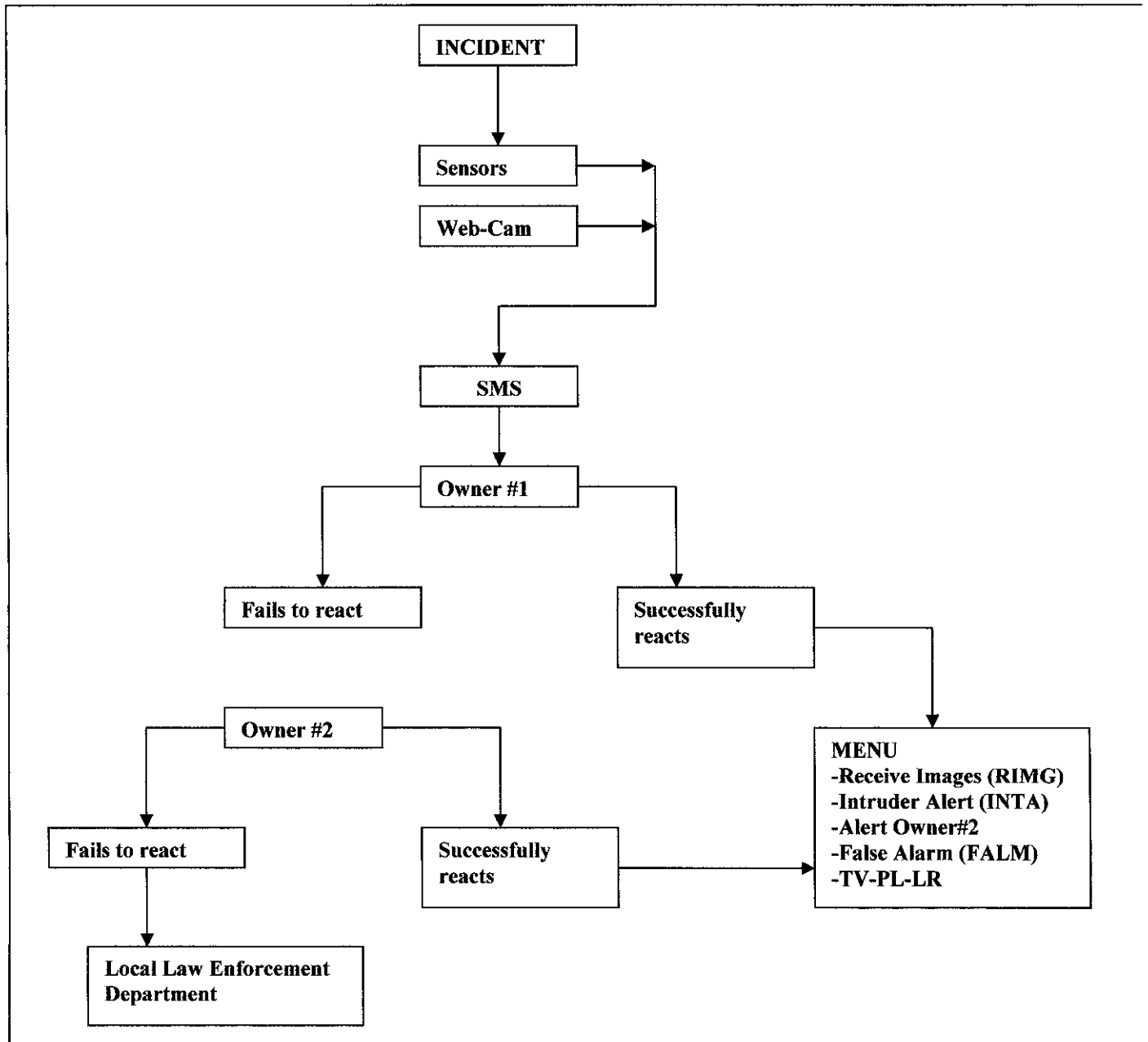
**Figure 3.4: System operation method**

### 3.1.4 System Concept

The project demonstration is based on simulation. Incident could occur in two ways, one is when the sensor such as door sensor is triggered by the thief or the second trigger will be when the web-cam detects massive amount of motion or movements. When one of these happens, the sensor will send a signal to the IHSS server and the server will respond to it by sending SMS to the first home owner, the mobile number that is pre-programmed in the software. Within 5 minutes, the owner should reply back to the system. There are number of commands that the owner could command the IHSS to execute. Upon selection of the command, the owner should reply the message to IHSS to execute the command. If there is still no respond from the owner in the 5 minutes time gap, IHSS will switch its attention to second owner of the home and send the same alert to the second owner. The system waits for another 5 minutes and if there is no response from the second owner as well, the system will straight away dial to local law enforcement department.

### 3.1.5 Developing, Test & Compiling Program

The project is divided into two important elements:
- Software
- Hardware (optional)

Much time was spent reading up on Internet journals as well as IT websites regarding the programming languages that should be utilized to complete the project. The language that is used in this project is Visual Basic. Books and online references were the preferred choice of information.

For this project, the following software was utilized;
- Microsoft Visual Basic 6.0
- Now SMS
- Open source codes

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As with any other software development, the development cycle of the compiler will look something like this:
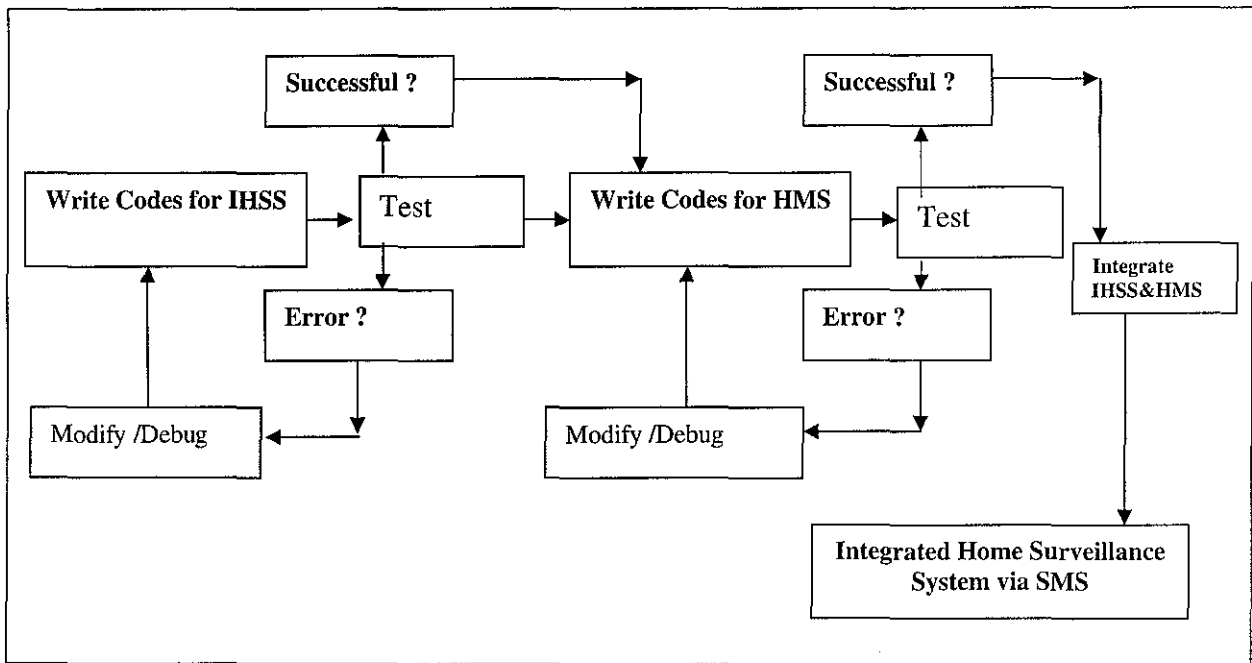


**Figure 3.5: Software development process**

The software was developed in stages where possible and each stage was tested after it has been done. There were two main stages, one was the development of IHSS system another was the development of HMS system. Each stage was tested as well debugged to enable the smooth running of the program and each program can work independently. The integration with the rest of the completed stages were done and modifications were made where necessary. When IHSS & HMS were ready, both were integrated together to make it as Integrated Home Surveillance System

# CHAPTER 4

# RESULTS AND DISCUSSION

In this chapter, the overall view of the project as well the obtained results will be discussed.

## 4.1 Results

The project was initiated by dividing it into two sections; software and hardware. It was decided that the software part of the project was worked first. A fully functional system matching the need of the middle class home owners was successfully created. The objective of the project has been realized. It was realized that utilizing so much time on this particular circuit is pointless as there is an alternative way to produce the same result that the circuit produces. Instead, further enhancement was done on the IHSS System by incorporating the image processing system by the webcam. Small software was built to enable the webcam to be sensitive to moving objects. The webcam was made to trigger the IHSS system whenever it motion percentage goes beyond the preprogrammed tolerance. The following sub chapters will provide further explanations on both of the system.

### 4.1.1 The Integrated Home Surveillance System (IHSS) via SMS

The Integrated Home Surveillance System (IHSS) is a system that enables home owners to manage their home security by just Short Messaging System (SMS). The home owners must have a PC connected to the system via GSM modem or via normal mobile phone that has inbuilt GSM modem as well GPRS/WAP services enabled. All types of sensors can be connected to the IHSS server but to make the system as an **affordable one** for the middle class residents, a good quality web-cam as well as some simple sensors such as door sensors or window sensors can be connected to the IHSS server. But of course, there must be hardware connected to the PC that does the hardware (sensors, web-cam) interfacing between the IHSS software as well the sensors itself. The hardware can be either the parallel or serial port connections. All the sensors and web-cam must be connected to this parallel/serial port to be interfaced with software.

## 4.1.1.1 IHSS Operation

When the sensors or the web-cam based motion detector detects any form intrusions, it will send a triggering signal to the IHSS server. Once the signal is received by the server, SMS will be sent to the owner of the house. The database of the sever will be pre-programmed with the mobile numbers of the home owner(s) as well as the other important residents of the house. When the first owner receives the SMS alert from the IHSS server, he/she must react to the SMS by replying their desired actions. The standard SMS will contain commands such as:

> **-Receive Images (RIMG)**
> **-Intruder Alert (INTA)**
> **-Alert Home Owner #2 (AOWR)**
> **-False Alarm (FALM)**
> -TV-PL-LR

The first home owner must react to the threat within 5 minutes upon receiving the SMS. If he/she failed to do so, the IHSS server will send SMS to the next second home owner. If the second home owner fails to react as well within 5 minutes, the IHSS server will

send SMS to the police. The home owner, who tend to reacts to the threat, will reply to the IHSS server by typing **Q RIMG/INTA/AOWR/FALM** and send it to the IHSS server number. The home owner will receive confirmation after each action has been executed.

The Commands:

Receive Images (RIMG)

This command will take a snap shot of the incident area (depending on the location of the web-cam) and send it to the home owner via MMS. The IHSS server will be utilizing the service providers GPRS/WAP service and this feature is very much dependant on the telecommunication service providers, Telco providers' GPRS/WAP server.

Intruder Alert (INTA)

This command will activate the home's Intruder Alert audio that could be heard for a quit a distance. The home owner will also have the option to disable the alert by the command of FALM.

Alert Home Owner #2 (AOWR)

This command will inform the second home owner regarding the threat and will be a warning to the home owner not to return to home or inform the rest of the other home residents about the threat. This will enable the entire home residents to know about the threat and take preventive measures in returning home or take action if they are in the home premises.

False Alarm (FALM)

This command will reset the IHSS alarm system to default mode. This command is done to reset the IHSS as well as disable the intruder alert audio.

## 4.1.2 IHSS Enhancement: The Home Management System (HMS) via SMS

The Home Management System also known as HMS is an added feature in the IHSS system that enables home owners to manage their home electrical devices by SMS. The architecture of this feature is very much similar to the architecture of the IHSS System. The only difference between the two system is that their purposes. As obvious as it is, the IHSS system is a home surveillance system that is controlled by the home owner via SMS. The HMS system is a home management system that enables home owners to manage their home electrical devices such as televisions, porch lights and living rooms lights via SMS.

### 4.1.2.1 HMS Operation

This feature can be a security element or home management feature. This is because; scenarios such as home owner forgetting to switch on the porch lights when he/she is away with the family can be solved by using this feature. Also, scenarios where the home owner would like fake their presence in the house can also be done using this feature. It all depends on how the one looks at it. The home owner just needs to send SMS by typing **Q TV (television)/PL (porch lights)/ LR (living room lights)** and send it to the IHSS server number. This HMS is just a concept and the architecture on how this could be implemented is still under research. The concept is the most important part to be presented in the early stages as creativity finds its own way in realizing the concept. But none the less, this concept can be implemented by having wireless signal receiver attached to the televisions or the porch lights which will provide sufficient voltage to switch on the televisions or the lights. But before any of this is done, the main power points of the devices must be switched to make sure that the current is always present.

The security system design is one of a kind. Research done implies that there are no such systems that allow the home owners to have two way interactions with their security system. It was also found that no SMS based home management system in the current market. Shown in next few pages are snap shots of IHSS System control panel as well IHSS System in action.
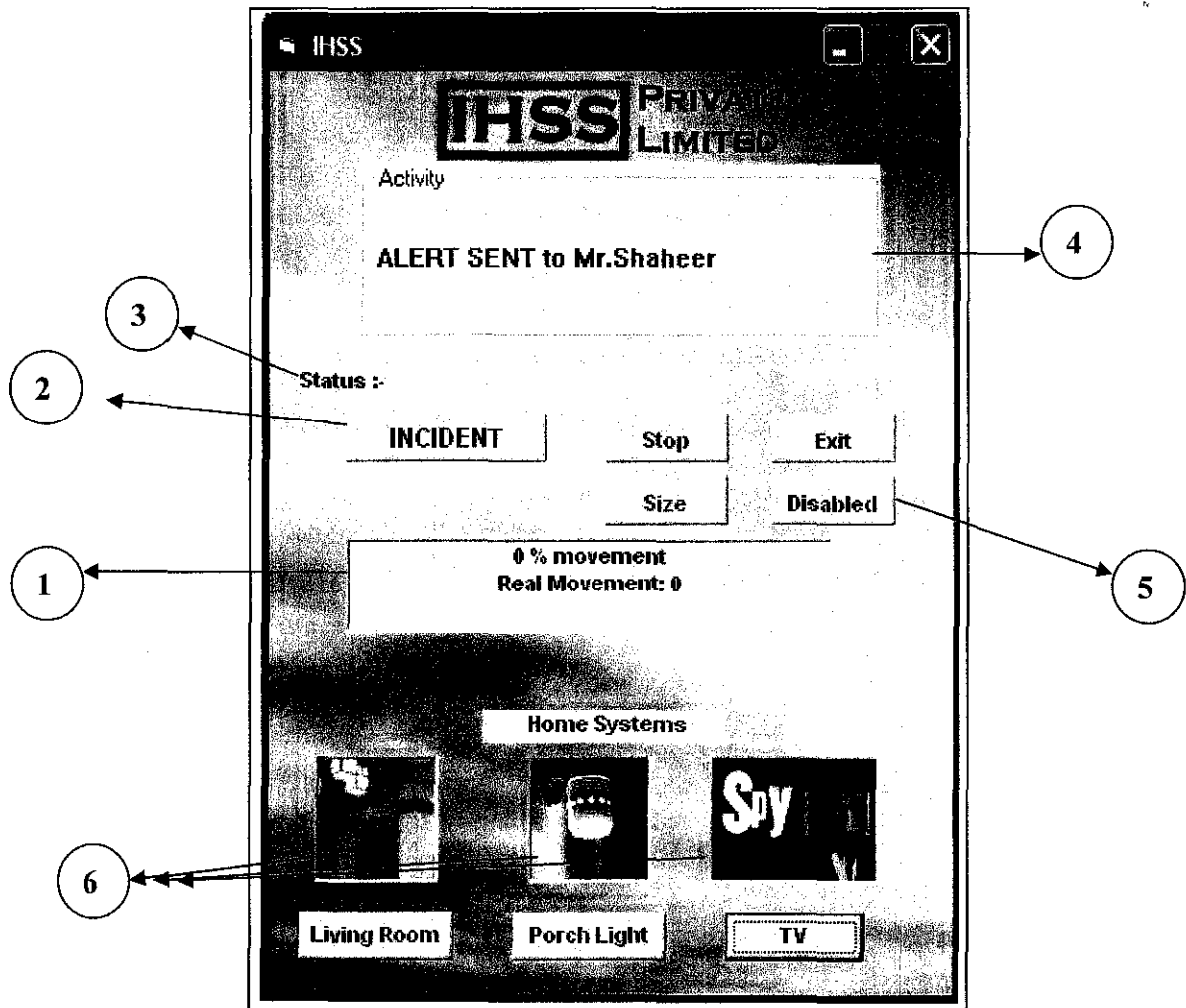


Figure 4.1: IHSS System control panel

## 4.2 IHSS Control Panel

The control panel of the IHSS system is a unique and important part of the system. The control panel of the IHSS server controls the whole operation of the IHSS. Below are the functions of each buttons in the control panel.

**Table 1: IHSS Control Panel button functions**

| Button No. | Function |
| --- | --- |
| 1 | Percentage of Motion (Web-cam) |
| 2 | To trigger the IHSS system |
| 3 | Status of the MMS sent |
| 4 | Activity Display panel |
| 5 | To disable the system |
| 6 | Home electrical devices manual activation/deactivation |

## 4.3 IHSS in Action

The next few images that are shown in the following pages provide an in-depth look on how the IHSS operates.
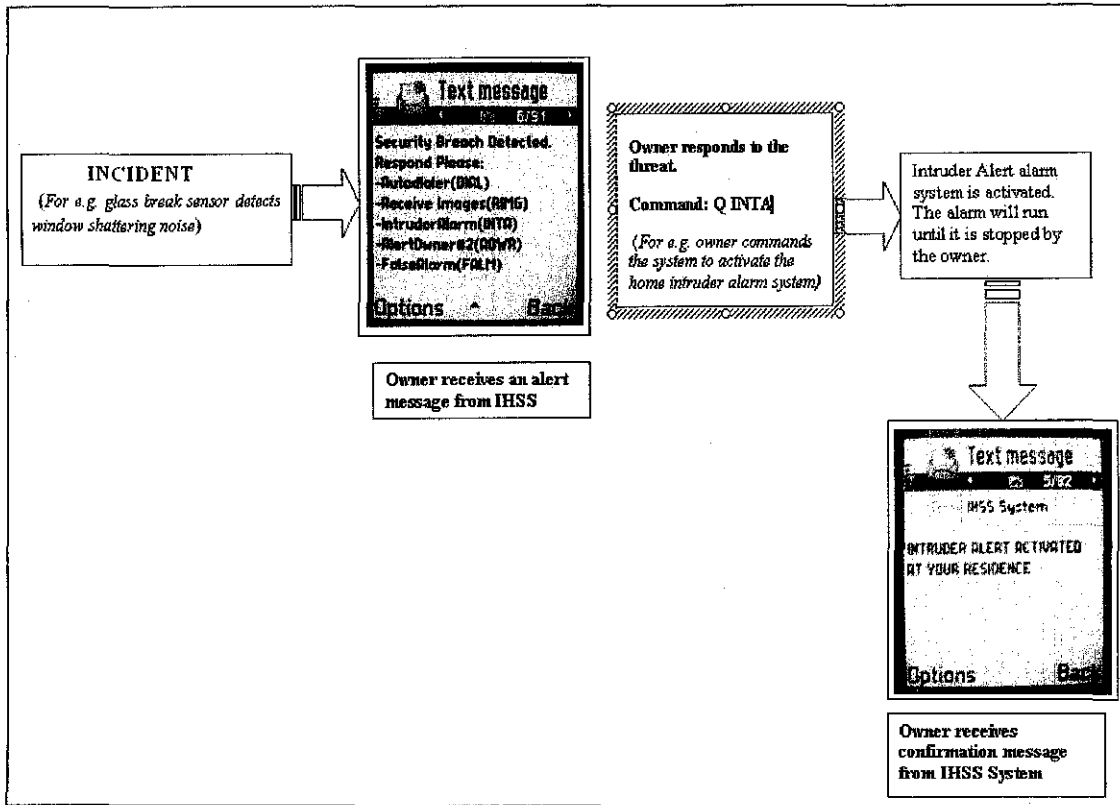


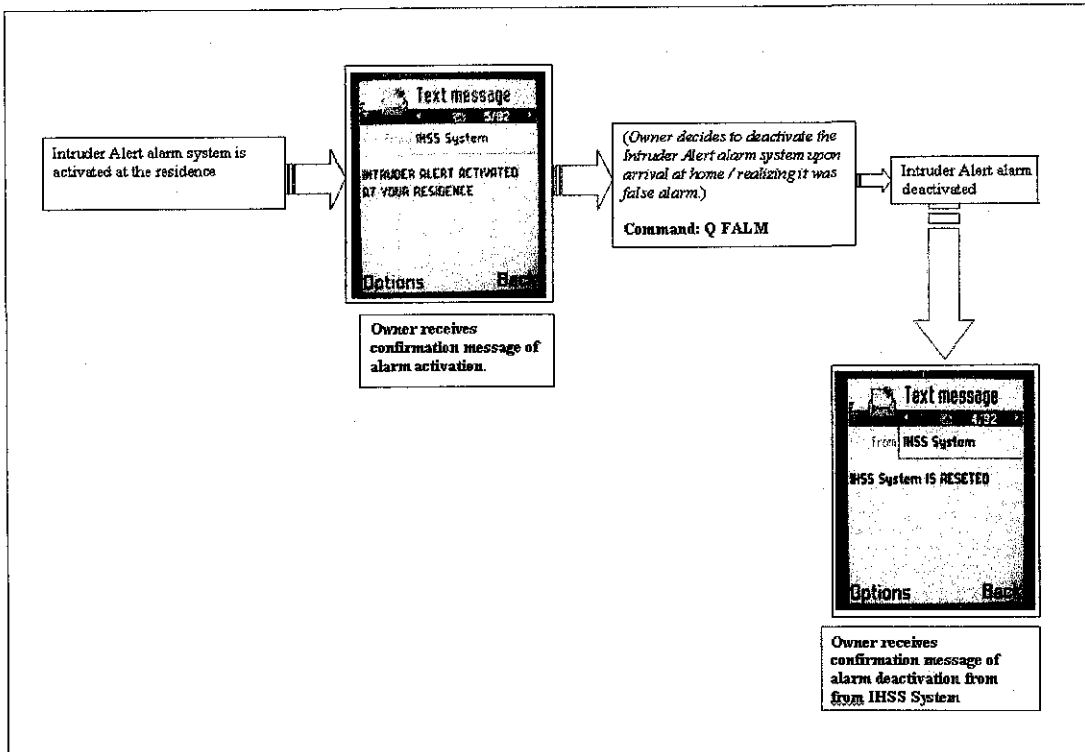**Figure 4.2: IHSS System in action: Activating Intruder Alert alarm**

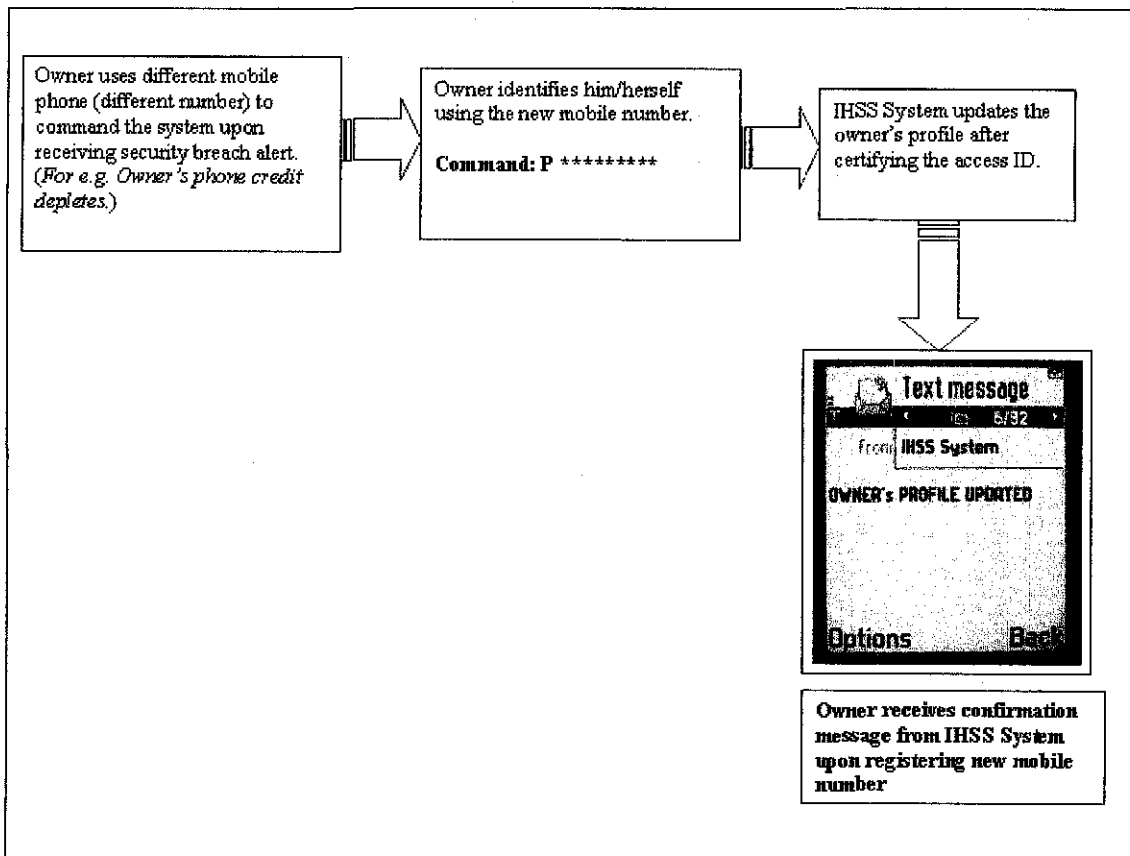**Figure 4.3: IHSS System in action: Deactivating Intruder Alert alarm**

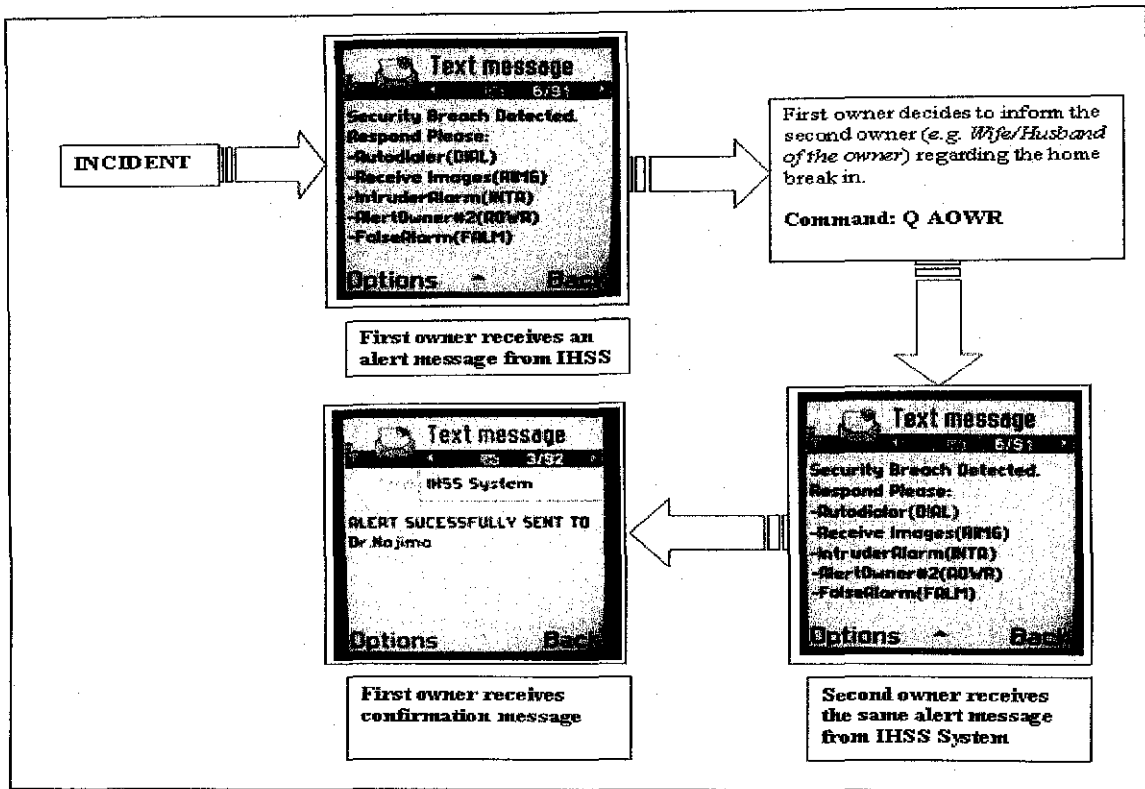

**Figure 4.4: IHSS System in action: Updating owner's profile**

**Figure 4.5: IHSS System in action: Alerting second owner**

# CHAPTER 5

# CONCLUSION & RECOMMENDATIONS

## 5.1 Conclusion

In a nutshell, the Integrated Home Surveillance System (IHSS) designed for this project has been realized. All the concepts that have been thought thoroughly and carefully integrated together made the IHSS system to be a one of a kind project. The project has undergone two major stages of enhancement, the first being the delivery of the IHSS system it self and the second being the IHSS system enhancement, the HMS system. There is always room for improvements as well as more enhancement of the system by doing more extensive research and development. A security system that is simple yet technologically advanced which requires minimal technical knowledge and ease of implementation due to its DIY element has been successfully designed and created. The Integrated Home Surveillance System via SMS technology has high chances of being commercialized as a product if sufficient research as well investment is poured into the project. Finally, the Integrated Home Surveillance System via SMS technology is a must to be implemented system for every middle class resident's household due to its uniqueness of the system besides the point that it's cheap pre & post implementation cost and its DIY element.

## 5.2 Recommendations

As the project slowly but steadily progressed from final year project part one and to part two now to nearing the end of the both part of the project, quite a number of areas for improvement have been identified  if the project is to be fully implemented and commercialized  in near future. Followings are few recommendations to make the product a better one.

### 5.2.1 3G Transmission Medium

The main transmission medium that is being utilized in the project is the typical GPRS/WAP connections from the Telcos, to be exact Maxis. The Maxis SMS/MMS server was utilized to transmit and receive data. There are times where the transmission as well receiving of the data is late due to the congestion of the Maxis server. It is hoped that in time to come, 3G transmission medium can be utilized to implement the system as the connection is way much better than the normal GPRS/WAP server. Although 3G is widely available, but it is only provided in particular areas only. Big cities such as Kuala Lumpur and etc will have 3G connections but places like Tronoh, Perak is very unlikely to have them in time to come. The 3G technology needs much more broadcasting from the telecommunication companies and it must be taken seriously by them as it could be the main transmission medium in near future.

## 5.2.2 Private Transmit/Receive Portal

To enable the smooth transmission as well receiving of data, the potential company that will be company commercializing the product must secure a minimum of one private line with the telecommunication company. The telecommunication companies such as Let it be Maxis, Digi or Celcom can always sign MoU (Memorandum of Understanding) with the commercializing company and rent their services for a price to enable the IHSS System to operate smoothly without much transmission hiccups. The key to 100% operability of the IHSS System lies very much to the error-free transmission and receiving of data to and from the service provider's server.

## 5.2.3 Wireless enabled Home Electrical devices

The Home Management System (HMS) concept operates under the assumption that the electrical devices such as televisions, porch lights and etc are wirelessly enabled devices. This means that the devices will have its own IP address that enables it to operate via wireless. To enable the HMS system to operate via SMS, the devices must be able to receive signals from the IHSS server wirelessly and provide sufficient current input to the device and turn it on upon receiving the command from the home owner. Wireless technology protocol must be dwelled thoroughly and the data transmission and receiving protocol must be looked into as well.

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[4]    The   Modern   Group,   Image:   Modern   Alarm   Systems   from
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# APPENDICES

**APPENDIX A: SURVEY QUESTIONAIRE FORM**

**APPENDIX B: PROGRAM SOURCE CODES**

# APPENDIX A

## SURVEY QUESTIONAIRE FORM

Project Survey ------------------------------------------------------------------------------------

As home break-ins being one of the most frequent crimes taking place in Malaysia, securing one's home is one of homeowners' top priorities. Upper class residents have always secured their homes with private security guards as well sophisticated surveillance systems. The medium class residents (income of RM3.5k to RM4k) seem to have taken this threat lightly. One of the simplest methods of securing home is to invest in a home alarm system. System being simple has not encouraged the medium class residents to utilize them efficiently.
This survey is conducted to investigate the reasons the medium class residents are still not encourage to utilize home alarm system that is simple yet efficient enough to secure their homes.

State: _____                                                    Yes        No

1. Home is secured with any form of security method?                  ☐          ☐

2. Home located in a guarded neighborhood                             ☐          ☐

3. Home located in a non-crime prone area?                            ☐          ☐

4. Are the home alarm systems expensive to install and maintain?      ☐          ☐

5. Alarm system requires technical knowledge to fully utilize them?   ☐          ☐

6. Your neighbors will look after your home while you are away?        ☐          ☐

7. Your home is located in well-lighted neighborhood?                 ☐          ☐

8. You are confident that your home is so secured by itself that       ☐          ☐
   break-in attempts will be unsuccessful?

9. You are not bothered as nothing valuable is kept there?            ☐          ☐

10. It is waste of money?                                             ☐          ☐

11. Others (*Please state your reasons*)...........................................................................

## APPENDIX B
### PROGRAM SOURCE CODES

```
Option Explicit

Private Declare Sub ReleaseCapture Lib "user32" ()
Const WM_NCLBUTTONDOWN = &HA1
Const HTCAPTION = 2

Private m_TimeToCapture_milliseconds As Integer

Private m_Width As Long
Private m_Height As Long

Private mCapHwnd As Long

Private bStopped As Boolean
Dim ConnectionString As String
Dim conn As New ADODB.Connection

Dim db_file As String
Dim SQLstmt As String
Dim HttpReq As WinHttpRequest

Dim cn As ADODB.Connection
Dim rs As ADODB.Recordset

Dim time_counter As Integer
'Determines the Owner#
Dim current_owner As Integer

Dim GSM_Modem As String
Dim arrMessage
Dim owner_name(2) As String
Dim mobile_number(2) As String
Dim password(2) As String
Dim MessageSender As String

'the new line in SMS shud be considered
Dim MessageText As String
Dim MessageText2 As String

Private Declare Function sndPlaySound Lib "WINMM.DLL" Alias "sndPlaySoundA"
(ByVal lpszSoundName As String, ByVal uFlags As Long) As Long
```

```
Private Const SND_SYNC = &H0
Private Const SND_ASYNC = &H1
Private Const SND_NODEFAULT = &H2
Private Const SND_LOOP = &H8
Private Const SND_NOSTOP = &H10

Dim MessageRecieved As Boolean
Public MessageRecievedMovement As Boolean

'Loops a sound
Private Sub PlaySound(lsFilename As String)
    Dim wFlags As Long
    Dim X As Long

    wFlags = SND_ASYNC Or SND_NODEFAULT Or SND_LOOP
    X = sndPlaySound(App.Path & "\Sounds\" & lsFilename, wFlags)
End Sub

'Stops a sound from playing
Private Sub StopSound(lsFilename As String)
    Dim X As Long
    Dim wFlags As Long

    wFlags = SND_ASYNC Or SND_NODEFAULT
    X = sndPlaySound(App.Path & "\Sounds\" & lsFilename, wFlags)
End Sub

Private Sub BtnStopSound_Click()
    StopSound "policecall.wav"

End Sub

Private Sub cmdOptions_Click()
On Error Resume Next
    If mCapHwnd = 0 Then Exit Sub
    Call SendMessage(mCapHwnd, WM_CAP_DLG_VIDEOSOURCE, 0, 0)
    DoEvents
End Sub

Private Sub BtnStartAlm_Click()
PlaySound "intruderalert.wav"
End Sub

Private Sub ResetSystem() 'to stop the alarm & to reset the system
Timer1.Enabled = False
End Sub
```

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```
Private Sub SendSMS(mobilenumber As String, owner_name As String, strMessageText
As String)

    Timer2.Enabled = False
    LblActivity.Caption = "Sending Alert to " & owner_name

    Dim url As String

    mobilenumber = Replace(mobilenumber, "+", "%2B")

    url = "http://127.0.0.1:8800/?PhoneNumber=" & mobilenumber & "&text=" &
strMessageText

'   Create the WinHTTPRequest ActiveX Object.
    Set HttpReq = New WinHttpRequest
'
'   ' Open an HTTP connection.
    HttpReq.Open "GET", url, False

'   ' Send the HTTP Request.
    HttpReq.Send

    Timer2.Enabled = True
End Sub
Private Sub OwnerChange(new_mobile As String, pwd As String)

Dim query As String


    db_file = App.Path & "\IHSS.mdb"
    Set cn = New ADODB.Connection
    'cn.CursorLocation = adUseClient
    cn.ConnectionString = _
        "Provider=Microsoft.Jet.OLEDB.4.0;" & _
        "Data Source=" & db_file & ";" & _
        "Persist Security Info=False"

    cn.Open
        query = "UPDATE IHSSDirectory set mobile_number = '" & new_mobile & "'
where password = '" & pwd & "'"
        cn.Execute query
        Dim rsOwner As New ADODB.Recordset
    rsOwner.Open "SELECT * FROM IHSSDirectory", cn, adOpenStatic, adCmdText

    'f rs.RecordCount <> 0 Then
        rsOwner.MoveFirst
```

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```
        owner_name(0) = rsOwner!owner_name
        mobile_number(0) = rsOwner!mobile_number
        password(0) = rsOwner!password

    rsOwner.MoveNext
    owner_name(1) = rsOwner!owner_name
        mobile_number(1) = rsOwner!mobile_number
        password(1) = rsOwner!password
        rsOwner.Close
    cn.Close


End Sub
Private Function ReceiveSMS()

    Dim FirstWord As String
    Dim SecondWord As String


    'make database connection
    Dim db_file As String
    Dim query As String
    db_file = App.Path & "\db2.mdb"
    Dim conn2 As New ADODB.Connection

'   ' cn.CursorLocation = adUseClient
    conn2.ConnectionString = _
        "Provider=Microsoft.Jet.OLEDB.4.0;" & _
        "Data Source=" & db_file & ";" & _
        "Persist Security Info=False"
    conn2.Open

    'Dim sender As String
    'Dim message As String

' 'Query = "INSERT INTO SMS VALUES ('" & sender & "', '" & message & "','0','" &
Now & "')"
    query = "SELECT * FROM SMS"
'
    Dim rs As New ADODB.Recordset
'
    rs.LockType = adLockOptimistic
    rs.Open query, conn2

    Dim count As Integer
    count = 0
```

```
                    Else
                        'Wrong Input
                        SendSMS rs!sender, "Owner", "INVALID COMMAND!PLEASE
TRY AGAIN." 'clarify
                        LblActivity.Caption = "Invalid Key"


                    End If 'image




                End If 'if "q"



                Else ' not the owner

            ' Check for the 2nd word if its correct /?
            If FirstWord = "P" And (SecondWord = UCase(password(0)) Or
SecondWord = UCase(password(1))) Then
                    ' Owner's phone no changed and Certify that owner no has been registered
                    OwnerChange rs!sender, SecondWord
                    SendSMS rs!sender, "New Owner", "OWNER's PROFILE UPDATED"
                    LblActivity.Caption = "OWNER's PROFILE UPDATED"
                    Else
                    ' Incorrect Password input
                    SendSMS rs!sender, "UNKNOWN OWNER", "INVALID
PASSWORD!PLEASE TRY AGAIN."
                        'MsgBox rs!sender & "-" & FirstWord & "-" & SecondWord & "-" &
password(0) & "-" & password(1)
                        Open App.Path & "\debug.log" For Append As #2
                        Write #2, Now() & " - sender: " & rs!sender & " - firstword: " & FirstWord
& " - secondword: " & SecondWord & " - pwd0:  " & password(0) & " - pwd1: " &
password(1) & " - UBound: " & UBound(arrMessage) & " - mobilenumber(0): " &
mobile_number(0) & " - mobilenumber(0): " & mobile_number(1)
                        Close #2
                        LblActivity.Caption = "ACCESS DENIED" ' shown in the system message
                    End If


            End If  ' not the owner

        Else    ' the msg is not 2 words
```

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```vb
'Error: Must be 2 words
        SendSMS rs!sender, "Owner", "INVALID COMMAND!PLEASE TRY AGAIN."
        LblActivity.Caption = "INVALID COMMAND!" ' shown in the system message
    End If   ' the msg is not 2 words


        rs!Read = 1
        rs.Update   'message read, so update the read status
    End If
        rs.MoveNext
        count = count + 1
    Wend
 rs.Close
 conn2.Close
 If count = 0 Then
   LblActivity.Caption = "NO NEW MESSAGES.."
 End If
 End Function



 Private Sub BtnExit_Click()
    Unload Me
    End
 End Sub


 Public Sub BtnIncident_Click()
  MessageRecievedMovement = True
  Dim MessageText As String
     Timer2.Enabled = False
     Timer1.Enabled = True
 End Sub


 Private Sub BtnStopAlm_Click()
 StopSound "intruderalert.wav"
 End Sub


 Private Sub cmdSavePicture_Click()
 On Error Resume Next
    DoEvents

    Picture1.Picture = imgWebCam.Picture
    SavePicture Me.Picture1, "C:\TestSnapshot" & ".jpg"
    Shell ("D:\Program Files\ImageMagick-6.3.3-Q16\convert " + "C:\TestSnapshot.jpg" +
 " -resize 400x100 " + "C:\TestSnapshot.jpg")
    Sleep 4000
    DoEvents
```

```
                'Print the Status of the connection
                lblStatus = HttpReq.Status & " - " & HttpReq.StatusText
        End Sub


        Private Sub cmdSize_Click()
        'On Error Resume Next
                'If mCapHwnd = 0 Then Exit Sub
                'Call SendMessage(mCapHwnd, WM_CAP_DLG_VIDEOFORMAT, 0, 0)
                'DoEvents
        MessageRecievedMovement = True
        End Sub


        Private Sub cmdStart_Click()
        Start
                cmdOptions.Enabled = True
                cmdSize.Enabled = True
                cmdStop.Enabled = True
                cmdStart.Enabled = False
        End Sub


        Private Sub cmdStop_Click()
         StopWork
                cmdOptions.Enabled = False
                cmdSize.Enabled = False
                cmdStop.Enabled = False
                cmdStart.Enabled = True
        End Sub


        Private Sub Command1_Click()
         Timer1.Enabled = False
        End Sub


        Private Sub Command2_Click()
         Timer1.Enabled = False
        End Sub


        Private Sub Command3_Click()
            If shpLivingRoom.Visible = True Then
                shpLivingRoom.Visible = False
                picLivingRoom.Visible = True
                PlaySound "porchlight.wav"
                StopSound "porchlight.wav"
            Else
                shpLivingRoom.Visible = True
                picLivingRoom.Visible = False
```

```
    End If
End Sub

Private Sub Command4_Click()
    If shpPorchLight.Visible = True Then
        shpPorchLight.Visible = False
        picPorchLight.Visible = True
        PlaySound "porchlight.wav"
        StopSound "porchlight.wav"
    Else
        shpPorchLight.Visible = True
        picPorchLight.Visible = False
    End If
End Sub

Private Sub Command5_Click()
    If shpTV.Visible = True Then
        shpTV.Visible = False
        picTV.Visible = True
        PlaySound "Friends.wav"
        StopSound "Friends.wav"
    Else
        shpTV.Visible = True
        picTV.Visible = False
        PlaySound "porchlight.wav"
        StopSound "porchlight.wav"
    End If
End Sub

Private Sub Form_Load()
 On Error Resume Next

    m_TimeToCapture_milliseconds = 100
    m_Width = 352
    m_Height = 288
    bStopped = True
    mCapHwnd = 0

    ConnectionString = _
        "PROVIDER=MSDataShape;Data PROVIDER=" & _
        "Microsoft.Jet.OLEDB.4.0;Data Source=" _
        & App.Path & "\db1.mdb;"
    conn.ConnectionString = ConnectionString
    conn.CursorLocation = adUseClient
    conn.Open
```

```
    MessageText = "Security Breach Detected.Please Respond:\n-Receive
Images(RIMG)\n-IntruderAlarm(INTA)\n-AlertOwner#2(AOWR)\n-
FalseAlarm(FALM)\n-TV-PL-LR"
ReDim arrMessage(30)

MessageText2 = "ALERT SUCESSFULLY SENT TO "

 time_counter = 0
 current_owner = 1
 'TODO!!!
 ReadConf
 'GSM_Modem = "Nokia 6230i USB "
 'connect to the database and get the owners info


 db_file = App.Path & "\IHSS.mdb"
  Set cn = New ADODB.Connection
  ' cn.CursorLocation = adUseClient
  cn.ConnectionString = _
     "Provider=Microsoft.Jet.OLEDB.4.0;" & _
     "Data Source=" & db_file & ";" & _
     "Persist Security Info=False"
  cn.Open
  SQLstmt = "SELECT * FROM IHSSDirectory"

 Set rs = New ADODB.Recordset
 rs.Open SQLstmt, cn, adOpenStatic, adCmdText

 'f rs.RecordCount <> 0 Then
  rs.MoveFirst
    owner_name(0) = rs!owner_name
    mobile_number(0) = rs!mobile_number
    password(0) = rs!password

  rs.MoveNext
    owner_name(1) = rs!owner_name
    mobile_number(1) = rs!mobile_number
    password(1) = rs!password
 'rs.Close
 'cn.Close
    MessageRecieved = False
    Timer2.Enabled = True

 MessageSender = ""

 picLivingRoom.Visible = False
```

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```vb
      End If

  time_counter = time_counter + 1
End Sub

Private Sub Timer2_Timer() 'MSG IS CHECKED FOR EVERY 1 MINUTE
LblActivity.Caption = "CHECKING NEW MESSAGES.."
'Receive
ReceiveSMS
End Sub

Private Sub Timer3_Timer()
'On Error Resume Next
'
'   ' pause the timer
'   Timer3.Enabled = False
'
'   ' get the next frame;
'   Call SendMessage(mCapHwnd, WM_CAP_GET_FRAME, 0, 0)
'
'   ' copy the frame to the clipboard
'   Call SendMessage(mCapHwnd, WM_CAP_COPY, 0, 0)
'
'   ' For some reason, the API is not resizing the video
'   ' feed to the width and height provided when the video
'   ' feed was started, so we must resize the image here
'   ' Image1.Stretch = True
'
'   ' get from the clipboard
'   imgWebCam.Picture = Clipboard.GetData
'   Clipboard.Clear
'
'   ' restart the timer
'   DoEvents
'   If Not bStopped Then
'       Timer3.Enabled = True
'   End If
End Sub

Public Sub Start()
On Error Resume Next
  If mCapHwnd <> 0 Then Exit Sub

  'FrameNum = 0
```

```vb
Timer3.Interval = m_TimeToCapture_milliseconds

    ' for safety, call stop, just in case we are already running
    Me.Timer3.Enabled = False

    ' setup a capture window
    mCapHwnd = capCreateCaptureWindowA("WebCap", 0, 0, 0, m_Width, m_Height,
Me.hwnd, 0)
    DoEvents

    ' connect to the capture device
    Call SendMessage(mCapHwnd, WM_CAP_CONNECT, 0, 0)
    DoEvents

    Call SendMessage(mCapHwnd, WM_CAP_SET_PREVIEW, 0, 0)

    ' set the timer information
    bStopped = False
    'Me.Timer3.Enabled = True
    End Sub


    Public Sub StopWork()
On Error Resume Next
    ' stop the timer
    bStopped = True
    Timer3.Enabled = False

    ' disconnect from the video source
    DoEvents

    Call SendMessage(mCapHwnd, WM_CAP_DISCONNECT, 0, 0)
    mCapHwnd = 0

End Sub

Public Sub GetPicture()
    Dim rs As New ADODB.Recordset
    Dim mystream As New ADODB.Stream
    Dim picLocation As String
    mystream.Type = adTypeBinary

    'picLocation = "c:\\tDB.jpg"
    picLocation = "D:\\Program Files\\NowSMS\\html\\tDB.jpg"
```

```
    rs.Open "SELECT * FROM tImage ORDER BY timestamp DESC", conn

    mystream.Open
    mystream.Write rs!Image
    mystream.SaveToFile picLocation, adSaveCreateOverWrite
    mystream.Close
    imgWebCam.Picture = LoadPicture(picLocation)
    rs.Close
End Sub

Private Sub ReadConf()
    Dim tmpStr As String
    Dim tmpInt As Integer
    Open App.Path & "\conf.ini" For Input As #1
    Do While Not EOF(1)
        Input #1, tmpStr
        tmpInt = InStr(1, tmpStr, "=")
        If tmpInt And Left(tmpStr, 1) <> ";" Then
            If Left(tmpStr, tmpInt - 1) = "modemname" Then   'modem name
                'MsgBox "Modem Name: " & Right(tmpStr, Len(tmpStr) - tmpInt)
                GSM_Modem = Right(tmpStr, Len(tmpStr) - tmpInt)
            'ElseIf Left(tmpStr, tmpInt - 1) = "mydatabasefile" Then   'modem name
                'MsgBox "My Database file: " & Right(tmpStr, Len(tmpStr) - tmpInt)
            End If
        End If
    Loop
    Close #1
End Sub
```