IoT Based Smart Surveillance and Automation

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Abstract - *In this paper, we introduce a compact and complete solution to this problem, all packed in single Raspberry Pi by implementing an effective object detection model using Machine Learning and integrating it with advanced Image Enhancement technology, opencv to detect any human activity even under adverse conditions, it will start recording only if a person or a movement is identified and stop recording once there is no movement. This technique will improve the system's efficiency in terms of reducing the storage needed for saving recordings, and reducing the processing and searching time in the recordings. Body temperature of the person is recorded, In case of increased body temperature readings it will trigger an alert system to notify the owner.*

Key Words: Machine learning, Raspberry pi, OpenCV, IoT

1. INTRODUCTION

Video Surveillance systems have been an extremely essential part of security systems installed in all types of offices, schools, hotels, businesses and even people's homes.

A real-time surveillance system is designed and realized by using Raspberry Pi. The cheap price, low power consumption, and the availability of open-source software are major merits of using Raspberry Pi in developing applications. Thus, it has been widely implemented in the development of IoT technology, as its reliability and available information on the Internet.

Recent cameras that record when a movement is detected save storage rather than recording all the time. These new features of recording methods in the recent cameras indeed have affected its prices. Even though recording videos depending on detecting a movement has enhanced the efficiency of the surveillance system, it still consumes large storage. Thus, the need for a camera that records only humans has emerged. We will interface an IR temperature sensor and send the email alerts with the image of the person if the temperature of any particular person exceeds the set value.

There is a requirement for a savvy and astute framework that is ought to identify any vindictive action and quickly report to essential individuals to carry out responsive actions.

Since the corona outbreak, scanning body temperature has become the "new normal" to tackle the current Covid19 pandemic. There are many temperature guns available in the market, but none of them gives any alert or email notification to higher authorities to take action when the temperature exceeds a particular limit. A traditional security camera system provides excellent support to the security of any home or business but can entirely be expensive.

2. LITERATURE SURVEY

Initially, many Security Systems such as RFID, OTP-based systems, and biometrics were used to prevent unauthorized access. But sooner, people realized merely preventing unauthorized access was not enough and there was a need to come up with systems that would aid in catching the intruder, while also unfolding their motives.

Similar PIR-based systems triggered camera and sensor networks on motion detection, then uploaded captures to the cloud server and sent alerts using GSM technology.

All of the above solutions were heavily hardware dependent which is subjected to high-risk failure. Also, these solutions usually require a PC along with Wi-Fi DSP Kit which should be continuously ON for 24 hours, this leads to higher power consumption and also involves additional charges for every alert being sent.

3. Our Proposed Method

The smart system is based on Raspberry Pi 3B adopts the Internet of Things architecture and combines several sensors and devices for room security to set up a safer environment. In this proposed system, we introduce a compact and complete solution to this problem, all packed in a single Raspberry Pi by implementing an effective object detection model using Machine Learning and integrating it with advanced Image Enhancement technology and OpenCV libraries to detect only human activity even under adverse conditions. MLX90614 IR

temperature is connected to raspberry pi, which will measure the body temperature. This will trigger the alert system and send SMS/Mail. Also, the entire data is being collected by this system.

We have leveraged the power of IoT and built a Temperature Monitoring device with Email alerts using Raspberry Pi, MLX90614, and PiCamera.
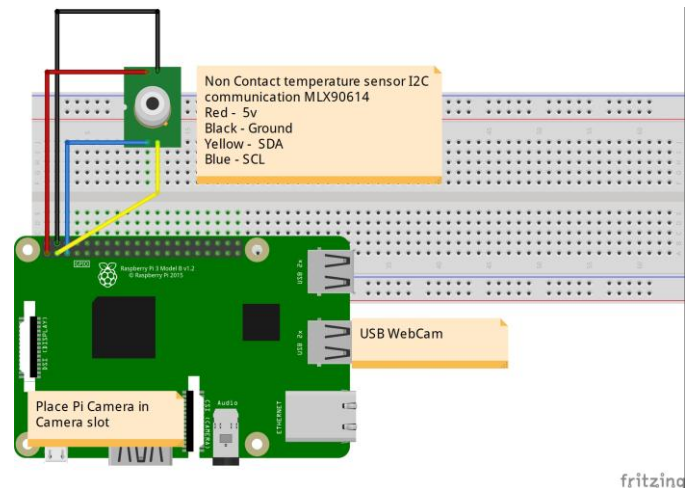
An innovative surveillance system is powered by the Raspberry Pi 3B that provides results with minimal latencies.

There are 6 steps involved in the working of our model:

1: Body Temperature is Recorded

2: Input Camera Feed

3: Background Subtraction

4: Detection

5: Start Video Recording and Upload to drive

6: Alert using SMTP protocol
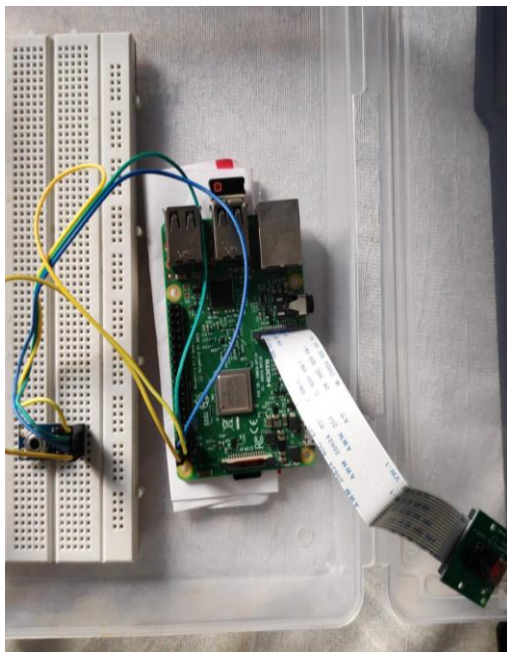
**Figure 1**- Proposed Model

Figure 2- Circuit Diagram

3.1. Contactless Body Temperature Monitoring.

Since the corona outbreak, scanning body temperature has become the "new normal" to tackle the current Covid19 pandemic. There are many temperature guns available in the market, but none of them gives any alert or email notification to higher authorities to take action when the temperature exceeds a particular limit.
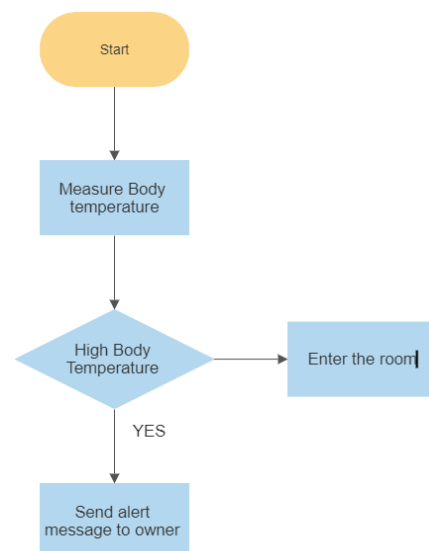

Figure-3: Body temperature measurement

3.2 BACKGROUND SUBTRACTION

Background subtraction (BS) is a common and widely used technique for generating a foreground mask (namely, a binary image containing the pixels belonging to moving objects in the scene) by using static cameras.

The background of our video stream is largely static and unchanging over consecutive frames of a video. Therefore,

if we can model the background, we monitor it for substantial changes. If there is a substantial change, we can detect it. This change normally corresponds to motion on our video. The input video is taken from a USB WebCam connected to Raspberry Pi, the very first frame is considered as background frame which is updated after particular intervals is compared with the current frame and if detection is above the threshold value the system starts video recording and stops when there is no detection involved.
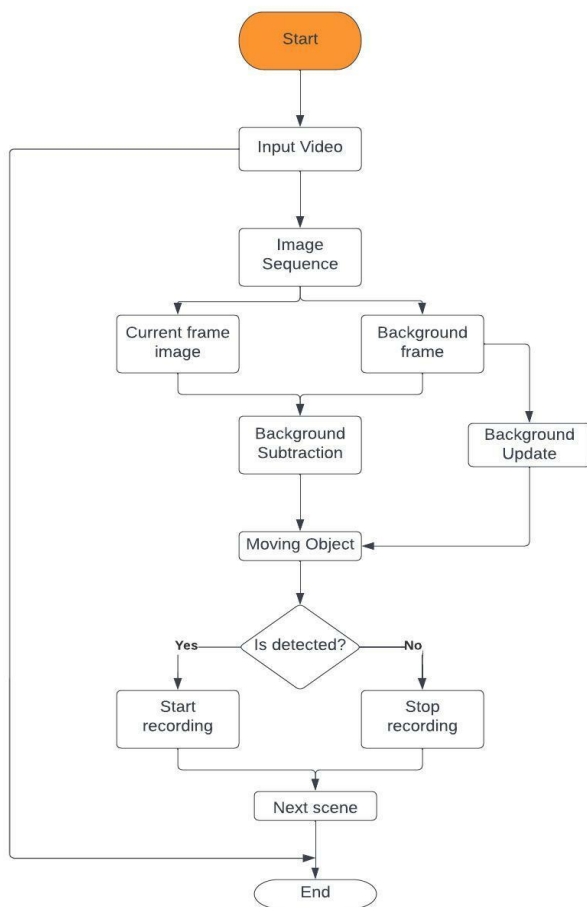
Figure -4: Background subtraction motion detection

3.3 SMTP & GOOGLE DRIVE API

SMTP is a Simple Mail Transfer Protocol which is an application layer protocol responsible for email service using TCP/IP. It provides the ability to send and receive e-mail messages and is managed by the Internet Engineering Task Force(IETF).

Google Drive API allows you to create apps that leverage Google Drive cloud storage. You can develop applications that integrate with Google Drive, and create robust functionality in your application using Google Drive API.

4 RESULTS AND DISCUSSIONS

The system uses a three-tier architecture, where the first tier is the algorithm running to detect motion that keeps constantly running in a loop triggering certain functions when deemed necessary.

The second tier is the database and cloud storage which stores important data in cloud or SD card.

It also includes the e-mail servers that aid in notifying the user in real-time.

The third and final tier is the part of the system that experiences user interaction. An IR temperature sensor sends email alerts with the image of the person if the temperature of any particular person exceeds the set value.
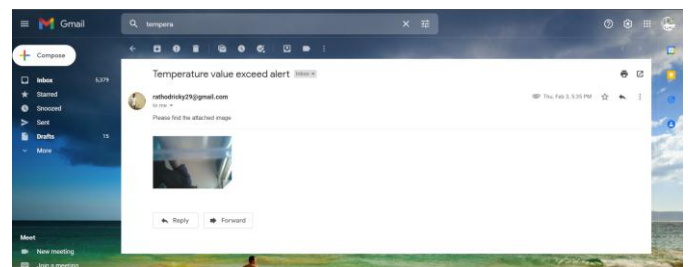
Figure 5- Body temperature Email alert
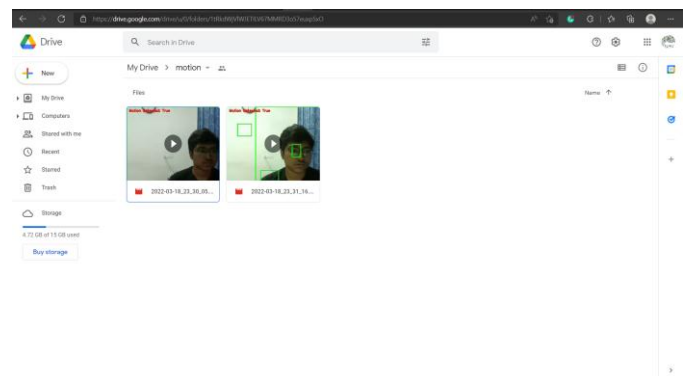
Figure 6 - Video uploaded to drive

3. CONCLUSIONS AND FUTURE SCOPE

The implementation of security cameras typically requires running cables, as referenced in a past post, and includes extensive labor and initial installation typically brings with it a heftier price tag.Our proposed system provides a cost-effective solution to the problem with a total system cost of Rs 5600 all packed in a single Raspberry Pi by implementing an effective object detection model to detect any human activity even under adverse conditions which only records when any human is detected, the body temperature of the person is recorded while entry and exit

from premises, triggering an alert system when increased body temperature is detected. This technique will improve the system's efficiency in terms of reducing the storage needed for saving recordings, and reducing the processing and searching time in the recordings.

Automatic door lock when any theft is detected in surveillance mode and when the body temperature of the user entering the room is high. For further improving this system we can develop a mesh network with thread protocol based on IPv6 using 4K Ultra HD cameras to enable face recognized door open system using IoT components and also use the other benefits of the face recognition system. Real-time video stream available through a monitor.

4. ACKNOWLEDGEMENT

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