



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 Issue: X Month of publication: October 2017

DOI: <http://doi.org/10.22214/ijraset.2017.10032>

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Raspberry Pi Based Advanced Security System Using IOT

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Abstract: In the Advanced Raspberry Pi Surveillance system. Here Raspberry Pi, a credit card sized mini-computer is used in surveillance to control the threat of thefts. The main idea of this system is to notify the user whenever there is human interference in the surveillance area. Using PIR sensor, this system captures surrounding and detects human presence. This presence of motion notifies the user. This notification process is done by sending short message service (SMS) through GSM Module. Along with surveillance notification, this system is also used during morning times for normal surveillance which is monitored in the presence of user. Asnight time surveillance becomes very difficult using manual observation. This system can replace manual observation and notifies the security officials. It can also be used in wide areas like industries and home security services, banks etc..

Keywords: surveillance system, Raspberry Pi3, PIR sensor, GSM, Camera, DC Gear Motor, L293D etc.

I. INTRODUCTION

In recent days, the uncontrolled threat of thefts is making people worry about their valuable things. So there is a necessity of continuous surveillance in their houses which includes their valuable things. Nowadays the surveillance systems have become more useful in common life by using efficient computer algorithms in the place of the manual observation. Whether the person is residing in the house or out of it, the monitoring system should be active enough to notify the particular person. These are done by set of computers. It becomes complex because of the use of Closed Circuit Cameras. To overcome the difficulties of surveillance through CCTV footages, Raspberry Pi the mini-computer it is enough to capture the footages and it reduces the size and the price. Advance security system using Raspberry Pi involves PIR sensor. It detects the human interference through surveillance and notifies it to the user by message through GSM and as well as MAIL.

A. Raspberry Pi

Raspberry Pi3 model B is a credit card sized single board computer. This board is the high cost when compared to an actual computer, it uses power rating of 5V, 700mA and it weighs not more than 50g. It is also available as Computer Module Development Kit, which is handy device used for industrial applications and has more flexibility.

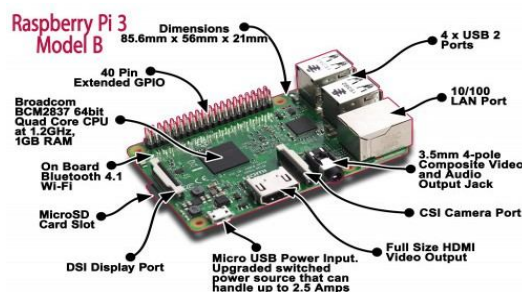


Fig. 1. Raspberry Pi 3 model B Board

Noobs, Raspbian etc. which is installed the SD card. It has 1 Camera connector to interface with the camera module. Accessories like Keyboard, Mouse and USB Wi-Fi dongle can be connected through 4 USB 2.0 ports. Ethernet connectivity through RJ45 port, 3.5mm Audio Port with low noise power supply can be linked up. It can be connected to LCD/LED monitor, Televisions and projectors to display the information through HDMI port. The sensors, switches and control of LED's are done by 40 GPIO pins. By all these embedded on a single board, Raspberry Pi is not just limited to single use, it can be of wide use according to the application.

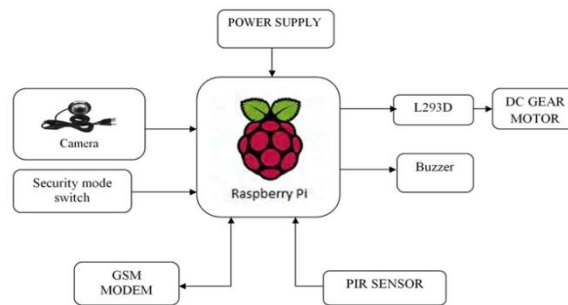
B. GSM Module

GSM Modem with Sim800 module is built with Dual band GSM/GPRS. It has a variable baud rate ranging from 9600 to 115200. Baud rate can be configurable using AT commands. It works on frequencies 900 / 1800 MHz. It operates on 12V regulated power supply. It has a SIM card slot to insert SIM and a receiving antenna to receive network signals. It has RS232 interface which allows it to connect de-vices like PC, Raspberry Pi, microcontroller etc. This module can perform the basic functions of a mobile phone like receiving and sending messages, voice calls, and TCP/IP communication over GPRS based on the various AT commands. These AT commands can sent through the serial port on Raspberry Pi, thus functions such as dialing and answering calls, sending and receiving messages and surfing online can be done



C. IMPLEMENTATION

1) System Design



The basic aim of this system design is to continuously capture the surroundings under surveillance and if interference (any movement) is noticed, the message is sent to the user notifying him. To send the message we use GSM module's short message service (SMS) which is connected to Raspberry Pi through the RS232 serial port. A program is written for continuously capturing the surroundings using camera and comparing them with the image frame of time shift. This comparison detects the motion notifying through a message. Raspberry Pi will control all of the accessories at a time viz., Camera, PIR sensor and GSM module.

D. Algorithm

Raspberry Pi board uses Linux-Kernel operating systems supporting programming languages like C, Python etc., Python language is used in ARS system makes easy to communicate with a serial port, GSM modules.

GSM module responds to AT commands through serial communication. AT means attention. Set of AT commands perform different functions.

By following below steps the system is implemented:

- 1) Import all the required modules for serial communication
- 2) Initialize serial port for communicating with GSM module.
- 3) Communicate with a camera to read the images of the surrounding.
- 4) Camera image frames are captured when PIR sensor detects the motion of the object..
- 5) If motion is detected, then notification is sent.
- 6) If a motion detection fails, then surveillance continues.
- 7) Message is sent by GSM module which sends the notification to the user via email.
- 8) Raspberry Pi then clears off the message sent from GSM Module's temporary memory.

9) Then the surveillance continues.

II. HARDWARE AND SOFTWARE REQUIREMENTS

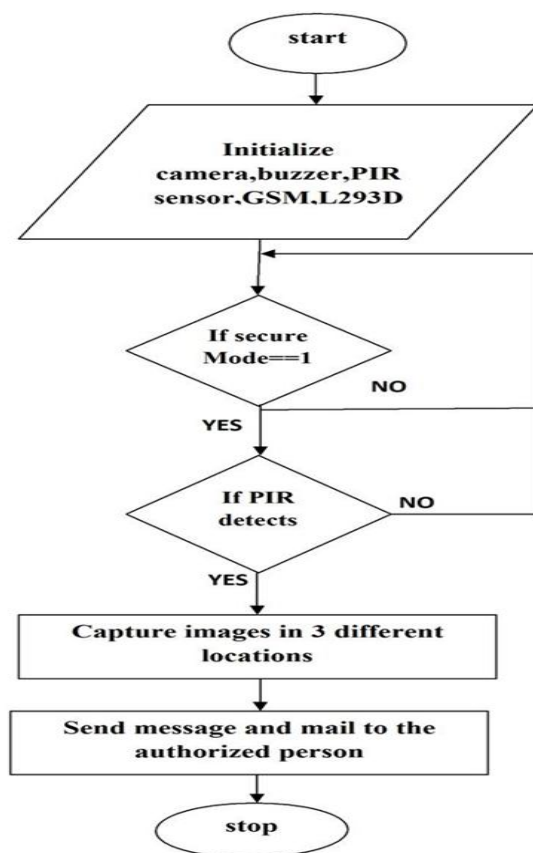
A. Hardware

- 1) *PIR sensor*: PIR sensors allow us to sense motion. They are small, inexpensive, low-power, and easy to access. For that reason, they are commonly found in appliances and gadgets used in homes or businesses. They can be referred to as PIR, "Passive Infrared", "Pyro electric", or "IR motion" sensors.
- 2) *L293D*: L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. The L293D has been designed to provide bidirectional drive currents of 1 A at voltages from 4.5 V to 36 V.
- 3) *Gear motors*: Gear motors are complete motive force systems consisting of an electric motor and a reduction gear train integrated. This greatly reduces the complexity and cost of designing. Gear motors allow the use of economical low-horsepower motors to provide great motive force at low speed such as in lifts, winches, medical tables, jacks, and robotics.

B. Software

- 1) *Linux (Raspbian Jessie) os.*: Linux is the most widely known and used operating system. As an operating system, Linux is the software that sits on top of all other software on a computer, receiving requests from those programs and relaying these requests to the computer's hardware.
- 2) *Python language*: Python is a wonderful and powerful programming language that's easy to use (easy to read and write) and with Raspberry Pi lets you connect your project to the real world. Python syntax is very clean, with an emphasis on readability and uses Standard English keywords. Start by opening IDLE from the desktop.
- 3) *Sd formatter (4.0)*: It is used to format all SD cards.
- 4) *Win 32 disk imager*: Win32DiskImager is an open-sourced Windows program for saving or restoring images from removable drives like USB drives, SD, and Memory card.

C. Flow Chart

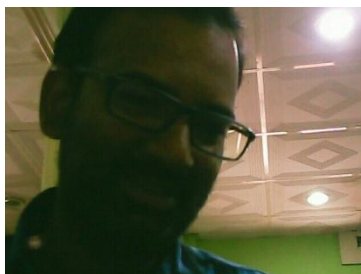


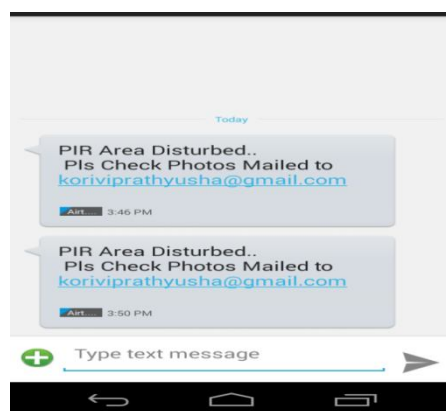
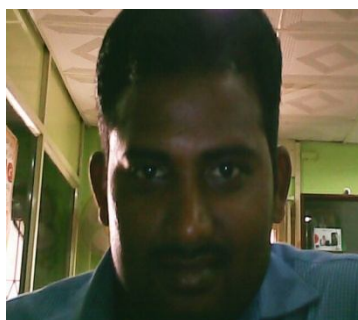
III. CONCLUSION AND FUTURE WORK

In the bank security system, night time surveillance becomes very difficult by using manual observation. This system can replace manual observation and notifies the security officials. The system can also be used in wide areas like industries and home security services. A direct application of the system i.e., surveillance with notification is explained in the application section. we are using just few features of Raspberry Pi. Raspberry Pi with its wide features can be used for multi purposes and have much scope for future work. This work can be extended in future to discover the people's identity under the surveillance or else it notifies the user as a suspect. This can be further extended to autonomous robotic surveillance also

VI. RESULTS

This system is practically tested and the results are obtained successfully
Results of this system are as follows





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