Smart Surveillance System Using Tensor Flow

Chetan B V[1], Bharath P K[2], Akarsh S A[3], Mayur Vernekar[4], Nikhil Swamy B K[5]

Assistant Professor, Dept. of ECE, GM Institute of Technology, Davangere, India[1]

Final Year Students, Dept. of ECE, GM Institute of Technology, Davangere, India[2,3,4,5]

Abstract: In this modern era, surveillance security camera system plays a vital role in day-to-day life, as it full-fills the safety aspects against burglary, theft related problems and reduces the need of the watchman. This work proposes a smart surveillance system that would act as a solution for security issues. The proposed system for smart surveillance involves a security camera with the night vision capabilities interfaced with raspberry pi. OpenCV is used to perform real-time image processing. This system proves to be a cost-effective way of surveillance, as it uses a credit card-sized chip Raspberry Pi (RPI). The methodology of the proposed system involves breaking down a video, captured by the camera in real-time, into separate frames. Each frame is processed using image processing tools in python. The pre-processed images (frames) are compared for change in pixel values, to detect the movement of an object. Then, an object detection algorithm like Tensor Flow is used to detect the object and classify it. Later, a buzzer is actuated to cognize the security system and personnel. Also, an alert notification is sent to the owner.

Keywords: Tensor Flow, Raspberry Pi, OpenCV, Python

I. INTRODUCTION

One of the most important concerns in the modern day world for homes or businesses is security. In India approximately 2,44,119 burglaries are reported in year 2017. This was a jump over 10% from 2016. When a number of such cases stood at 2,20,854. The financial loss due to these thefts and burglaries are staggering. In 2017, value of property stolen from residential premises was in excess of Rs. 2065 crores, a 40% jump from Rs. 1475 crores stolen the previous year. Indeed, home safety is a serious concern for the residents as well as the police and the authorities. Hence, in order to encourage people to protect their homes against threats like robberies, burglaries and thefts.

The Idea focuses on addressing home and business security concerns by the providing a motion detection and object detection solution using Raspberry Pi. The Raspberry Pi is a small- sized computer (almost the size of a credit-card) that has the ability to plug into a computer monitor or any other display and can be connected keyboard and mouse for operation. It has an operating system called Raspbian OS and can be a very handy system to run applications in programming languages like Scratch and Python, camera is interfaced to the raspberry pi for the image acquisition. It acts as a man in the middle or a secure intermediate entity in the security crises. It's a low latency real time system which is of a great need for the generation. The system would cognize the security when the motion of the object is detected.

II. RELATED WORK

Suthagar S et. al [1] proposed system opted model raspberry pi 2 which has operating speed 900MHz. This system also used a pi camera. So the image is captured via the pi camera and it is send to the raspberry pi 2 for processing for face and human detection with the help of openCV. Then, the face detected is compared with the database, if the human detected is known (visitor) or not (stranger) and based on the output, an audio output is produced and a message is sent to the user.

Chinmaya Kaundanya et. al [2] proposed model uses Raspberry Pi, camera module is used to capture images once the motion is detected by the PIR Sensor. This system will monitor when motion detected and checks for the faces in the image captured and with the help of face recognition alerts if the face detected is not stored in the database.

Yongseok Yoo et. al [3] proposed system has a new feature based on signed difference, which represents the pattern of motion in a given region. The pattern is measured by calculating the Earth Mover's Distance between regions with opposite signs in the signed difference. The robustness of the perceptive metric is exploited to detect moving objects accurately. We also propose an efficient algorithm to approximate the value along four given directions and to locate the regions of moving objects.

The proposed algorithm by Garima Mathur et. al [4] was implemented on a captured video sequence. Object was detected first according to the image input, and then tracked in subsequent frames. The experimental implementation

could perform the object tracking without missing any frame and could successfully overlay bounding box. It could successfully generate an image sequence after the complete implementation of Mean Shift Algorithm.

The system proposed by Norharyati binti Harum et. al [5] camera works as a sensor to detect motion. The motion is detected by image processing techniques; background subtraction technique. The technique is applied by comparing two different captured images using Pi. No IR camera. The system can be controlled from anywhere using Telegram application, and users will receive alert message with video using the application easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

III. PROPOSED METHODOLOGY FOR SMART SURVEILLANCE

In this work, raspberry pi is used as the main computing system and for image acquisition digital camera is used. Later on, the image acquired or the frames acquired from the real-time video will be processed using the image processing tools in python. Using the object detection algorithm the object is detected and then the movement of the same is detected by comparing the frames obtained in real time and thus giving us the surveillance system which is low latency, low cost and effective to cognize the security. Fig. 1 shows the block diagram of the proposed smart surveillance system using Raspberry Pi. The block diagram depicts all the hardware blocks and components used for the proposed system for smart surveillance. Fig. 2 shows the flow of the embedded software/program in raspberry pi for implementing the proposed surveillance system.
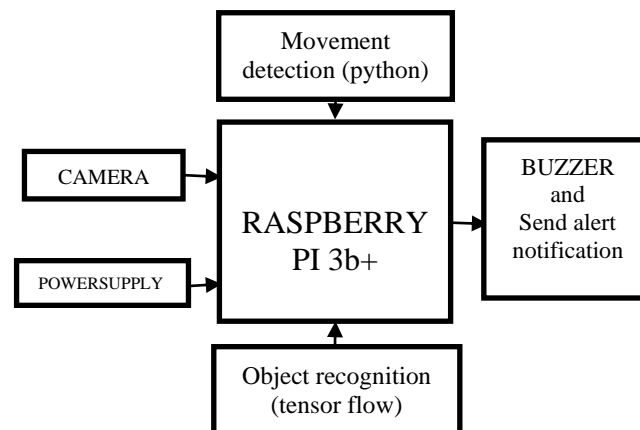
Fig. 1 Block diagram of the proposed smart surveillance system based on Raspberry Pi
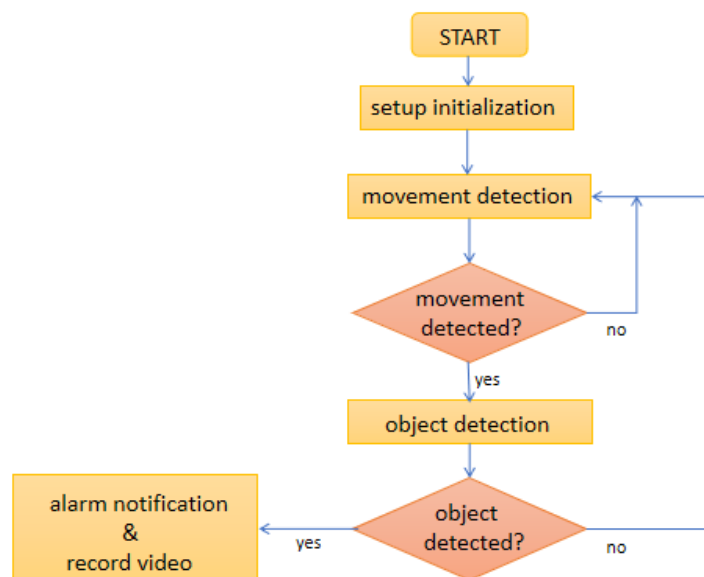
Fig. 2 Algorithm of the embedded software used for the implementation of the proposed smart surveillance system

IV. RESULTS AND DISCUSSION

There are two objectives to be achieved through the proposed smart surveillance system. First objective is to detect an object and classify it. Second objective is to detect the movement of the object. The proposed smart surveillance system is tested for classification of about 80 objects successfully. A test case of detecting a human, recognizing the human's movement and cognizing the alert system is presented here. Fig. 3 depicts the result of successful detection of a human in the frame captured by the security camera. Fig. 4 depicts the result of detection of movement in the object classified as human. Fig. 5 depicts a sms that indicates a detection of a person by the security camera. This indication of sms can be considered as an alert notification cognized by the proposed smart surveillance security system. This system could be used for various security related applications like banks, public utilities, warehouses etc. Thus, by the capability of the proposed system to perform surveillance in a smart way, the security personnel can get an aid to perform their duties more efficiently.
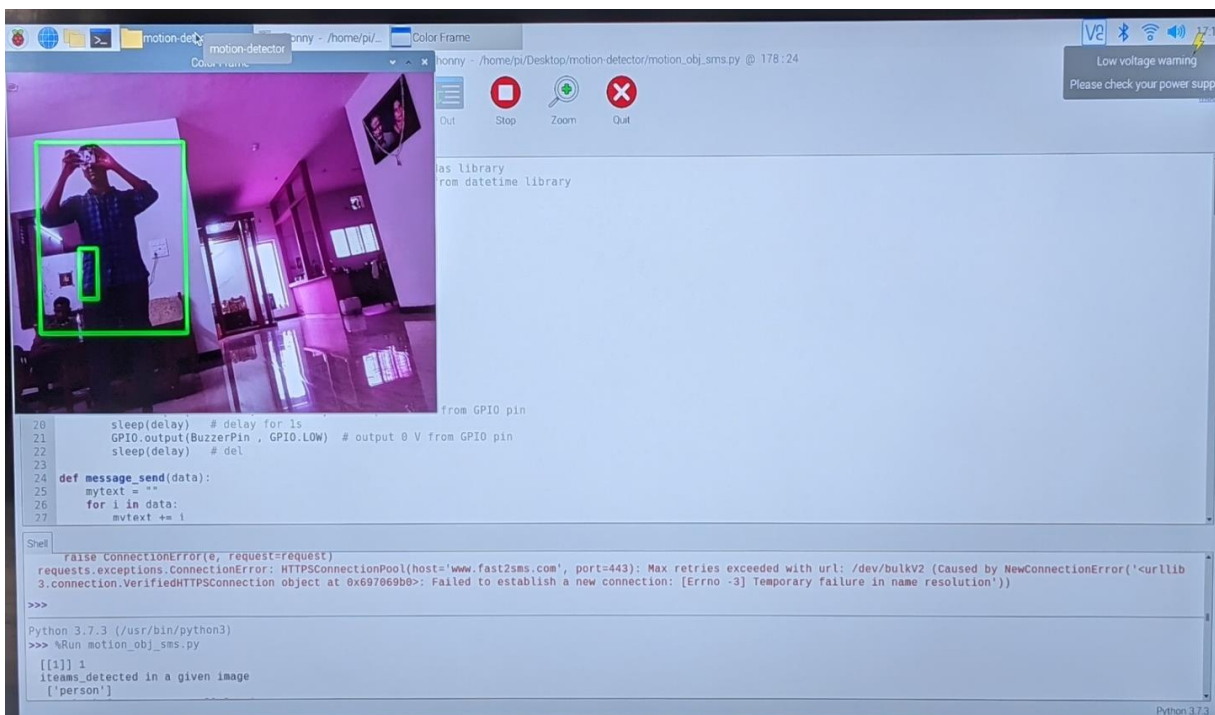

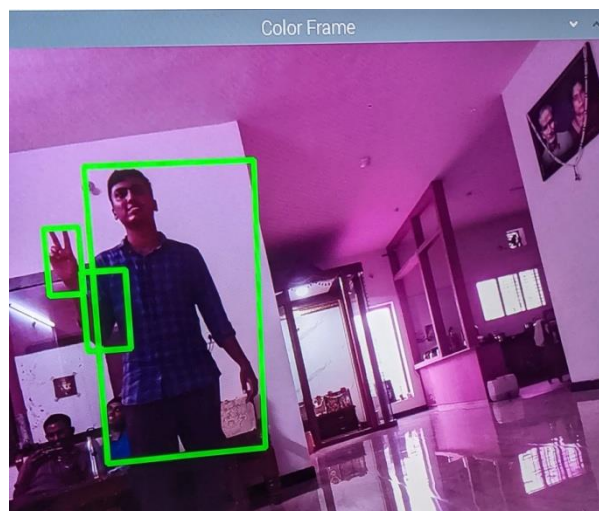Fig. 3 Detection and classification of the object as human

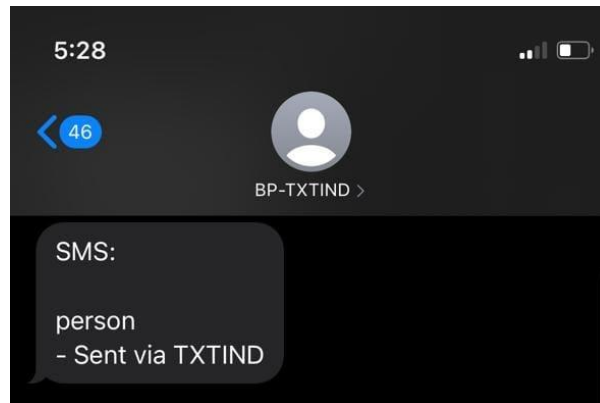Fig. 4 Detection of movement after classification of the object as human

Fig. 5 Alert notification via sms by the proposed system after detection of movement of human

V. CONCLUSION

A smart surveillance system based on the raspberry pi using tensorflow and openCV technologies has been implemented in this work. The proposed system is tested for detection and classification of about 80 objects. Also, after the successful classification of an object as a human being, the movement of the human being can be successfully detected by the algorithm used. The alert notification can be sent to a distant user through a sms. The proposed system act as a breakthrough in the security systems of today's world by enabling smart and hassle free surveillance. The proposed system could be adopted for many applications like banking security systems, warehouse monitoring, home security systems and others.

REFERENCES

[1]. Suthagar S, Augustina Shaglin Ponmalar,Benita Banupriya, Beulah ,"Smart Surveillance Camera Using Raspberry Pi 2 And Opencv", IJARTET, Vol. 3, Special Issue 19, April 2016.
[2]. Chinmaya Kaundanya, Omkar Pathak, Akash Nalawade, Sanket Parode, "Smart Surveillance System using Raspberry Pi and Face Recognition" IJARCCE, Vol. 6, Issue 4, April 2017.
[3]. Yongseok Yoo, Tae-Suh Park,"A Moving Object Detection Algorithm for Smart Cameras", IEEE, 2008.
[4]. Garima Mathur, Devendra Somwanshi, Dr. Mahesh M. Bundele,"Intelligent Video Surveillance based on Object Tracking", IEEE, 22-25 November 2018.
[5]. Norharyati binti Harum, Mohanad Faeq Ali, Nurul Azma Zakaria, Syahrulnaziah Anawar, "Smart Surveillance System using Background Subtraction Technique in IoT Application" IJACSA, Vol. 9, No. 12, 2018.
[6]. Wilson Feipeng Abaya, Jimmy Basa, Michael Sy Alexander C, Abad, Elmer P. Dadios ,"Low Cost Smart Security Camera with Night Vision Capability Using Raspberry Pi and OpenCV", IEEE , NOVEMBER 2014.
[7]. Ali A. Abed , Sara A. Rahman , "Computer Vision for Object Recognition and Tracking Based on Raspberry Pi" ICCIIDT , OCTOBER 2016 , pp 177-189.
[8]. B. Madhuravani, M.Rashmika, Dr. P. Bhaskara Reddy ,"Motion sensor and face recognition based surveillance system Using Raspberry Pi" IJARCS, Volume 8, No. 5, May – June 2017.
[9]. Adarsh Prabhakar Chantar, Charan G Bhaktha, Manjunath S G, Manojkumar H M, "Home Surveillance System using Raspberry Pi", IRJET, Volume: 04 Issue: 04 Apr -2017.
[10]. Tuntun Juhanai , Vivi Gusti Anggraini, "Design and Implementation of Smart Home Surveillance System" IEEE, 2016.

BIOGRAPHIES

Chetan B V is Assistant Professor in the Department of Electronics & Communication Engineering, GM Institute of Technology, Davangere with 9 years of experience. He has received B.E and M.Tech degrees from VTU, Belagavi in 2010 and 2012 respectively. His research interests include Digital System Design, Embedded Systems, Image Processing and Pattern Recognition.

Bharath P K, Akarsh S A, Mayur Vernekar and Nikhil Swamy B K are final year B.E students in ECE department, GM Institute of Technology, Davangere. They have good research interests in the field of embedded systems and IoT.