Chapter-1
Introduction

1.1 Problem Statement

The need to develop a cost-effective surveillance system through innovative technology immensely influenced the development of this project. This project will design and implement a security system based on Raspberry Pi microcomputer. The system should be able to detect motion (intruder), activate a camera to take frames of video after motion is sensed and then send an alert to the facility owner through electronic mail plus an image attachment.

The cost of installation of any security system depends on several factors. First, the type of camera being used is of great consideration. A typical digital camera e.g. CCTV and IP camera with an LCD costs about US $ 450 (different brands can differ on prices) while the Raspberry Pi SBC together with its camera module is estimated at US$ 80.

Another aspect of this project is to present an idea of monitoring and tracking of an intruder through the use of a camera. Any object passing through the field of view of camera will be detected then tracked in case the object attempts to move any body part.

1.2 Rationale

A smart security camera or surveillance system is a great innovation to security industry.

Security is a must feature which everyone need in their home, workplace in order to keep the place secure from robbery, thefts or burglary. This innovation can be called as a guard to each and every sector of the society and class that includes business class, Industrial class, factories, mining sectors and the essential element for a human that is for his home. Home security is a must sector which all over the world is in new demand. There have been a lot of technologies introduced since from 2000 for security purpose, amongst them the camera is the best one. There have been a lot of camera technologies available in the market. Camera and the CCTV surveillance system present have a limited feature of recording besides live streaming of the intruder and even the recording is of low quality and is its cost of implementation is also high especially for small home application. The advancements in video surveillance technology have made it possible to remotely access the camera through internet enabled PC or smartphone from anywhere in the world this make the use of DVR's and IP cameras.

Therefore, in order to resolve the cost and quality factors that old technologies possess, Raspberry PI came up, which crosses both these criteria, an effective computer which can be interfaced to different to hardware using its GPIO pins (General purpose Input Output Pins). A lot can be done on it ranging from motor speed control, automatic lighting, VPN server, security system etc. The latter is of great interest in this project.

The implementation of this system cannot replace the role of CCTV and IP surveillance Cameras wholly in industrial sectors but it can be revolutionary in-home owners to make them monitors theirs home at an affordable price. In addition to fact that the raspberry pi board is easy to implement, affordable, faster processing than the normal cameras and great scope for future advancements in its features that other CCTV's and surveillance system do not have.

Video processing is a term that indicates the processing on image or video that takes picture using camera and process according to defined parameters given by the programmers. The basic agenda behind image or video processing is visualization which is to observe the object which are not visible to naked eyes and it includes detection of objects via sensors, which tracks the movement and position of object.

1.3 Objective

The project is focusing on building a security camera through Raspberry Pi 3 module extensively for owners to monitor their property from anywhere using their smartphones at low cost, better video quality and new features that normal camera do not possess.

An incident came by few days ago where a family was robbed by a group of robbers. The family is a 3-member nuclear family where the man of the family was sleeping away from his family at rooftop of his house, he did not know what was going downstairs instead cameras where present but as camera only does recording so he can't do anything. Robbers have robbed around 3-4 lakh money as it was too late for the man of house to know what was going. As they came so silently that no one even neighbors couldn't find out that something is going on. They even break the camera to hide their identity and also to stop recording.

Therefore, so we came up with the idea of integrating camera by adding motion detectors, heat sensors, remote access of cameras, message and call service. We are going to use two modes, Day mode and night mode and during night mode timer will be set by the admin of the camera so that it can only detects the motion at that time only, motion will be detected using PIR sensor, and sends message to each motion that camera will detect and as motion gets increases call will be placed to the owner. the owner will also be able to remotely access the camera using his smartphone through an android app what is going on. Now in the above case robbers have broken the camera to hide their identities so for that we are adding a hooter or alarm to raspberry pi so that as the circuit breaks the camera will activates the alarm. For circuit break we will also take use of GSM modular that will be connected to raspberry pi and as the circuit will break call will be placed to the numbers that are fed in the GSM sim. Robbers also used to block camera by using steam, fog so for that we will be using a heat sensor on raspberry pi and as soon it will detect increase of temperature, with the help of hooters it will create sound that will make aware to the user and his neighbors too.

1.4 Goal

The main goal of this project is to design and develop a security system that includes specifications such as motion detection, emailing facility, for affordable cost and better video quality. The system is implemented or based on Raspberry PI 3.
The specific objectives are:

- To detect human during night and sends the message via e-mail.
- To describe how motion will be detected using Raspberry PI and how it will be interfaced with motion detector and pi camera.
- To study how a Raspberry Pi can be programmed to send messages via E-mail and as an alternative to mail hub.
- To remotely access the camera using an android app.
- To study the GPIO pins that will perform this above function.
- To install OS, Raspbian, on Raspberry pi 3.
- To configure camera on Raspberry pi 3 using python.

1.5 Justification

The security system designed will going to have extra features such as sending text messages, detection of heat, sound of hooter during break of circuit and more features can be added because of using Raspberry PI. It will have some common feature which camera surveillance system used to have, that is extensively to monitor facilities by owners. The owner shall be able to monitor their property from wherever they are in the world. It will not replace completely or will replace the use of CCTV and camera surveillance system but will reduce the cost of implementation of a basic security system and even it will have greater functionalities than which normal camera have. Thus, this will enable small home owners to secure facility at a cheaper rate.