

# Intruder Detection

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A report submitted in fulfillment of the Requirement for the award of  
BACHELOR OF COMPUTER SCIENCE (COMPUTER SYSTEMS &  
NETWORKS)

Faculty of Computer System & Software Engineering  
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December 2013

## **ABSTRACT**

With the increasing case in the robbery now day, it relevant to develop a security system that can protect the house of the victim, intruder detection system is a security system that use a mini computer Raspberry pi to detect an intruder that bypass the house of the user, most of the robbery happen when the victim is away with a reason of holiday or work, with the current security system that cannot by effort by some victim, intruder detection system is a security system that been develop with a low budget but with a efficient result, it will inform the victim by sending Short Message Service(SMS) if an intruder been detected inside the victim house. It been develop using the minicomputer raspberry pi and several alarm hardware such as magnetic switch and movement sensor that been assemble together to form an security system that can be effort by everyone, develop using PHP and python programming user can determine where they want to place the alarm and what kind of message that they will receive if there an intruder in the house thus protecting the user house by giving the user to inform to the authority such as police or the neighbor to check their house.

## **ABSTRAK**

Dalam peningkatan kadar jenayah semenjak ini, ianya perlu untuk menghasilkan satu sistem keselamatan yang dapat melindungi rumah mangsa, Sistem Intruder Detection adalah satu sistem yang menggunakan satu komputer kecil iaitu Raspberry pi untuk mengesan penceroboh yang menceroboh rumah pengguna, kes kemalangan biasanya berlaku apabila mangsa tiada dirumah atas sebab bercuti mahupun bekerja, dengan sistem keselamatan yang tidak mampu untuk dimiliki oleh sesetengah mangsa, sistem Intruder detection adalah satu sistem keselamatan yang dihasilkan menggunakan bajet yang rendah tetapi dengan keputusan yang memuaskan, sistem ini akan memberi amaran kepada pengguna melalui sistem pesanan ringkas(SMS) jika ada penceroboh memasuki rumah pengguna, ia nya dihasilkan menggunakan komputer kecil Raspberry pi dan alat pengesan seperti Magnetic Switch dan Movement Sensor yang digabung untuk membentuk satu sistem keselamatan yang dapat dimiliki oleh semua pengguna, dihasilkan menggunakan PHP dan Program Python, pengguna dapat memutuskan dimana mereka ingin memasang penggera dan apakah mesej yang mereka akan terima jika terdapat penceroboh didalam rumah dan dengan itu dapat melindungi rumah pengguna dengan memberi masa untuk pengguna memberitahu pihak berkusasa seperti polis ataupun jiran untuk memeriksa rumah mereka.

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## CHAPTER 01

### INTRODUCTION

#### 1.1 PROJECT OVERVIEW

As the economy of one country begin to rise, there is a lot of benefit to the people in the country as they can lead their life more comfortable, but with the increasing in the economic area, there will be a problem that arise as the cost of living expenses will begin to increase, this will lead to the increasing of criminal activity, but not everyone can afford an security system to protect their from the criminal such as robber and thief. Plus most of the criminal activity happens on the holiday such as Hari Raya, School Holiday, and Chinese New Year and other holiday that make family to leave their house empty for a week.

For such thing, when the thief happen to target an empty houses where the victim goes to holiday, they can enter the house easily because most of the house been rob is the area that did not have any security system, to detect and record the criminal activity, so it make the thief job easier but for the victim, with the house that been enter by the thief, they lose a lot of precious thing such as money and precious accessories. It's also hard to trace back the thief after the criminal activity happen. Most of the robber in Malaysia happen because of these reason and most of the case still unsolved.

With a recent development of technology, a low cost and efficient technology such as raspberry pi and arduino minicomputer have been develop so that it can be turned to become a home security that not only cheap but efficient.



## **1.2 PROBLEM STATEMENT**

Before develop the intruder detection, A several problem must be research first such as the how to reduce the false positive where the system might be triggered by an animal like cat or dog or nature such as strong wind, such as the device that need to detect the movement is by using the movement sensor, a movement by these problem will triggered the system to send the message like there a someone enter the house.

The house design, size and location of the device also need to count for when try to applying the system on the house, the location of the sensor need to be strategic and hard to be detected so the thief or robber did not realize they walk through it, also the size of the house determine how many sensor need to be installed in the house so it will decrease the false positive. The house design and size also determine the wiring of the system.

## **1.3 OBJECTIVE**

- i. Build a home security system with low cost that can be effort.
- ii. Building a security system that can powered by using a standalone power so that when a power shortage the system and hardware still running independently.
- iii. Build a home security system that will send a message to the house owner, when there a movement in the house.

## 1.4 SCOPE

### 1.4.1 House Owner

- I. The primary development of the system is for the house owner who have to take a leave or on the holiday.
- II. House owner can set up the phone number that they want to receive the message from the system when there is movement in the house.
- III. House owner can setup the message they want to receive.

## 1.5 THESIS ORGANIZATION

This thesis will be separate to 7 chapters, in the chapter 1, it will discuss about the objective of the developing the application, it also will explain about the problem in developing the application, in the chapter 2, it will discussing about the previous research that been made, it also will support the reason why this research is been develop.

As in the chapter 3, Methodology, the method of this research will be explain more detail in this chapter, for the chapter 4, Design chapter, it will show up how the design of the application and what the software being used to develop the application. In the chapter 5, Implementation, it will explain about the method that been implement to the application, the code that been use and the algorithm of the system.

In the Chapter 6, the result & discussion will explain the result of the research and what kind improvement can be made for the future research. For the last chapter, chapter 7, the conclusion it will conclude for all chapters in thesis.

## CHAPTER 02

### LITERATURE REVIEW

#### 2.1 INTRODUCTION

In this chapter, a discussion about the past studies of the devices and the current issues that lead to the development of the devices will be discussed, In this chapter, the research about the market available will be explain by using the chart and previous device that has same function in the market, this will show that the leading factor in developing the devices.

#### 2.2 OPEN SOURCE PROGRAMMING

In the development of the system, there are a lot of advantages for the developer who uses an open source programming as their main programming, but first what is the source code? According to James A. J. Wilson “The source code is made up of the numerous lines of instructions that programmers write for computers to interpret. These instructions tell a computer what to do and how to do it. We can think of the source code as the blueprint for a program and it may be written in any one of the various programming languages used today. One of the fundamental differences between open source software and proprietary software is that the source code of open source software must be made freely available with the software. Anyone should be able to download the source code, view it, and alter it as they see fit. With proprietary software, you generally cannot view or edit the source code.”[1]. that explain the meaning of the source code but what is the open source code can be describe? “.Open source refers to a program or software in which the source code (the form of the program when a programmer writes a program in a particular programming language) is available to the general public for use and/or modification from its original design free of charge. Open source code is typically created as a

collaborative effort in which programmers improve upon the code and share the changes within the community.” [2].

There are various factors that can be useful when using open source programming as their main programming. The first factor is bug-fixing, when a programmer creates a program of software, not all the software that has been developed is error-free. When a developer tries to release the software on the schedule, they might overlook a bug inside the program where they have a limited time to test the program, either its work or not. Logically, only the developer who built the system can have access to the code because only the developer had access to the code in the software, but this is not the case in open source, where various users have access to the code and can change it. This will fix all the mistakes and bugs that were in the original, and a better version of the software can be developed. The second factor is customization. When using a closed source application, such as Apple iPhone, the user cannot change or customize the settings inside the OS because it has been customized and adapted within the scope that was provided by the original vendor, so it never goes outside of its boundaries. But for a user who uses a smart phone that uses open source programming like Android, there are various ROMs or OS that can be installed and customized inside the smart phone. Any error or bug that is found can be immediately dealt with and fixed, just as with open source where the software can be customized so that it can be adapted to meet specific user needs. For educational and business institutions, the ability to customize the source code will enable improvements to the best practices provided by default installations, thus improving efficiency and possibly providing a competitive advantage. The third factor is the flexibility of the program. “When your business uses proprietary software such as Microsoft Windows and Office, you are on a treadmill that requires you to keep upgrading both software and hardware ad infinitum. Open source software, on the other hand, is typically much less resource-intensive, meaning that you can run it well even on older hardware. It's up to you--not some vendor--to decide when it's time to upgrade.” [3] The last factor is of course the cost of the development of the program. “Between the purchase price of the software itself, the exorbitant cost of mandatory virus protection, support charges, ongoing upgrade expenses and the costs associated with being locked in, proprietary software takes more out of your business than you probably even realize. And for what? You can get better quality at a fraction of the

price.”[3], there a lot more reason can be a factor in the usage of open source that will give an advantage to the developer who used an open source code as the man programming language. The reliability when using the open source has been approved it has been upgrade and been polished by an expert so that it can give and better security that which is very important in developing are software. Open source enable everyone to the examined software for security flaws. The continuous and broad peer-review enable by publicly available source code improved security through the identification and elimination of defects that might otherwise be missed. Gartner cooperation for example, recommends the open source Apache Web server as a more secure alternative to closed source Internet Information servers. The availability of source code also facilitates in-depth security reviews and audits by government customers. So when developing the current system it is better to use an open source programming where there system can be easily improve and be upgraded.

## **2.3 PYTHON LANGUAGE**

In the world of open source language there are lots of programming language has been developed, one the programming language is the Python language, Python language is a multi-paradigm programming language: object-oriented programming and structured programming are fully supported, and there are a number of language features which support functional programming and aspect-oriented programming (including by metaprogramming and by magic methods). Many other paradigms are supported using extensions, including design by contract and logic programming. According to the official python site, the language runs on various operating system like Windows, Linux/Unix, Mac OS X and currently had been ported into the Java and .NET virtual machines. As the other programming language its is free to use even for the commercial products, because of its OSI-approved open source license. So that will be give any developer an advantage in the developing cost where the cost to build an system or a program can be reduced.

“In general, scripting languages are much simpler than system languages like C++ and Java” by Laird [4]. Python has a simple and regular syntax. All the statements are terminated by the end of

line, and the block structure is indicated by indentation. When view by algorithm the python language programs look like executable pseudo-code. This eliminated a host of troublesome error for the beginner programmers, especially placement of semi-colons, indentation and bracketing as it is a common error when using C++ and java. Example when we used the C++ it will come out as these:

```
if (x < 0)
    cout << "x was negative";
    x = -x;
```

But in the python, the corresponding code executes as expected, since the indentation itself determine the block:

```
if x < 0:
    print "x was negative"
    x = -x
```

By these example, less mistake can be made when developing a program, these show only a simple program, but a program it made from a thousand of line, supposedly an simple error such as forgetting a semi-colons is made, the system will show an error, but by using the python language , such mistake can be ignore. Python also supports the use of functions and classes but does not force it. Simple programs really are simple. As example, let consider the ubiquitous “Hello World” in python:

```
print "Hello World!"
```

But in C++ language, it requires warping in a function and proceeded by a preprocessor directive:

```
#include <iostream.h>
int main()
{
    cout << "Hello World!";
}
```

And if we consider the Java, it is more complicated or can be said worse, when all the code must be inside of a class:

```
public class HelloWorld
{
    public static void main(String [] args)
    {
        System.out.println("Hello World!");
    }
}
```

So based on the example, Python is simple, python is dynamically typed, so there is no need for a variable declarations, this reduces the amount of code that programmer have to write thus save the time and space but also eliminated common errors stemming from misunderstanding the subtle distinctions of declaration, definition and use. For example, students or programmer in C++ and Java often ``accidentally" re-declare variables where they really only want to use them (typing `int count = 0;` when they mean `count = 0`). Such mistakes can be hard to track down. Python has a minimal but complete set of simple control structures: one selection construct (if-elif-else), one definite loop (for) and one indefinite loop (while). Python also has a modern exception handling mechanism similar to that found in C++ and Java. Unlike Java, however, programmer does not have to understand the exception mechanism to write simple programs. From a pedagogical perspective, Python's for loop is illustrative. It allows a control variable to take on successive values in a sequence. It can be used to iterate through any sequence such as a list (array) or string. Let say for an example, the items in a list can be printed as follows:

```
for item in List:
    print item
```

The range operation produces a sequence of numbers in a given range. For example, `range(5)` produces the list `[0,1,2,3,4]`. This can be used to provide numerically-controlled loops. The previous code could have been written (less clearly) as:

```
for i in range(len(List)):
    print List[i]
```

The for loop is simple and safe, allowing it to be introduced very early with no fear of infinite loops. So any mistake when using the C++ and Java looping can be reduced by using the python language.

Python has a simple uniform data model. Variables are always references to heap allocated values (objects). The model is consistent, avoiding the confusion over heap versus automatic variables in C++ or primitive versus object types in Java. Both of these languages require the teaching of multiple allocation models to implement even relatively simple programs. Similarly, Python has only a single parameter passing mechanism (by value). Parameter passing is simply assignment of actual to formal parameters at call time. Once students or programmer understand the simple assignment model, they get parameter passing for free.

By the other factor also the python is safe, because it provides a full dynamic run-time type checking on array subscripts. Python employs garbage collection so there is no problem with dangling pointers or memory leaks. It is impossible for user code in Python to produce a segmentation violation. In this respect Python is similar to Java, and both are much safer than C++.

Basically using python when developing a program is very easy, its simplicity make it easy to learn by a beginner in the programming.” There is also a huge library of standard and contributed modules providing components for programming GUIs, client-server applications, html viewers, databases, animations, and much more.[5]”. For a developing a program it is important to reduce the time and mistake so that the cost when developing the programs can be reduced.

## **2.4 RASPBERRY PI**

For the developing of the system, and small computer called Raspberry Pi will be used as a server for the system. The raspberry pi is a credit-card sized single board computer that has been developed in the United Kingdom. The raspberry has been equipped with all that commonly hardware that can be found in the normal mother board but in term of power its still below the normal motherboard but still raspberry pi still can be operates as a normal computer using the



open source operating system as the operating system such as Linux, FreeBSD , Plan 9, NetBSD and RISC OS.



For the storage, there are the slots for SD card slot, as the main programming language, raspberry pi used python as the main language.

As the history of the raspberry pi, the early concept is been developed in 2006 where the concept is from the Atmel Atmega644 microcontroller. The Foundation trustee Eben Upton assembled a group of teachers, academics and computer enthusiasts to devise a computer to inspire children.

There are lot of advantages when using the raspberry pi where it used an open source OS and open source programming language when operate. The raspberry pi also used little power consumption either than normal PC where it can operate on the USB power been connected to the Personal computer or been connected to external power supply such as Power Bank where it can operate to the utmost a week based on the Power bank power. When comes to the price, raspberry pi can be considered as cheap with the cost of rm175, it is an affordable price, where everyone can buy a raspberry pi for themselves, as the commercial counterparts of certain applications of raspberry pi can cost a lot, with Raspberry Pi, its offer a much cheaper alternative at only a fraction of the price.

As already mention raspberry pi is very small, and did not take a lot of space, as in the developing in the system security, this features is very important where the raspberry pi can be hidden where no one expected it while it is operating, it also can be operate by wireless by plug-in the wireless usb and can be access through the laptop or mobile, thus increasing the security feature for security system that will be developed.

There is no such thing as a perfect product, Raspberry pi comes with some weakness, first when you buy a raspberry pi it doesn't have a case, user need to build the case their own, or buy the case separately, although raspberry pi is a mini computer, it cannot run or support an X86 operating system, more easier way to understand it although the raspberry pi come with a complete set with its own CPU, video card, ram, and VGA port but it doesn't it can support all the OS, the hardware specification limitation do not allow Raspberry Pi to run 32 bit OS such as Microsoft Windows, Mac OS X or some distributions of Linux, this might be a big loss for not computer friendly end users but for an expert or professional users, this is not a problem where there are more operating system that Raspberry Pi can support.

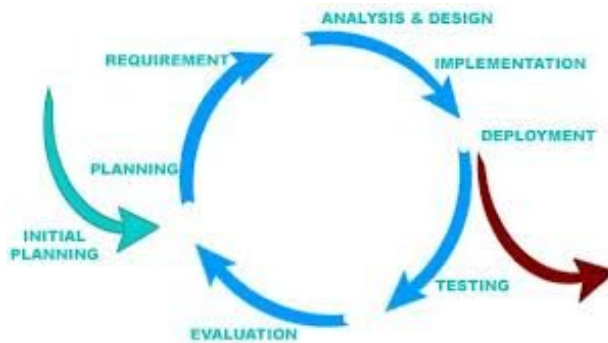
## CHAPTER 03

### METHODOLOGY

The Method that will be implemented in the research and development of the intruder detection will be discussing in this chapter. The development of this project will be based on the iterative and incremental development methodology. Using this method the outcome of the development of the system will deliver based on the user requirement that has been mention in the previous chapter.

#### 3.1 ITERATIVE AND INCREMENTAL DEVELOPMENT METHODS

This method is the combination of both iterative designs also can be called as iterative method and incremental build model for the development.



**Figure 3.1:** Iterative and Incremental Development Method

If this process was compared with the System Development and Life Cycle (SDLC), the process inside both methods is same but the step inside the iterative and incremental development process is different where the implementation, testing and evaluation part is repeated. This method is most similar to the Rapid Application Development (RAD).

By using this methods, it allows any mistake that been found in the development of the system to found and been repaired immediately, this will give some advantages where the time to develop the system can been reduced, By using this methods also, User view also will be take into the consideration by the developer to ensure that any fault that been found in the development of the system will be solve immediately, A multiple prototype and design will be produce in the development before the release of the final application.

### **3.2 JUSTIFICATION OF ITERATIVE AND INCREMENTAL DEVELOPMENT METHODS**

Justification of using this methodology in the development of the Application because of the different user that has different needs or requirements, so basically this application will have a design as to what the user desire in the system. So it must follow the user need in order to complete the design.

When the user request for the system, an interview will be need to ask the client the design of the house, so that when the system is been installed in the house, all the hardware is been place on the suitable place so that the effectiveness of the system is increasing, Also the any false positive can be reduced without effecting the system.

Iterative and incremental development methodology is adaptable to a different change, when each of the prototypes will go through the evaluation and testing, any change request that been made by the user can be made at this stage thus making the system more meeting the user criteria at the end of the development, Reverting back step is not applicable, though consideration can be made during evaluation whether changes should apply to the system or not.

### **3.3 ITERATIVE AND INCREMENTAL DEVELOPMENT METHOD**

This part will describe the phase and the related hardware and software that will be use during the development of the system.

### 3.3.1 PLANNING STAGE

The first step is to plan the whole project development accordingly, this is to make sure that resource and manpower can be distributed evenly thus providing a milestone that can be refer to for reference.

### 3.3.2 SYSTEM REQUIREMENT

Same like any method in development methodology, the next step is to gather requirement from the user of the system. This step is needed to ensure that the project that is being developed did not goes astray from the objective, and from what the user expect from the system. Requirements have major influence on the system that will be develop, as in iterative and incremental methodology the requirement became one of the important aspects in keeping the progress in check. Below is the information about the hardware use to build the system.

#### 3.3.2.1 HARDWARE REQUIREMENT

##### 1. Personal Computer

CPU	AMD FX(tm)-8120 8-core
RAM	8GB
HDD	2 Terabyte
Graphic Card	NVIDIA GeForce GT 640
Input Device	USB Mouse and Keyboard
Monitor	S2440L

##### 2. Raspberry Pie

Processor	ARM1176JZF-S 700MHz
memory	512MB
Graphic	Broadcom VideoCore IV

##### 3. Wireless dongle

##### 4. USB MODEM Doongle

### 3.3.2.2 SOFTWARE REQUIREMENT

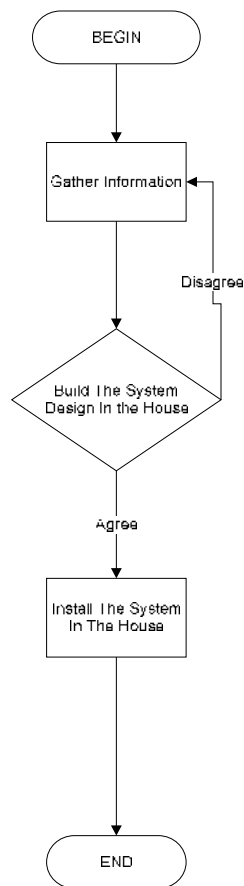
Operating System

- i. Personal Computer: Windows 7 32 bits
- ii. Notepad++
- iii. Putty

### 3.3.3 ANALYSIS AND DESIGN

Analysis and design can provide a view of how the application will interact with the user. It also provides a view of how functions inside the system interact with user and other function inside the module or the system. Analysis and design give the early foundation of the system.

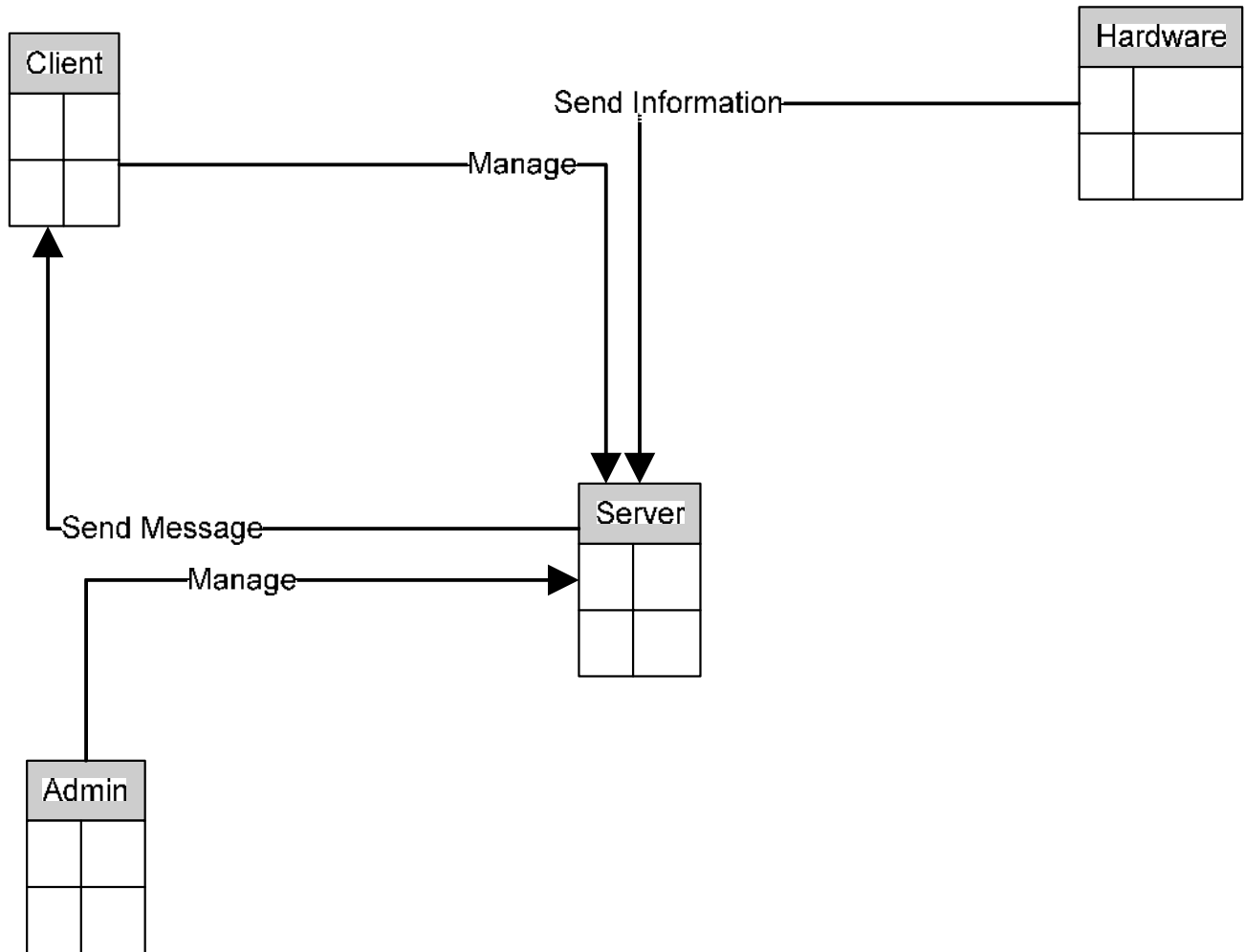
#### 3.3.3.1 FLOW CHART



**Figure 3.2:** Flow Chart (System Installment)

### 3.3.3.2 ENTITY RELATION DIAGRAM DESIGN

Below is the Entity Relation Diagram Design



**Figure 3.3:**Entity relation Diagram

### 3.3.3.3 USE CASE DIAGRAM DESIGN

Below is the use case diagram

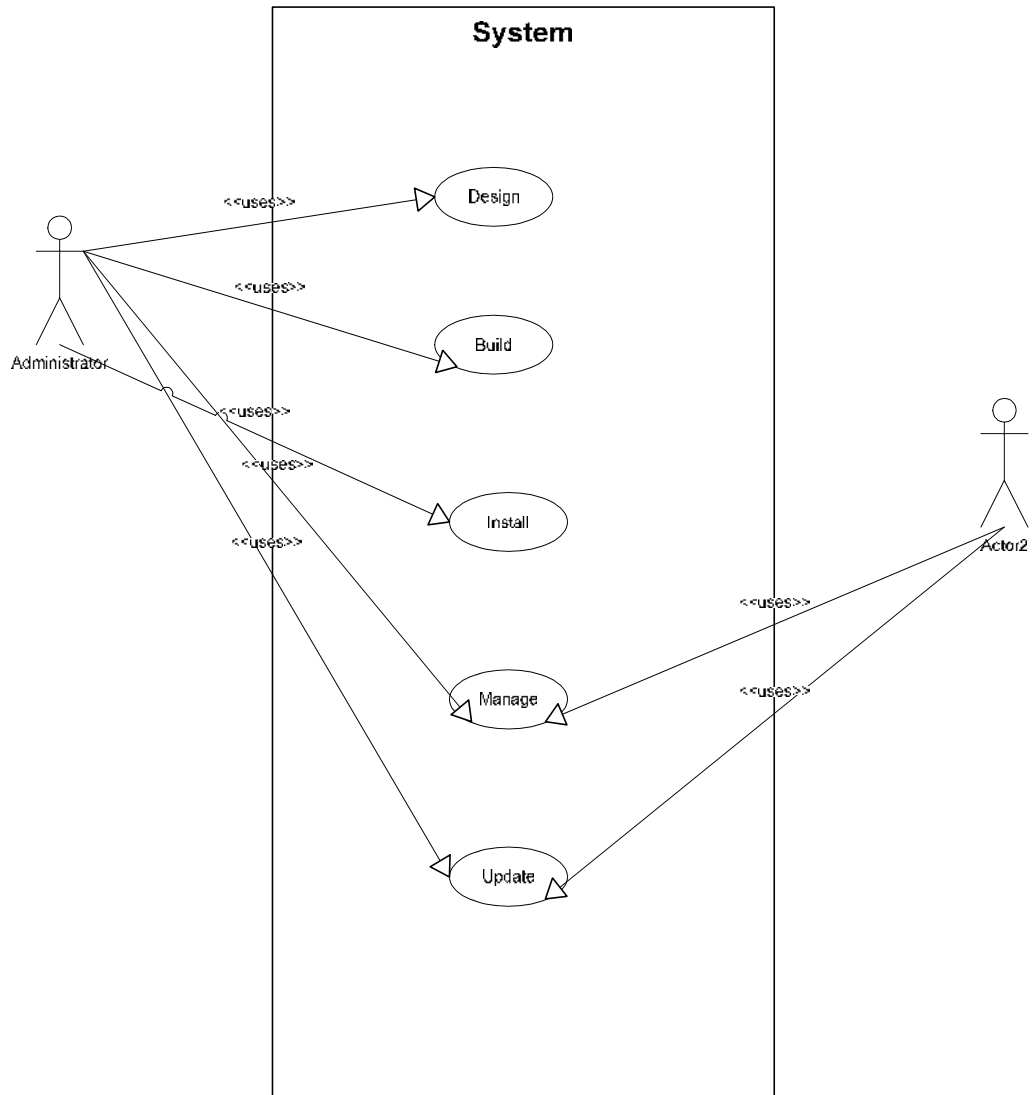


Figure 3.4: Use Case Diagram