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### Research Article

## Surveillance System Based On Raspberry Pi for Monitoring a Location Through A Mobile Device

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### Keywords

HSS-Home Security System,  
Raspberry Pi,  
Python,  
Dropbox,  
Microprocessor

### Abstract

Technology is a never ending process. To be able to design a product using the current technology that will be beneficial to the lives of others is a huge contribution to the community. Nowadays security is a main issue for protecting the resources. External attackers are easily detected but it is very difficult to detect byzantine attackers even from attack pattern. Even though a lot of technologies have come up we still have many questions unanswered. In this paper a surveillance Camera based on a microprocessor called the Raspberry Pi which efficiently records the footage of anything that moves within the monitored area and push SMS notifications to mobile numbers. It can also help us to view the directory of all visitors in a chronological order along with the date and time on our mobile device using cloud storage technologies like drop box.

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### Introduction

With advancement of technology things are becoming simpler and easier for us. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services.

In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Automation plays an increasingly important role in the world economy and in daily experience. Automatic systems are being preferred over manual system. Through this paper we have tried to show automatic control of a house as a result of which power is saved to some extent.

The “Home Security System—HSS” is a paper that introduces a big innovation in security systems. It lets people watch their home or their offices on internet and using mobile devices whenever they want. This is a real-time system and users are notified by the system in the case of a visitor at door.

The computer turns into a security system by adding the necessary software and hardware.

The HSS has lots of beneficial effects on society. Its social impact will be very important, because people far away from their home need not to be worried about it. People will be able to watch their home and give commands to the HSS by mobile devices. In the time of emergency they will be warned by the system by SMS. It is also very important for the police stations because the system will help them to determine the identity of the thief by using the database that the views are recorded. Briefly, the security need in the society is fulfilled.

### Methodology

The original and innovative aspect of the paper is watching home from internet and getting information by mobile devices. The system will alert when a visitor arrives, so the user is warned by SMS. Also using the wireless technology is a new thing in security systems. The originality of the HSS is accessing the system by mobility like PDA or cell phone (using WAP) and the internet. A home camera security system

can be a great way to home break-ins and provide us with recordable footage of what happens in and around our property. For all of the benefits of a camera setup at home. It uses the facility of dropbox for storing the images which are captured by the camera and the link is send to user through SMS.

## Literature survey

### “Wireless Home Security System Using Mobile”[1]

Wireless security is the prevention of unauthorized access or damage to mobile using wireless networks Systematic solution for home. The aim of this paper is to investigate a cost effective solution that will provide controlling of home appliances remotely and will also enable home security against intrusion in the absence of home owner. The system uses latest wireless communication like Bluetooth, Infrared and Wi-Fi access to the system for security and automated appliance control. Home security has been a major issue where crime is increasing and everybody wants to take proper measures to prevent intrusion. System will works on different wireless communications and latest 3 of 10 mobiles uses for security purpose. The proposed system characteristics involve remote controlling of appliances, intrusion detection, system security and auto-configuration such that system automatically adjusts the system settings on running hardware support check.

### “ Design and Implementation of Low Cost Home Security System using GSM Network” [2]

Home security has been a major issue where crime is increasing and everybody wants to take proper measures to prevent intrusion. In addition there is a need to automate home so that user can take advantage of the technological advancement in such a way that a person getting off his home does not need to think of his home security again and again. It is therefore the purpose of this invention to provide a security device, which gives immediate notification to the owner and security services like police station or fire brigade at the moment the unauthorized event occurs. This purpose is accomplished via use of some modules and a controller which activates a GSM (Global System for Mobile) module to send one or more SMS (Short Message Service) to the owner and corresponding security services at the time of break in. This system is low cost as it does not contain expensive sensors to detect emergencies and it is also easy to implement as the security modules will take very low space for installation.

### “ Raspberry Pi based Interactive Home Automation System through E-mail”[3]

Home automation is becoming more and more popular day by day due to its numerous advantages. This can be achieved by local networking or by remote control. This paper aims at designing a basic home automation application on Raspberry Pi through reading the subject of E-mail and the algorithm for the same has been developed in python environment which the default programming environment is provided by Raspberry Pi. Results show the efficient implementation of proposed algorithm for home automation. LEDs were used to indicate the switching action.

## System architecture

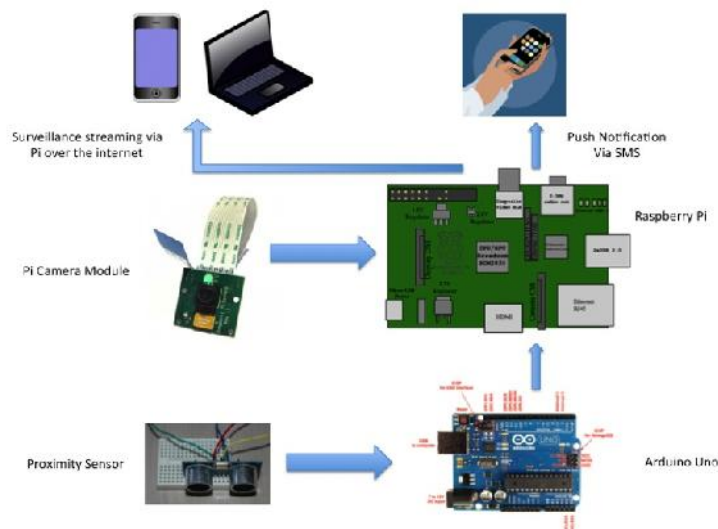


Fig.1 Block Diagram

**Proximity Module**

This module is basically responsible for the proximity assessing role of the system. The module consists of an HC-SR04 type proximity sensor. An IR sensor can also be used as a substitute. This module consists of the sensors and its interfacing with the Raspberry pi. The sensor interfaces are made to the appropriate pins on the Raspberry pi controller. The Raspberry pi sketch (written in Wiring Language – very C like language) is responsible for assessing the proximity numerical value and then triggering the Pi to take action appropriately.

**Recognizer**

This module is existent in the Raspberry Pi and is responsible for creating threads and receiving inputs from the Raspberry pi. The ports are assigned and then input is received appropriately. Necessary threshold to mitigate less significant subjects like moths and insects etc. are established. If the subject is within 30mtrs of the sensor the Pi is triggered to make a snapshot and embed the timestamp

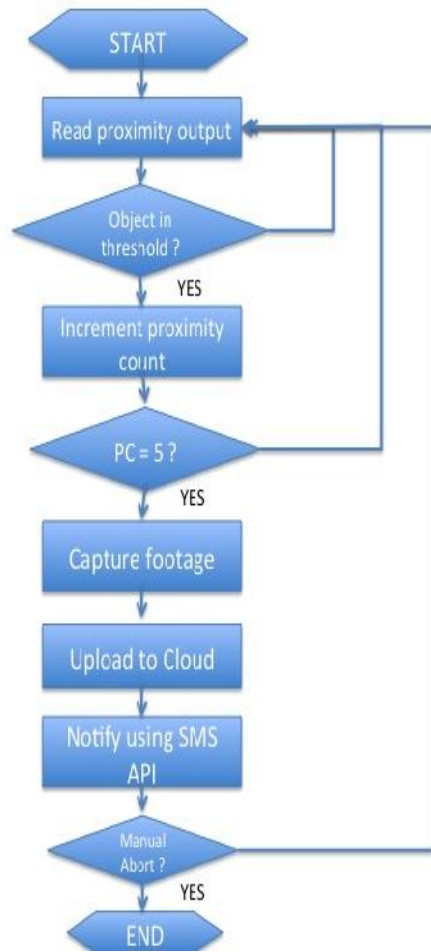
in the file name. The snap is uploaded onto a Dropbox directory and the necessary details are printed on the output. All the necessary implementations in the Raspberry Pi are done using Python Language.

**Notification**

This module also is a part of the Python script executing in the Raspberry Pi and it operates based on the TEXTLOCAL API which is capable of pushing messages to phones and this message will have the link to the snapshot in the Dropbox directory. This portion is also implemented using Python script on the Pi and uses few libraries like the recognizer module.

**Surveillance**

Surveillance module of the pi enables the user to be aware of the happenings outside the front door of the house or office. It enables the feature of telepresence and helps keep track in real time and historically of the visitors to the house in the absence of the owner.



**Fig.2 Flowchart for Home Surveillance**

## Hardware components RASPERRY PI



**Fig.3 Raspberry Pi Circuit**

The Raspberry Pi is a credit-card-sized single board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi is manufactured in two board configurations through licensed manufacturing deals with Newark element14, RS Components. The hardware is the same across all manufacturers.

The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 processor, Video core IV GPU and was originally shipped with 256 megabytes of RAM upgraded to 512 MB. The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC via the RISC OS image or the Brandy Basic clone for Linux), C, JAVA and Perl.

### **Contribution**

The obvious benefit of camera security at home is that it creates a deterrent to crime. With that as the starting point, the following should also be factored into our decision on the plus side.

### **Portability**

A camera security system is relatively portable. Cameras can be placed just about anywhere provided there is a power supply. Some cameras are so small they can be hidden in plants, pictures or anywhere they won't be detected.

### **Evidence Gathering**

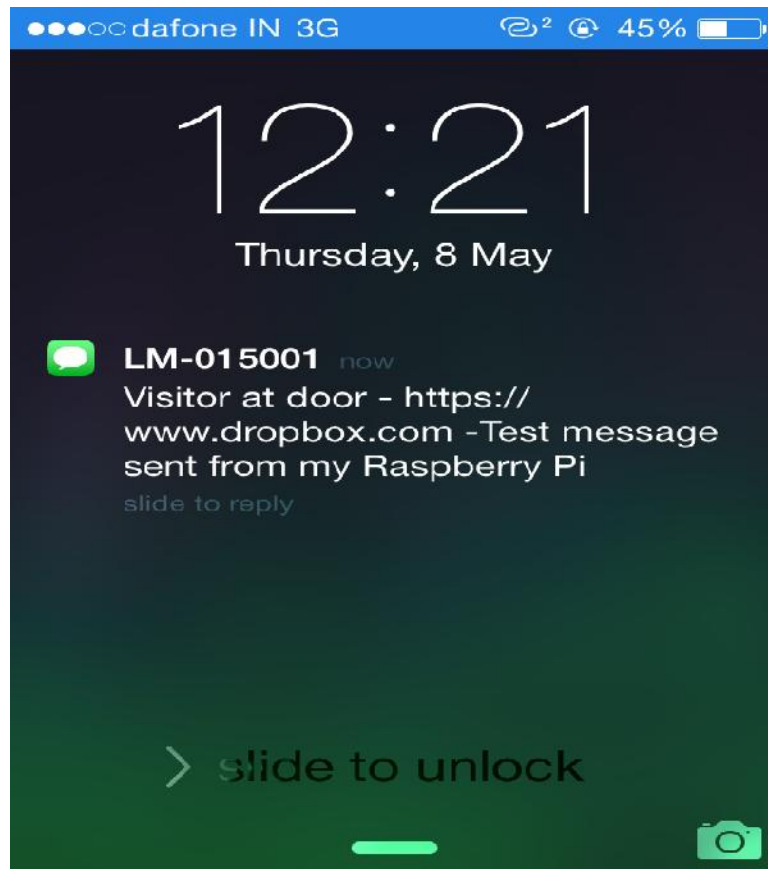
Just as the mere presence of camera security is enough to deter most criminals from attempting to break in to your home, in the event that the cameras go undetected, the video footage thus recorded of the intruder can be used as evidence to locate and convict the burglar.

### **Cost**

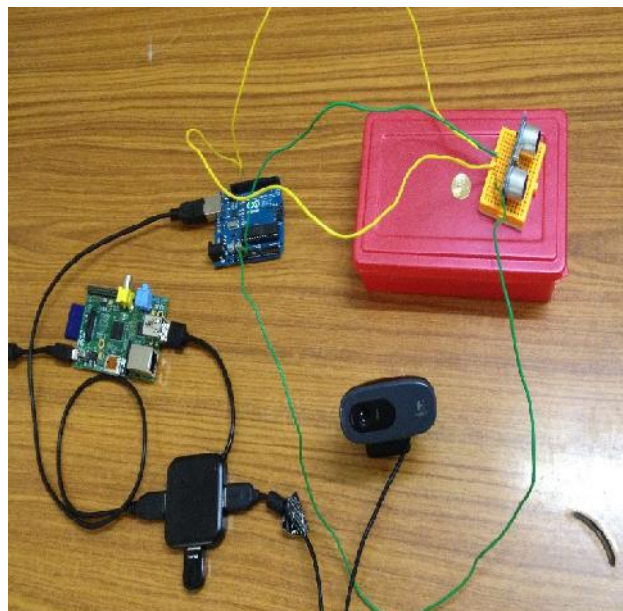
Cost is both an advantage and a disadvantage of camera security. Oftentimes all that is needed is a fake camera with a red flashing LED inside. Giving the appearance of camera security without actually having a video security system can be a more than adequate crime deterrent. Not only that, but it will hardly cost us anything.

### **Performance evaluation**

For verification of the practicality of the proposed system algorithm, LED's are used to indicate the switching signal of the interfaced devices. The experimental set up is shown in Fig 4. Results were generated by a series of sending link of Dropbox to the user phone in form of SMS. SSH Login into the Pi is to be entered. Execute the Recognizer.py program and the proximity module keeps displaying the distance ahead of it in inches through serial output from the Raspberry Pi. In this it place an object ahead of the HC-SR04 proximity sensor and the system detects it. Object is detected and the programs triggers the camera to capture footage and uploads it to the Dropbox directory from the Raspberry Pi. The SMS API is invoked and the system starts to notify on the number pre-installed in the API. The user receives a notification on the phone with a link to Dropbox directory where the visitor picture is stored. On clicking the link the list of visitor footage is accessible in a chronologically sorted order.



**Fig.4 User SMS Display**



**Fig.5 Hardware Setup**

## Conclusion

This system is an example of the DIY (Do It Yourself) projects made possible by single board systems like Raspberry Pi. A home surveillance system of this sort is highly cost effective compared to the huge amounts of money people invest in commercial surveillance systems. This system can be further expanded with the ability to stream live feeds from your camera to the Raspberry Pi Webserver hence making it accessible from anywhere in the world through the Pi's IP address. A popular such service called Motion enables the camera feeds to be accessible from the internet on the Pi's IP and assigned port. The feeds can also be broadcasted on secure lines. The raspberry pi has a new add on component called the Pi Cam module which is a camera module specifically designed for the Pi and such Embedded system projects. Raspberry Pi proves to be a smart, economic and efficient platform for implementing the home automation.

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