

Raspberry Pi Based Home Surveillance System using SMTP



N. Jeenath Shafana , Anupam Tiwari, Ramkesh Kasana

Abstract: Different Technologies are emerging in the field of Home Surveillance now a days. Surveillance systems are being used to reduce man power and to increase security of a home. Technologies like Computer Vision and Internet of Things (IOT) are one of them. In this project a surveillance system has been implemented employing a single board computer i.e. Raspberry Pi 3 which will act like a central processing unit with the help of python language and a module named as Open Source Computer Vision(Open CV).To make it more automated a local database of authorized persons has been made. It will store the images of the different authorized persons who can enter in that security area. Camera will be always in surveillance mode and it will be searching for a face persistently. It'll act as Computer Vision. This will lead to more accurate system with high efficiency. Therefore it'll capture the image of the person automatically and compare it with the local database. In the case of match, door will be open automatically otherwise in the case of unauthorized person, system will send the image of the unauthorized person to owner of the home via SMTP(Simple Mail Transfer Protocol). A local library in Python - "smtplib" is being press into service to send messages. The smtplib module characterizes a SMTP customer meeting object that can be utilized to send messages to any Web machine with SMTP(Simple Mail Transfer Protocol). Also a webpage has been made with the help of apache server to store the images of unauthorized persons.

Keywords : Internet of Things, SMTP, Open CV, Home Surveillance.

I. INTRODUCTION

Today many mortgage holders have a home observation framework. Generally these frameworks have been worked in a specially appointed manner with direct wired associations between the control place and the sensors. This is changing because of the utilization of neighborhood innovation for the interconnections (be they wired or remote) and the way that the controlling framework is progressively

associated with the Internet. The association with the Internet empowers property holders (and possibly others) to get to data gathered by the home security and observing framework from wherever. Some get-away houses are situated in country zones, and they may be utilized uniquely during excursion time or the House is bolted entire day because of their work and utilized distinctly during Night. Property holders can only with significant effort beware of the state of their home each day. In this manner, reconnaissance is expected to advise the mortgage holder if the house has been broken into. The administrations that can be given by such a framework can likewise be advantageous for families with kids. At the point when the youngsters play in various rooms, utilizing this reconnaissance framework the parent(s) can easily take care of their kids without much of a stretch as screen will show about presence of the kids inside the house.

The home reconnaissance framework additionally incorporates face location and acknowledgment process, face discovery incorporates recognizing the human face and acknowledgment incorporates coordinating the identified face with the substance of the relatives and arrives at the resolution whether they are relatives or not.

The procedure of face location helps the property holder in the accompanying way, whether the proprietor need to open the entryway or not. It provides opportunity to proprietor to see who are altogether drawing close to the entryway. In the event that the individual drawing close to the entryway is a non-relative, interloper ready message is sent to the proprietor through the email alongside the caught gatecrasher face which was taken close to the entryway.

II. TOOLSET

A system which can distinguish different faces and automatically verifies identity of a person comparing it with a database is known as Face Recognition System. In this project Open Camera Vision module are being used to identify a person. It'll open the door if it identifies a person otherwise captured image will be send to the mail using SMTP. openCV(Open Source Computer Vision Library) is an open source library of hundreds of computer algorithms. Complete structure of openCV is made up of different modules which are following

Core functionality(core): It defines basic data structure of multi-dimensional array mat and also includes some basic functions.

Image Processing(imgproc) : A module comprised of linear and non-linear image filtering, histograms, color, space conversion , geometrical image transformation and so on.

Video analysis(video): A module to estimate motion and to subtract background and to track object with the help of different algorithm.

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Camera Calibration and 3D Reconstruction(calib3d): A module comprised of 3D reconstructor, object pose estimation, single and stereo camera calibration.

2D Features Framework(features2d): It detects salient feature descriptor and descriptor matchers.

Raspberry Pi[3]: It is a Single-board PC with remote LAN and Bluetooth availability. It is the primary piece of the home observation framework. It has faster Ethernet, Power-over-Ethernet support (with separate PoE HAT), 1.4GHz 64-bit quad-core processor, dual-band wireless LAN and Bluetooth 4.2/BLE.

III. LITERATURE SURVEY

Paper 1. In the home automation framework (HAF) by Vikram N.[1], utilized ATmega microcontroller as base, and gives minimal effort for home mechanization framework. The HAF give us the security perspectives, for example, movement identification, gas spillage assurance, fire insurance and force sparing in the home.

Paper 2. Design and Implementation of Security Systems for Smart Home based on GSM technology by Jayashri Bangali [2], Security has transforming into a fundamental issue everywhere. Home security is getting the opportunity to be key nowadays as the potential results of interference are growing bit by bit. Prosperity from robbery, spilling of rough gas and fire are the most basic necessities of home security structure for people. A traditional home security structure offers the hints similar to alarm. In any case, the GSM (Global System for Mobile trades) based security structures gives improved security as at whatever point a banner from sensor occurs, a text is sent to a needed number to take basic exercises. This paper proposes two techniques for home security system. The fundamental structure uses web camera. At whatever point there is a development before the camera, it gives security alert in regards to sound and a mail is passed on to the owner. The subsequent procedure sends SMS which uses GSM-GPS Module and microcontroller, sensors, moves and signals. The GSM based home security structure has been arranged and attempted with the adaptable framework. The customer can go wherever through the GSM development therefore making the system territory self-sufficient. The correspondence of home is right through the SMS which has been attempted with the compact frameworks and is tackling any flexible framework.

Paper 3. The smart home surveillance by Eleni Isa, Nicolas Sklavos [3], gives us the savvy home idea which depends on Ethernet shield and ATmega 328 board. The procedure includes catching the photograph and stores it in the memory card, the ethernet shield introduces the association, the photograph is moved from the memory card to the interior support, lastly the shield plans the procedure, which will send the information through the Ethernet.

Paper 4. The Evaluation of Relevance Vector Machine Classifier for a Real-time Face Recognition System by Karthik HS, Manikandan J.[4], presents us about the machine learning based pattern recognition system which includes real time face recognition system. Relevance Vector Machine has been used in this paper which can be consider as the latest machine learning algorithm for the development of face recognition system with the help of histogram of oriented gradient features.

Paper 5. In Smart Surveillance System Using PIR Sensor Network and GSM by M. Sathish kumar [5], we learnt that

observation is the most basic security structure in-home, mechanical, office, and open spots. In this security structure relies upon the embedded structure close by GSM and sensor frameworks. The human advancement is perceived using the PIR sensors. In this time, the system triggers an alert distinctive the closeness of individual in a specific between the time of time and simultaneously sends the what number of individuals are intruder by methods for a message to the SMS through GSM Modem. Right when the security structure is instituted, the CCTV camera is activated. This exceedingly responsive methodology has low computational essentials. In this way, it is proper for a home surveillance system. This perception security structure completed using PIC scaled downscale controller, camera, GSM what're more, sensors. In this surveillance security system PIR sensor has been used which is a low force, and simplicity. It has a wide point of convergence expand, and are definitely not hard to interface with microcontroller. This security system can be realized in spots like home, office, shop, etc. Despite this, this system can be equipped with glass break locators to redesign the degree of confirmation. Usage of multi-sensor data blend and complex computation can be used to assemble the incredible FOV for greater spaces. With a particular ultimate objective to overhaul the region accuracy and to improve the system for setting up the PIR sensor banner, usage of more moving strategies, for instance, probabilistic hypotheses. For executing this structure there is a significant issue of having a framework in your cellphone moreover in the system that work to screen and security.

IV. PROPOSED SYSTEM

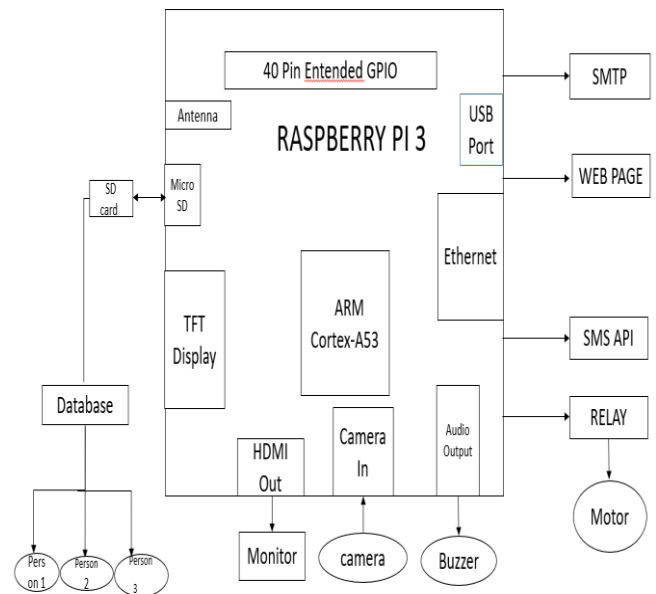


Fig1: System Overview.

In this proposed framework, as the camera is in reconnaissance mode naturally the individual picture will be caught as the individual comes in front of the camera, it will compare it with database and the database utilizing the convolution neural systems, where the precision will be very high and the speed will be more too. Face recognition is an important aspect of this project. The entire face acknowledgment stage can be partitioned in to 3 stages.

- I. Building a picture database of the individuals from the house.
- II. Identifying the countenances in the database and use it to prepare the face recognizer.
- III. Recognize faces in the caught edge and compare it with the prepared database.

Database of the pictures ought to be taken with various lightings and various articulations of the individuals else even the individuals from the house might be recognized as interlopers. All the pictures are put away in an envelope.

OpenCV contains numerous pre-prepared classifiers for face recognition which depends on Haar-Cascade based classifier. All the appearances in picture database is recognized, changed over to grayscale and spared.

The camera will be searching for a face consistently. On the off chance that a face is distinguished, that casing is contrasted and the prepared database and if a coordinating edge isn't found in the database, the present casing is caught and it is sent as a warning through the email to the proprietor.

V. RESULT AND DISCUSSION

On effective completion of this work, the building holder gets the notice with the movement distinguished casing alongside the time stamp on the edge. The essence of the individual is distinguished and perceived. The examination between the caught face and the appearances put away in the database is performed. The notice is sent to proprietor utilizing SMTP for both the movement identification and face acknowledgment to proprietor independently.



Fig 2: Output of the monitoring screen.

Above figure shows the output on the monitoring screen, when the person come in front of the camera it will automatically detect the person.

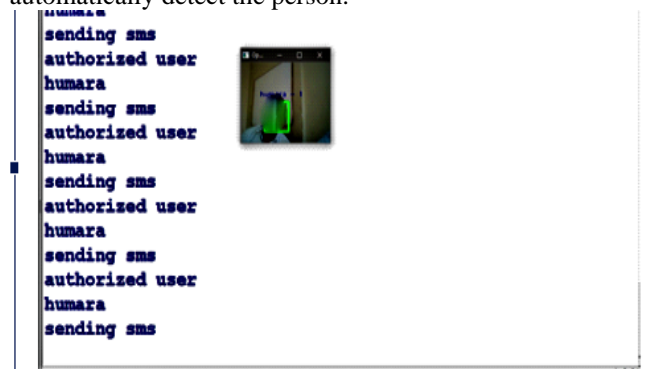


Fig 3: Comparing user with database

If the person is authenticated it will display the person name and also the status i.e. the person is authenticated or not as shown in the above image.

VI. CONCLUSION

According to this system, it makes our life easy and more secure as we can get the status of the person entering into the house from a remote area with the image of the unauthorized person through SMTP mail protocol and also a SMS API is made using TWILIO as it helps us to perform some agile techniques to share the information in this project. By using TWILIO's API we will be able to send, receive and able to track the delivery report of sent message. To make it more secure it uses basic authentication process of HTTP. In this manner it will act as indicating that a unauthenticated person is entered into the room.

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First Author N. Jeenath Shafana, received her M. E degree of Computer Science and Engineering from Anna University Chennai. She got University Rank in her ME respectively. Currently, she is working as an Assistant Professor in Computer Science and Engineering of SRM Institute of Science and Technology, Ramapuram Chennai. Her research area is focused on Cloud computing, Privacy preservation, Intrusion Detection System.



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