Chapter-2
Market Analysis and Product Potential

2.1 Related Works on Security Systems:

As the advancement in technology is increasing, researchers and developers have come up with a wide range of security systems that are used for remote monitoring, alerting the house owner, and basically keeping the house safe and secure, controlling task through affordable and easy to implement hardware systems. Some have so far been realized while other still remain a proposition.

A surveillance system was presented by Padmashree A. Shake and Sumedha S.Borde which assesses the implementation of a cost-effective alerting system based on small motion detection. The microcontroller they used helps to monitor the household activities in real time from anywhere. They implemented their system by implementing cheap in price, low power consumption; well utilize resources and efficient surveillance system using a set of various sensors.

D.Jeevanand designed a networked video capture system using Raspberry Pi. The system, he and his team designed works on capturing video and distributing with networked systems works on capturing video and distributing with networked systems. He builds the system to work in real-time situations. He builds such application that offers client video monitor with the help of alerting module and SBC platform.

Sneha Singhd along with his team described IP camera surveillance sing Raspberry PI technology. They included the feature of alerting the administration person via SMS alarm as required by the client. They also have common feature of capturing video and distributing with networked systems. It was designed in real-time situations based on Raspberry Pi SBC.

Jadhav G. J evaluates the use of various sensors, microcontroller units and fingerprint module to formulate and implement a cost-effective surveillance system. They have used ARM core as a basis processor of the system and have PIR sensor to detect motion in the vision area.

In 2014, Sanjana Prasad and his colleagues designed a mobile smart surveillance system based on motion detector sensor PIR and SBC of Raspberry Pi .
Uday Kumar implemented secure surveillance system of a low-cost using a camera with Raspberry Pi and the images acquired have to be transferred to the drop box cloud storage by using a 3G dongle.

2.2 Security Definition

Security literally means a way by which something is protected through a system of interworking devices and components. Security system helps to protect our houses from burglar's and from thefts, basically not allowing unknown to have unauthorized access. The sensors are typically placed in entrances as well as easily accessible locations. These components are present in a home security system: The primary controller of a security system known as control panel, windows and door sensors, motion sensors, wired or wireless CCTV or other technology security cameras, sirens with high-decibel or alarm and window stickers.

2.3 Security Evolution

The art of home protection was greatly improved with the invention of electricity. In 1853, the first patent on electro-magnetic alarms was introduced which meant that businesses and wealthy residents could secure their valuables. Magnetic contacts were installed on the windows and doors that, when tripped, would send a signal through the electromagnetic wiring and sound an alarm. These groundbreaking security systems were effective in deterring break-ins from occurring.

According to Cisco Expo, major strides have been made with regards to surveillance systems. After the alarm system, analog video camera with Video Cassette Recorder evolved. It had poor imaging and no remote access. To overcome the drawbacks of this system, digital video recorders evolved.

Network Video Recorder then emerged. They have the advantages of the DVRs but have other merits over DVRs. They give more storage options and network connection. The most superior version is the type that uses Cisco Video Surveillance Platform.

2.4 Current Security Technologies

2.4.1 Arduino Based Home Security System

This security system project deals with the development and design of a intrusion control system for home, which is being used to ensure security and prevent/control any theft attempt. The system makes use of an integrated embedded system consisting of an open hardware microcontroller(Arduino) and a modulator-demodulator based on Global System for Mobile communication (GSM) technology.

The developed and designed system which can be installed in the home. An intrusion-detector unit is also connected to the microcontroller-based security system. The system thus works with a passive infrared sensor (PIR) for motion detection. In case of unauthorized entry attempt, a warning message is being transmitted by the system (as an sms) to the owner's mobile phone, or to any pre-configured mobile phone number for further processing.

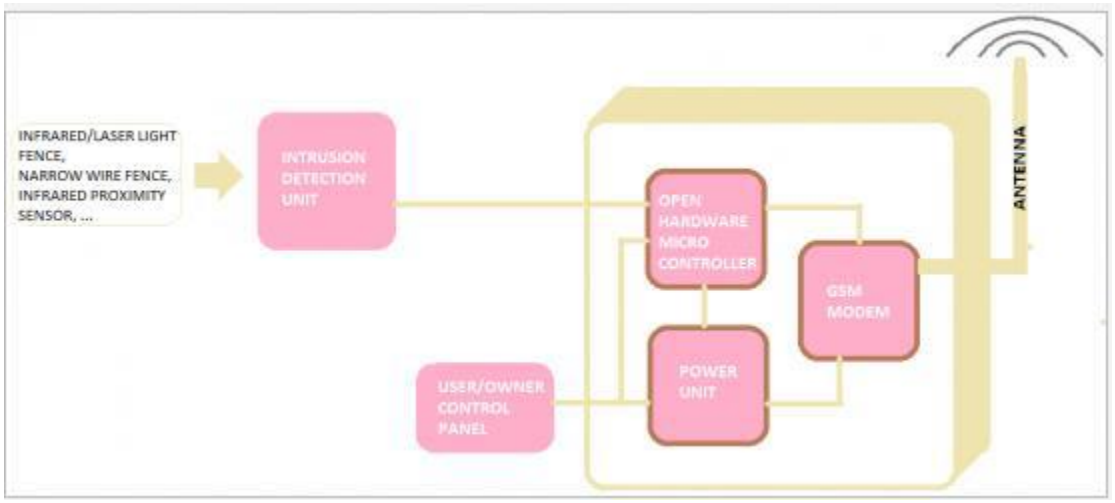

Figure 2.1: Arduino based home security system block diagram

The security system comprises of an Arduino Uno microcontroller, a standard SIM900A based GSM/GPRS modem and PIR sensor. The whole system can be powered from any 12VDC/2A power supply unit/battery.

2.4.1.1 How it works

Its working principle can be analyzed from the block diagram of fig 2.1. When input power is applied to the system, the system goes into standby mode. The preprogrammed warning message is automatically transmitted to the concerned mobile number when the terminals of connector joining PIR with the Arduino microcontroller are short circuited. It only conveys a notification message.

2.4.2 Remote Surveillance IP System

IP surveillance is a digitalized and networked version of closed-circuit television (CCTV). An IP camera records real-time video footage and the distributes it over an IP (Internet protocol) network in an IP surveillance system,. By polishing CCTV with networking capability provides additional benefits, including:

- Improved ability for mobile areas viewing and control. Anyone on the network can individually view video from any camera connected to the network.
- It is made possible to store data in any remote location only by using IP storage.
- An image of a crime suspect, for example, can be immediately distributed to Police officials.
- The ability to connect to email and other communications systems so that alerts can be sent automatically.
- This system however does not transmit the image of the intruder.

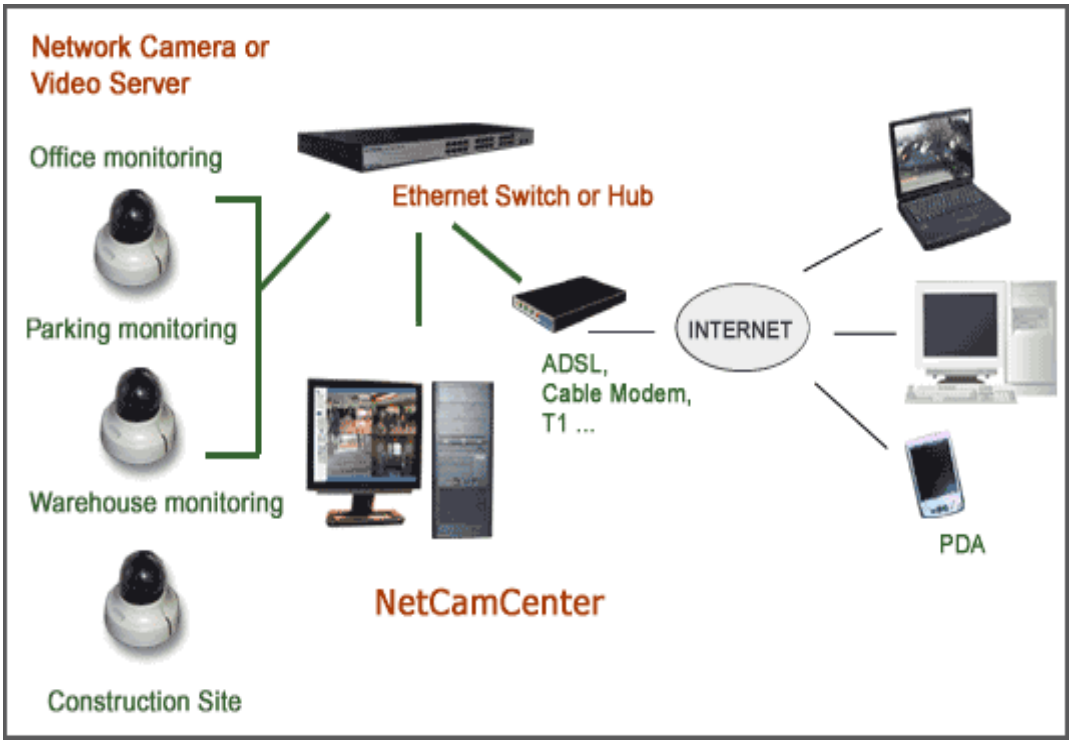

Figure 2.2 Remote Surveillance IP System

2.4.3 Closed-circuit television (CCTV) Security System

The use of video cameras to transmit a signal to a specific place is called Video surveillance on a limited set of monitors. It differs from broadcast television in that the signal is not broadcasted openly to all, though it employs a point to point (P2P), point to multipoint, or mesh wireless internetworks links. In 1949. the very first commercial closed-circuit television system (CCTV) became available in the U.S. called Vericon.

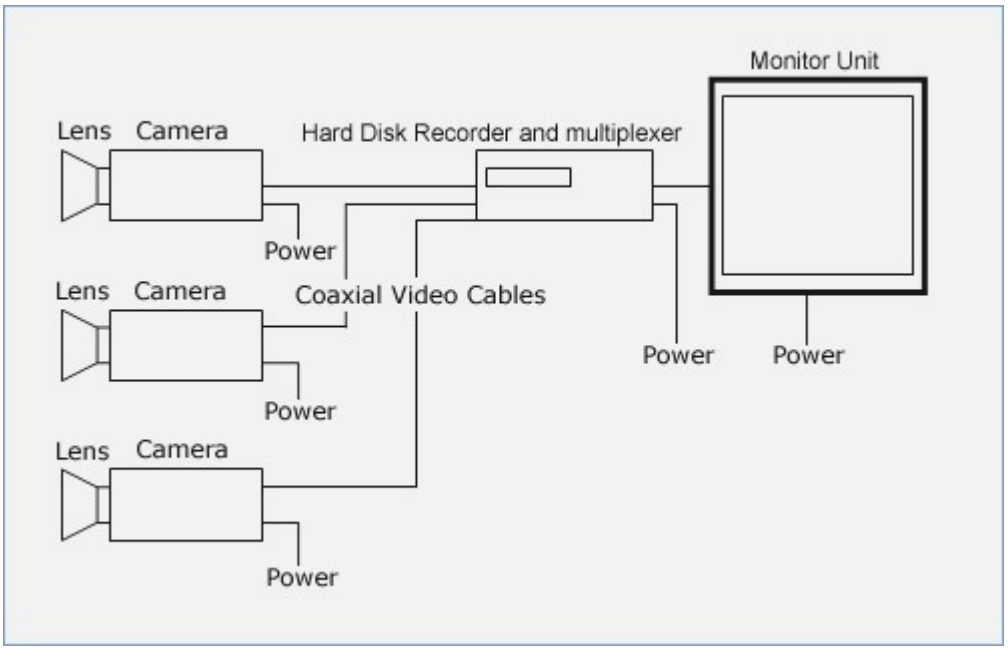

Figure 2.3 CCTV Block diagram

2.4.2.1 Operation of a CCTV Security System

The simplest system is a camera connected directly to a monitor by a coaxial cable with the power for the camera being provided from the monitor. The outdoor or indoor camera takes several images per second and thus cannot be differentiated by human eye. The images are then transferred via a coaxial cable or optic fiber to a computer placed in a secure location. These computers are monitored by security personnel and responds to any improper behaviors. These systems have been incorporated with alarm systems so as to send out an alert in case of a security bridge.

Two types of CCTV storage exist; VCR and DVR. The DVR system is more superior as it can be able to transmit digitized video signals over the data networks and thus can allow for remote control and monitoring of the system.

2.4.4 Raspberry Pi Based Surveillance System

In existing security systems the features like motion detection, image processing and alert mechanism are lacking behind. So, by using raspberry pi based surveillance systems all these features can be implemented which extends security at a higher level. The alert ought to contain a time lapse photo or video and transmitted over the internet. This thus will enable the users to monitor the homes from anywhere in the world.

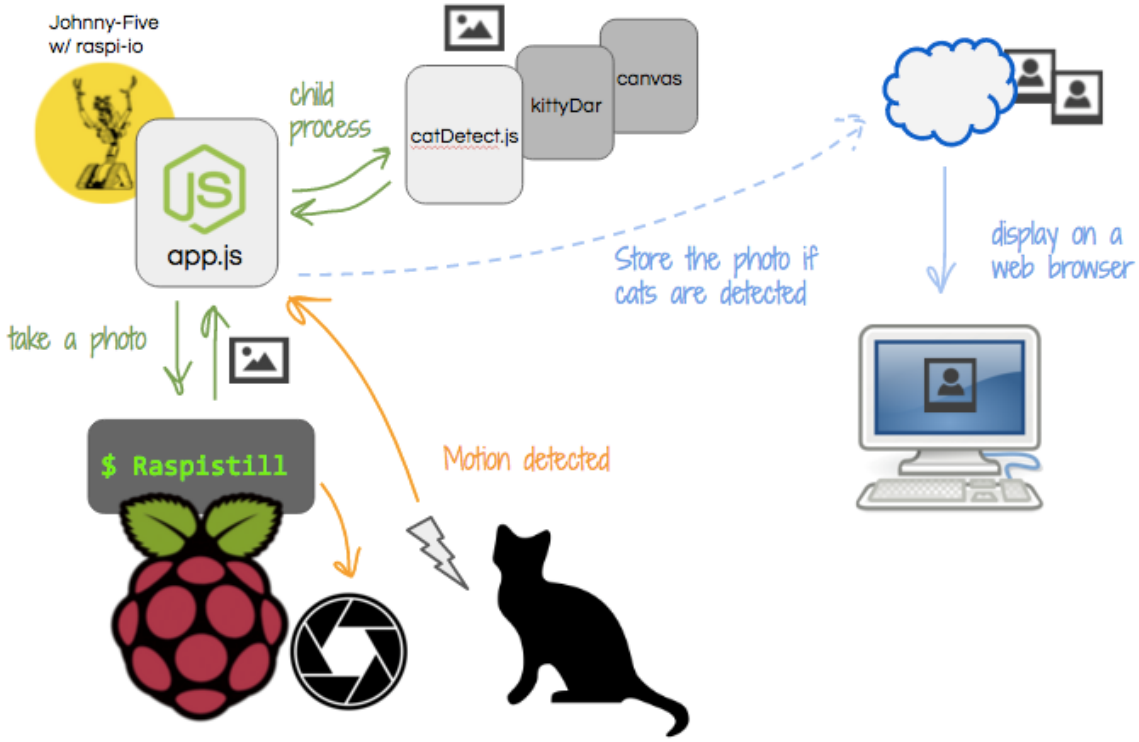

Figure 2.4 Raspberry Pi Based Surveillance System

2.4.4.1 Why Raspberry Pi based Security Systems for Homes?

Several criteria have been used to select a security system required to safeguard a facility. The chief among all these has been the cost of implementation of such a system. The Raspberry Pi is also a very versatile device whose functionality is not limited. It can be extended from being merely a security device to temperature control device, automatic lighting and proxy server. The following reasons are enough to explain the need to have your home security system based on Raspberry Pi:

- An IP Camera system has the ability to distribute alarm messages over the internet as well as the Raspberry Pi based security system. However, the cost of an IP Camera makes it not easily affordable to small home owners.(insert cost plus citation) Thus they can be deployed in large industrial set ups, defense forces, police departments etc.
- Arduino microcontroller based security system can be relatively cheaper to implement as compared to Raspberry Pi based system but its memory capacity renders it more ineffective especially when trying to interface with other modules e.g. camera, monitors, motion sensors, mouse and keyboard. Raspberry Pi has an extendable SD card storage and can be expanded to suit the needs of an individual. Moreover, Arduino microcontroller requires a GSM modem to enable it transfer information through the internet. The Raspberry Pi has a port to connect it to the internet.
- A CCTV surveillance system is expensive to purchase and install compared to the system in question. It requires a DVR system to connect it to the data networks through TNP/IP. A DVR on its own is very expensive. Hence such a system may not be afforded by low income home owners.