DEVELOPING A MODULAR SECURITY SYSTEM THROUGH A MICROCONTROLLER-BASED FIRMWARE APPROACH

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ABSTRACT

Security Systems are one of the most important features of a modern home. However, due to very expensive systems developed and marketed by OEM's (Original Equipment Manufacturer), security and protection in any form becomes a privilege only to those who can afford it. Modern Security systems are basically built with the latest high-end semiconductor devices and faster communication mediums. This study focuses on the development of a new framework and architecture of a microcontroller-SMS based software for security systems. As each major key system process would be treated as independent objects, we would be able to create a simplified processing bridged for any technological and communication constraints available to potential security product consumers. With this, the proponents of this study envisions a hardware-based software solution for security systems engineered using a Modular framework making it dependable, flexible, faster, scalable and economically viable to all people, family, home and establishments in the society.

***Keywords**: Firmware, Microcontroller, SMS, Modular, Analog Signals, EEPROM, Embedded system*

CHAPTER I

INTRODUCTION

1.1 Background of the Study

Security Systems are one of the most important features of modern home. Unauthorized break-in, fire, and cases alike pose a threat to people who live in "Supposedly" secure homes. The integration of both high-end semiconductor devices such as microcontrollers and a faster medium for communication like SMS (Short-Messaging-System) will enable us to enhance and elevate the level of security in our homes and in different establishments in the society as well. Moreover, a thorough analysis, evaluation of the existing security systems and strategic implementation of a new solution through an enhanced framework enables us to address issues concerning economic viability which pertain to the overall cost of acquisition, efficiency, flexibility, scalability, and dependability of security system resources to the potential consumers in the society.

Microcontrollers are one of the most advanced semiconductor technologies existing in the digital world today. Designed as a programmable module to function at specific instructions, Microcontrollers are the frontlines of new technologies that paved the way for the advent of electronic devices and gadgets that suit the daily needs and activities of people. SMS on the other hand, is the most inexpensive, safe and spam-free medium for communications today. Aside from its emergence as a need in daily human activities, transactions, business, relationship etc, SMS is much more likely to be read by a person at

any one time, since the majority if not all of the people today have their mobile phones at reach 24 hours a day.

In today's world, people are getting more and more concerned about how to protect themselves and their houses from emergencies. People always embarked in seeking for technologies that will make their lives easy, ergonomic and well secured from the extremities of life. A further look and analysis into the existing security systems will enable us to grasp the chance of designing an enhanced architectural strategy for security systems that is more effective, economically viable and efficient making it available to all classes and levels of life.

1.2 Statement of the Problem

The Study primarily aims to establish a framework in developing a Modular Security system through a microcontroller-based Firmware Solution.

Specifically it seeks to answer the following questions

1. What are the existing Microcontroller-SMS based security systems?
2. How do the existing architectures work?
3. How can microcontroller-SMS based software in a Firmware approach be implemented to resolve technological limitations of existing systems
4. How can a Modular design approach be achieved in microcontroller-SMS Security System to lessen its cost without compromising the effectiveness and flexibility of the whole system?

1.3 Objective of the Study

The general objective of this research is to develop a Framework for a Microcontroller-SMS based Security Systems.

The specific objectives are:

1. To identify existing technology and architecture of existing microcontroller-SMS based Security Systems.
2. To make a comparison among the Security Systems.
3. To learn how existing architecture and strategy for security systems work.
4. To design a Framework or architecture based on the evaluation made.
5. To develop a Framework for a microcontroller-SMS based Security System in a Modular Design approach using a Firmware Software solution.
6. To develop a framework that would be fit enough to answer and resolve the technological and economical issue and problems present in the existing security systems.

1.4 Scope and Limitation of the Study

The study aims to develop a Modular Model for Security Systems using microcontroller-SMS based Software Solution in a Firmware approach. The study focuses on the evaluation and analysis only of the existing security systems which are based on microcontroller and SMS (Short-Messaging-Service).

The study does not aim to implement all the available features of existing security systems. Rather, it aims to develop and test a microcontroller based Firmware solution for security system in a Modular approach. This study also limits the systems communication adaptability to just two NOKIA mobile phones, as all mobile phones are compatible to a loadable set of Firmware software solution embedded in the microcontroller. This study does not intend to evaluate and analyze communication failures and flaws such as SMS –spoofing and cases alike since these matters constitute communication security of GSM networks. The proposed output of this study should be economically calculated to be less than the package cost of standard security systems developed and market today as mentioned in the theoretical framework. The prototype testing will constitute a test of a loadable set of Firmware for two different variant NOKIA mobile phones. It limits the whole system test to only the automated sending process of SMS to recipient.

It shall be implemented in the Ateneo de Davao University Computer and Engineering laboratories. The working prototype shall be tested and evaluated with the proponent's primary goals and objectives.

1.5 Significance of the Study

People are getting more and more concerned about how to protect themselves from the extremities of the human habitat. Security systems and facilities alike should be catered to all people and not just to those who are privilege enough to afford such systems. The key to this is to lower its cost

without compromising the effectiveness, flexibility and dependability of security. Utilizing the technological power that existing semiconductor and communication mediums can give, we can develop a framework on a microcontroller-SMS based software solution for security systems in a Modular and wireless environment. With this, we can enhance systems convergence, flexibility, dependability, scalability, economic viability and thus, making it cost efficient to all people, family, home and establishments in the society and in every levels of life.

1.6 Glossary of Terms

firmware - is software that is embedded in a hardware device. Often it is provided in flash ROMs and can be updated by an end user. The term was originally coined to indicate a functional replacement for hardware on low cost microprocessors.

Modular Design– is a technique in designing a system which integrates every independent module of the system and treating them as a different object. This causes the system to be robust, flexible and scalable.

Microcontroller – is a computer-on-a-chip optimized to control electronic devices. It has its own CPU core, memory for program, memory for data, and I/O interfaces needed which is integrated in a single circuitry.

SMS – (Short Messaging Services) is the ability to send and receive text message to and from mobile phones. Text has maximum of 160 characters and can be a word, numbers or alphanumeric combinations.

Embedded system - is a special-purpose computer system, which is completely encapsulated by the device it controls. An embedded system has specific requirements and performs pre-defined tasks, unlike a general-purpose personal computer. An embedded system is a programmed hardware device

EEPROM - data memory that needs to be saved when there is no supply. It is usually used for storing important data that must not be lost if power supply suddenly stops. For instance, one such data is an assigned temperature in temperature regulators. If during a loss of power supply this data was lost, we would have to make the adjustment once again upon return of supply. Thus our device looses on self-reliance.

Analog Signals - A transmission current in which information is perceived as a string of impulses that represent the binary system of 1's and 0's.