

A Smart Intruder Detection System

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Abstract:- Presumably, the most priceless asset of a city is its inhabitants and their things. An intruder detection system is the contemporary metropolitan idea which is totally essential for inhabitants of a framework to have a quality life. This intruder detection system is used to detect an intruder and generate the alert to the authorized person. Based upon this, the incident responder can investigate the issue and take the necessary action at the instant. Here in the system the PIR sensor senses motion of human beings and it is captured by using the Pi camera. The extracted face is recognized and it is then sent to the Raspberry Pi through HDMI cable. This system is well executed in Open CV- Python. The captured image is compared with the saved image of the authorized person in the database. The system can distinguish an authorized and unauthorized person by comparing. If it is found to be an unauthorized person, then system sends the recognized image to the owner whose authorized number we feed in the system, through email using Wi-Fi technology.

Keywords: Intruder detection, Image acquisition module, Image recognition, Raspberry pi.

INTRODUCTION

A human intrusion detection system is designed to detect an unauthorized entry into a building, shops or a protected area and deny such unauthorized access to protect personnel and property from damage or harm. Security systems are mainly used in inhabited, commercial, manufacturing, and army properties for protection against burglary or property damage, as well as private safety against intruders. This system provides proper detection of intruder and provides security. By using this system, we can reduce robbery by detecting the intruder. So we can respond quickly such that no harm takes place in our home. In the designed system, the camera is kept outside the room and the continuous video is captured by the camera. We designed our system in such a way that as soon as intruder enters the room, the processing takes place at the client. All of which could be enabled through the software or dedicated apps, and capture the intruder image by using the Raspberry Pi.

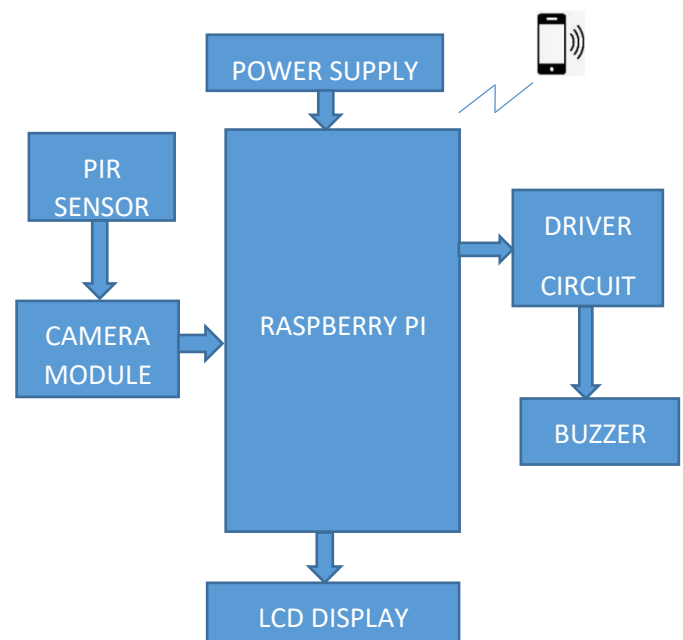
Camera only provides functions such as capture image, storage image and upload image for the user. The PIR sensor detects a movement of human and it sends the signal to the raspberry pi through its GPIO and we define what the Raspberry Pi should do as it detects an intruder through the Python coding. Our basic idea is to develop a system which will detect and capture the image of the intruder in the premises via raspberry Pi camera. Perform face recognition on the raspberry pi .It should immediately captured the image of the visitor and intruder if any. The users image it was already stored in the database .The system will compare the image with the datasets provided in the database. If the captured image is not matched with the dataset image, Raspberry pi sends commands to Pi

camera to click the picture and save it. After it, Raspberry Pi creates a mail and sends it to the defined mail address with recently click images. The email contains a picture of intruder as attachment.

EXISTING METHOD

There are many existing intruder detection systems for surveillance and security systems. They either need human intervention to detect intruder or need a long work for the installation and there is also a possibility of false alarms. In Surveillance system, the intruder is detected using the video recordable cameras which are already installed and stored in an external storage disk. But in this system needs a huge investment for installing, storing and monitoring the activities. Thought the occurrence of activity is less, the footage is to be deleted, after examining by the owner. This leads to waste of man hour as he should watch the complete video and this may lead to missing small details during analysis. We couldn't monitor the streaming video directly. The Automatic robbery/theft detection using smart surveillance in banks by V. K. Bhanse. They have used Raspberry pi is a single board PC to reduce the multi faced idea of system. [2]

BLOCK DIAGRAM



The other system is a radar-based human intruder detection system. Which uses radar to detect human intruders by transmitting pulses of radio waves or microwaves that will bounce off any object in their path. These systems are easily available and cost effective, but it causes radiation

radio signals are used, and the other type of burglar alarm systems which are electronic alarm, it is designed for alerting the owner during intruder enters. These are divided into several types, such as passive IR (PIR) motion detector system, ultrasonic motion detector system, glass-break detector system, photoelectric beam system, vibration sensor system. Even though, they do not require human support for detecting intruder, there is a possibility of false alarm. This may lead to unnecessary pressure to the owner. Those alerting systems are only alerted we couldn't find the image of the intruder. Image processing based intrusion detection and security enhancement by R.G.Bhavani. In this intruder detection the GSM module, Bluetooth was used to communicate data over the mobile operators. Using these modules the system alert the authorized person. The entry of OTP on the keypad, failing which the access was denied, treating the visitors as intruders. [1]

PROPOSED SYSTEM

The system consists of a Raspberry Pi and Pi camera which is used to acquire video continuously and taking a snapshot of intruder. The camera continuously monitors the area and acquires the video. From the acquired video, images are taken for every period of time. The obtained images are converted into RGB images. These pictures are again processed, to check whether the intruder is present or not. The processing stops in the case if intruder is not present. If the intruder is present, the system differentiates between pets and human beings. If not, the information is sent to the server. The server displays the images of intruder with date and time. And further, the processed image is compared with the database in the system. If the Person's image matches with the images in the storage of the system, the processing terminates. If not the user gets a mail and a message to the developed app which has status of the intruder's presence and the image of the intruder. From the app the user controls the system by giving an alarm from any place which helps to alert the people.

IMAGE ACQUISITION MODULE

When a person enters into the shop and sensor will be activated which in turn activates a hidden Pi camera. The camera will capture the image of the intruder and pass it to the microcomputer through HDMI cable for further processing.

FACE RECOGNITION

Face recognition is the process of verifying a person in the given digital image. In recognition phase, the mined face is matched with the images in the training set. If a match is not found, an mms is sent to the owner of shop including the image of the theft. This knowledge can be used to construct matching facial features by identifying the location and size of eye, mouth & nose bridge region and calculating the gradient of pixel intensities.

Input image is get from the Pi camera and we have to get the face alone from its backgrounds by removing areas other than the face in the image. There are certain characteristics that can be used for classifying a human face from the other portions in an image. These

characteristics are matched using Haar Features. The characteristics that are common to all human faces are:

- The eyes section tends to be duskier than the upper audacities
- The nose bridge is the brightest of all other regions in the human face



Fig 1. Intruder detection system

DETECTION AND EMAIL ALERT

Raising an alert when intruder detection happens and mailing the intruder image by utilizing JPG media document.

RASPBERRY PI

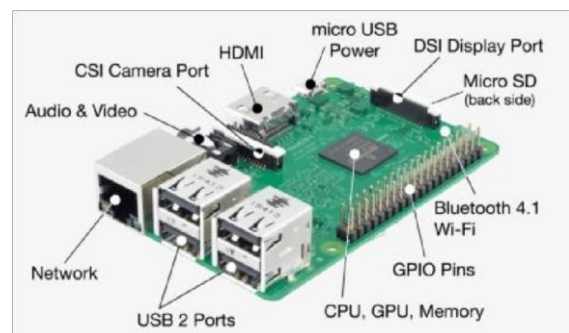


Fig 2. Raspberry pi

The Raspberry Pi is a credit-card sized computer. We can plug it into a computer monitor or TV, and uses a standard keyboard and mouse and used in place of CPU. It is low in cost and mainly used for students for learning programming languages like python and scratch. Raspberry Pi 3 is works on LINUX operating system. The board consists of many features and also has a very good processing speed which is suitable for advanced applications. It is a single board computer.

PI CAMERA



Fig 3. Pi Camera

The Pi camera is a handy and light weight and it supports Raspberry Pi. Using the MIPI camera serial interface protocol can communicate it with Raspberry Pi. It is normally used in image processing, machine learning or in surveillance projects .this 5MP camera delivers outstanding photos but can also shoot video, ideal for drones or a CCTV project.

PIR SENSOR

A Passive infrared sensor (PIR sensor) is an electronic sensor that actions infrared (IR) light transmitting from objects in its field of view. They are regularly utilized in PIR-based movement identifiers. PIR sensors are normally utilized in security alerts and programmed lighting applications.

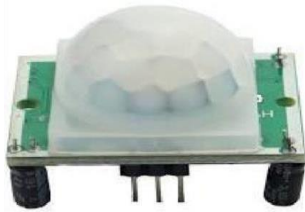


Fig 4. PIR Sensor

EXPERIMENTAL RESULTS

Raspberry PI interfaced with sensor and camera module. After the shop is closed .The system will be started .PIR sensor detects the person and using the camera the face is detected and compares with the predefined database .If it is an intruder, then it will send the call alert and the image of an intruder will send to the owner through Wi-Fi. At the same time the buzzer will ON in the surrounding of the shop.

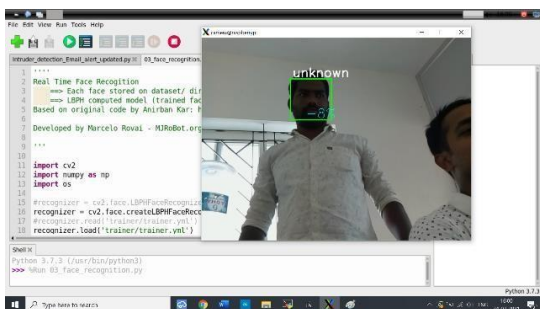


Fig 5.Output of face recognition

CONCLUSION

Our framework would right away tell the client about the in-house situation alongside the live streaming. The framework consolidates security utilizing IoT (Internet of Things). The security module effective sends notices after distinguishing intruder utilizing wireless and wired procedures where administrator /owner further can make essential moves along these lines upgrade accommodation and security, save energy proficient.

REFERENCES:

- [1] Sivakumar, Swetha, and R. GomathiBhavani. "Image Processing Based System for Intrusion Detection and Home Security Enhancement." In 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), pp. 1676-1680. IEEE, 2018.
- [2] Bhanse, Vivek Kishor, and M. D. Jaybhaye. "Face Detection and tracking using Image processing on Raspberry Pi." In 2018 International Conference on Inventive Research in Computing Applications (ICIRCA), pp. 1099-1103. IEEE, 2018.
- [3] Kakadiya, R., Lemos, R., Mangalan, S., Pillai, M. and Nikam, S., 2019, June. Ai based automatic robbery/theft detection using smart surveillance in banks. In 2019 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA) (pp. 201-204). IEEE.
- [4] Wang, Jin-xiang. "Research and implementation of intrusion detection algorithm in video surveillance." In 2016 International Conference on Audio, Language and Image Processing (ICALIP), pp. 345-348. IEEE, 2016.
- [5] Tian, Y.L., Brown, L., Hampapur, A., Lu, M., Senior, A. and Shu, C.F., 2008. IBM smart surveillance system(S3): event based video surveillance system with an open and extensible framework. Machine Vision and Applications, 19(5), pp.315-327
- [6] Cuppens, F., &Miege, A. (2002, May). Alert correlation in a cooperative intrusion detection framework. In Proceedings 2002 IEEE symposium on security and privacy (pp. 202-215). IEEE.
- [7] Bhardwaj, R., Bera, K., Jadhav, O., Gaikwad, P. and Gupta, T., 2018. Intrusion Detection through Image Processing and getting Notified Via SMS and Live Streaming.
- [8] Menaga,S., Paruvathavardhini.J., Kalaivani, P. and Haribabu, S., 2019. Air quality monitoring system using vehicles based on the IoT. IRJET, 6(3), pp.3250-3254.
- [9] Himel, M.S., Bar, K. and Bappy, M.H., 2019. Human Face Recognition Using Image Processing.
- [10] Sharma, R., Kumar, D., Puranik, V. and Gautham, K., 2019, April. Performance Analysis of Human Face Recognition Techniques. In 2019 4th International Conference on Internet of Things: Smart Innovation and Usages (IoT-SIU) (pp. 1-4). IEEE.
- [11] Tabrizi, FaridMolazem, and KarthikPattabiraman. "Intrusion Detection System for Embedded Systems." In Proceedings of the Doctoral Symposium of the 16th International Middleware Conference, pp. 1-4.2015
- [12] Shivakumar, D., Gayathri, P., Muthukumar, M. and Menaga, S., 2020. Measurement of Temperature and Humidity Using DHT11 Sensor. Journal of Advancement in Communication System, 2(3).
- [13] Dugad, Shashikant, VijayalakshmiPuliyadi, HeetPalod, Nidhi Johnson, Simran Rajput, and Swapna Johnny. "Ship intrusion detection security system using image processing & SVM." In 2017 International Conference on Nascent Technologies in Engineering (ICNTE), pp. 1-7. IEEE, 2017.
- [14] Kongurrsa, Nawin, NarumolChumuang, and MahasakKetcham. "Real-Time intrusion—Detecting and alert system by image processing techniques." In 2017 10th International Conference on Ubimedia Computing and Workshops (Ubi-Media), pp. 1-6. IEEE 2017.