

An Efficient And High Throughput Aws Based Face Recognition Using Open Cv

¹Prof.K.Dhanunjaya, ²Uppala Sumanth

¹ H.O.D, Department. of ECE, Audisankara College of Engineering & Technology, Gudur, Nellore Dist.,A.P.

² PG Scholar, Department. of ECE, Audisankara College of Engineering & Technology, Gudur, Nellore Dist.,A.P.

dhanu.karumanchi@gmail.com¹, sumanthuppala123@gmail.com²

ABSTRACT:

Face recognition in a real-time setting has an exciting area and a rapidly growing challenge in today's world, face recognition is an significant part for the determination of security, Biometric and surveillance system. So, there is a requirement for an enhanced and cost effective system for improving better results. This concept goal is to discover the feasibility of implementing Raspberry Pi based face recognition system using efficient face detection and recognition techniques such as Principal Component Analysis, Haar detection. Open CV, AWS S3 server with SES and Crontab are used here to implement proposed architecture. Power optimization is another goal in this concept by introducing power gating technique. Here combination of both PIR and IR sensors are used to detect living body in front of camera. Camera power will on and capture the forth pose if and only if both PIR and IR are activated. While in positive scenario, servo motor is used here for indication purpose; while in false scenario, Detected image is stored in local host as further evaluation of taking decision for uploading stored image to AWS S3 server with the help of Crontab application frame work. As well automated mail will be forwarded to admin using AWS SES.

KEYWORDS: Raspberry-pi, Amazon Web Services, Haar detection, Principal Component Analysis, Amazon Simple Email Service, Crontab, Open CV, surveillance system, Biometric, Client/Server, Passive Infrared.

INTRODUCTION: The information age is quickly revolutionizing the way transactions are completed. There is a need for a faster and accurate user identification and authentication method. Face recognition has become one of the most important user identification methods. Literature survey statistics shows that research work in face recognition system is in its booming era, and in the past forty years, the research in this field has increased exponentially. over biometric framework like unique finger impression or iris acknowledgment. The human face assumes a significant job in our everyday life, passing on individuals distinguish. Each individual has their very own face character. This paper utilizes strategy which absolutely autonomous on outward appearance which influences on acknowledgment framework. Web cam snap a photo and utilizing face descriptor apparatus face acknowledgment finished with database which previously put away on raspberry pi [1] and data showed on yield screen Face descriptor apparatus utilized for face acknowledgment with three perspectives as recognize a face to follow, distinguish facial element to track and track the face [4] Feature extraction is dimensionality decrease system. This methodology is helpful when picture size are bigger. Fundamental point of highlight extraction is to speak to the data of unique picture in lower dimensionality space with tasks, for example, edge detection, corner detection of picture. Computer-based face detection and recognition systems are rapidly spreading is various sectors such as malls, universities, and ministries. The goal of this research is to build a system that can detect and recognize faces of people using image-processing techniques[6]. Practically, this idea can be implemented in large places to provide security. Face recognition which is a combination of machine learning and the biometric techniques which holds the qualities of not only high precision but also the reliability. For automatically detecting the human's face from the databases this system can be used[8]. In recent years open computer vision has been widely used in different kinds of applications such as

surveillance camera, robotics etc. This technology is used for authentication, validation, authorization, and identification. In developed countries, the government creates a datasets which is helpful for recognize the human face which compares the suspicious act with trained dataset and information stored in database. The core concept of Face detection [1] is to give computer an ability to find human faces in a video or an image seamlessly. Over the years numerous algorithms have been proposed and developed to improve the face detection efficiency. Human brains can instantly recognize and detect faces but when it comes to computers there is always a challenge. Face detection systems are affected by extreme lightening, pose variation, and large variation in faces. Face Recognition [2] is used widely in Biometrics scanner and security system. Especially in biometrics faces of an individual are matched to the existing ones in the database. Important facial features are extracted in the first stage of an algorithms, there are modifications done in feature extractions and algorithms to improvise the efficiency of the detection. Computers and Embedded systems which detect faces are widely used in variety of applications like identity verification. criminal identification, security systems. Manywell-known biometrics-based identification and verification techniques existed. Fingerprints, facial features, and iris have been employed in various security applications. Face recognition is considered a good choice biometric technique For vehicle security and alarm systems because it based on human face feature information and can work under different conditions [6]. Therefore, most of the face recognition techniques have been developed to achieve a higher rate of discrimination [7].

LITERATURE SURVEY:

In [1], a face detection system using Raspberry Pi was developed. Authors did not approach face recognition implementation due to complexity of the recognition process, since recognition process would need more powerful resources to accomplish better results. In [2], the authors were able to switch from the closed-circuit television CCTV graphical processor to a computer graphical processing unit GPU, and embed the security cameras into the computer GPU. In [3], authors attempted to detect faces in a digital image using various techniques such as skin color segmentation, morphological processing, template matching, Fisher linear discriminant (FLD), and Eigen face decomposition [7]. Face identification [8] is defined in three steps (1) face detection (2) feature extraction (3) face recognition. Camera configuration is very important to track moving persons and recognize [9] them precisely. Facial feature points encode critical information about face shape. Precise location and facial feature points tracing are important. Each feature point is usually detected and traced by performing a local search for the better matching position [10]. There are very less researches on face recognition using edge-based detection [11]. The edges are not only carrying valuable data about face but are also simple to process. The Viola Jones method builds a classifier by selecting a few significant features using AdaBoost. Viola jones method successfully merges more composite classifiers in cascade structure [12] which exponentially increases speed of detector by focusing on the favourable features of the face. The most famous sample of cartography is Bing Maps or Google Maps, which is a useful service for people. Along these lines, Computer Vision is programmed for perceiving some specific parts in maps: for example roads, water, buildings, or fields. This is an instance of how to relate Computer Vision in Smart Earth [13]. Prof. Vijay Bagdihave, Ms.RenukaChumurkar showed a smart monitoring system utilizing PIR sensor, Raspberry Pi, and mobile device. They likewise should utilize smoke detector for detecting fire. After capturing the image to customer mail via Wi-Fi, user will be alerting about the fire or thief. They used smoke discovery algorithm and background subtraction algorithm for motion detection [6]. The image of a person sent to twitter and email after captured [14].

PROPOSED METHOD:

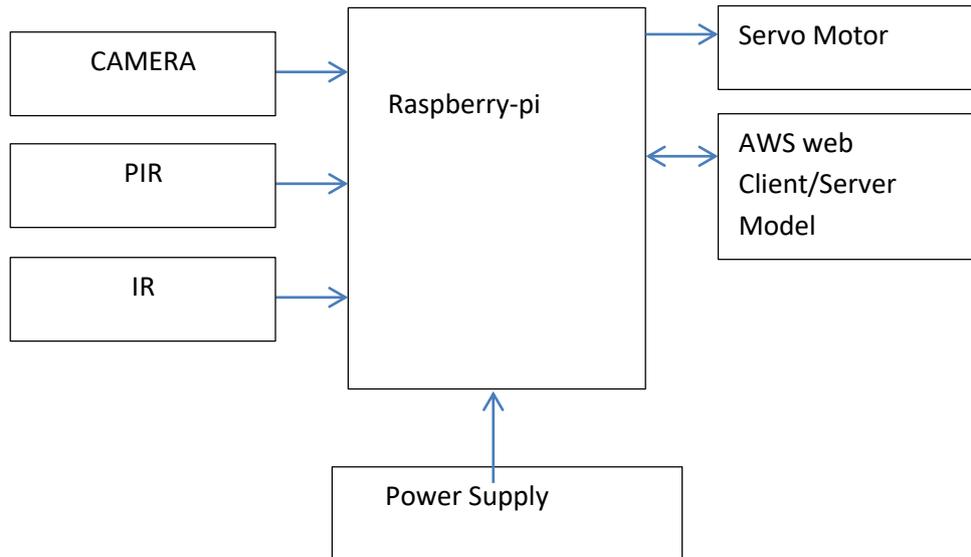


Fig1: AWS based Face recognition system

This project is going to develop face detection and recognition system that is capable of processing images very fast while acquiring very high true positive face detection rates. Object recognition frameworks have been tried crosswise over different standard face databases, with and without noise and other obscuring effects. The outcome of Object recognition frameworks uncover that well utilized face recognition even from low quality pictures and shows astounding[5] execution productivity, monitor threats, and avoid/examine person activities addition to face detection motion detection is always an important requirement. Face Identification Using Raspberry Pi is mainly about maintaining a secure environment [9]. OpenCV (open source computer vision) is the major software that is being used in this project. For detecting faces, system using various algorithms like Haar cascade, linear SVM. IR sensor is used to detect whether any objects are in front of camera or not, while PIR is used to find whether detected object is living body or not. Finally camera power and life validity is saved by dynamically switching on its power only when its operation comes in to picture. Using Amazon SES console[12], we can configure email sending service in a couple of seconds. If captured face is available in database, servo motor will be activated to show a positive scenario. If any captured face is not presented in our data base, automatically that will be stored and **Crontab**[11] comes in to picture. Stored image on local host will be uploaded to AWS S3 server, then **SES** service will be activated to send An automated Electronic mail to authorised person along with that uploaded image attachment.

FACE DETECTION USING HAAR CASCADES:

Object Detection using Haar feature-based cascade classifiers is an effective method which was proposed by Paul Viola and Michael Jones [2, 3]. It is an adaptive machine learning based approach in which a cascade function is trained from several positive and negative images. This is then used to detect objects in other images. Initially, this algorithm requires plenty of positive images (images of faces) and negative images (images without faces) to train the classifier. Then Features are extracted[6] from it. Every feature is a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle. Then all possible sizes and locations of every kernel are used to calculate plenty of features. To calculate each feature, the sum of pixels under white and black rectangles is found [2, 3]. Face detection nowadays is generally satisfactory because of high exactness and uniqueness. Haar features can easily be scaled by increasing or decreasing the size of the pixel group being examined. This allows features to be used to detect objects of various sizes. These features, rather than using the intensity values of a pixel, use the change in contrast values between adjacent rectangular groups of pixels. The contrast variances between the pixel groups are

used to determine relative light and dark areas. Two or three adjacent groups with a relative contrast variance form a Haar-like feature.

PRINCIPAL COMPONENT ANALYSIS (PCA):

Essential segment examination was imagined in 1901 by Karl Pearson. PCA is a variable diminishment system and helpful when gotten information have a few repetition. This will come about into lessening of factors into more modest number of factors which are called Principal Components which will represent the most of the change in the watched variable. Issues emerge when we wish to perform acknowledgment in a high dimensional space. Objective of PCA is to diminish the dimensionality of the information by holding as much as variety conceivable in our unique informational collection. Then again dimensionality diminishment infers data misfortune[14]. The best low-dimensional space can be controlled by best primary parts. The real preferred standpoint of PCA is utilizing it in eigenface approach which helps in lessening the span of the database for acknowledgment of a test pictures. The pictures are put away as their component vectors in the database which are discovered anticipating each what's more, every prepared picture to the arrangement of Eigen appearances acquired. PCA is connected on Eigen confront way to deal with decrease the dimensionality of a vast informational index.

Open CV:

Open CV 'open source PC vision library' is an open source picture preparing library made by Intel 8109 what's more, kept up by Willow carport accessible for C, C++, what's more, Python. OpenCV is need a compiler like DevC++, code squares, visual C++. In this paper utilizes C++ dialect furthermore, DevC++ compiler. In OpenCV there are four modules. Predominantly utilized are CV: primary OpenCV capacities, picture handling calculations, vision calculations and highgui: GUI capacities, Image and Video I/O. Utilizing this OpenCV, we will stack pictures caught by camera. These pictures are in three configurations paired picture, dark scale picture and shaded picture. The hued picture contain R G B with pixel values containing 0-255. It has profundity of the picture with 8 bits and 3 channels. For stacking the picture utilizing Open CV, the taking after program is utilized.

AWS BASED FACE RECOGNITION:

There are two primary applications of machine learning that analyze images containing faces: face detection and face comparison. A face detection system is designed to answer the question: is there a face in this picture? A face detection system[4] determines the presence, location, scale, and (possibly) orientation of any face present in a still image or video frame. This system is designed to detect the presence of faces regardless of attributes such as gender, age, and facial hair.

AWS DETECT FACES OPERATION RESPONSE

DetectFaces returns the following information for each detected face:

- **Bounding box** – The coordinates of the bounding box that surrounds the face.
- **Confidence** – The level of confidence that the bounding box contains a face.
- **Facial landmarks** – An array of facial landmarks. For each landmark (such as the left eye, right eye, and mouth), the response provides the x and y coordinates.
- **Facial attributes** – A set of facial attributes, such as whether the face has a beard. For each such attribute, the response provides a value. The value can be of different types, such as a Boolean type (whether a person is wearing sunglasses) or a string (whether the person is male or female). In addition, for most attributes, the response also provides a confidence in the detected value for the attribute.
- **Quality** – Describes the brightness and the sharpness of the face. For information about ensuring the best possible face detection

AMAZON SIMPLE EMAIL SERVICE (AWS-SES):

SES is a cost-effective, flexible, and scalable email service that enables developers to send mail from within any application. You can configure Amazon SES[9] quickly to support several email use cases,

including transactional, marketing, or mass email communications. Amazon SES's flexible IP deployment and email authentication options help drive higher deliverability and protect sender reputation, while sending analytics measure the impact of each email. With Amazon SES, you can send email securely, globally, and at scale.

CRONTAB: Cron is a Linux based utility for scheduling time-based jobs that run automatically at a set time, date or after a specific interval. You can automate various repetitive administrative tasks using cron jobs. We can use crontab to automate and schedule tasks on your Linux machine. This is simply a file-based configuration table with lists of jobs and timings when tasks are scheduled to run.

RESULT:

In this Section, the simulation and experimental results of the proposed face recognition schemes are presented.

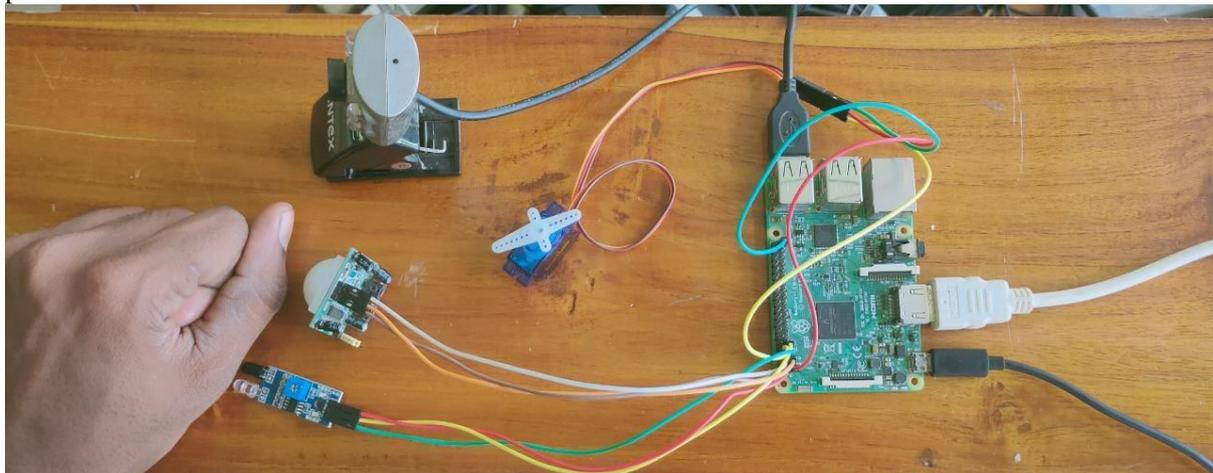


Fig: Proposed Hardware architecture

Above figure represents the proposed hardware architecture with input sensors (PIR, IR), output device (Servo motor), main heart processing unit(Raspberry Pi) and Capturing unit(Camera).

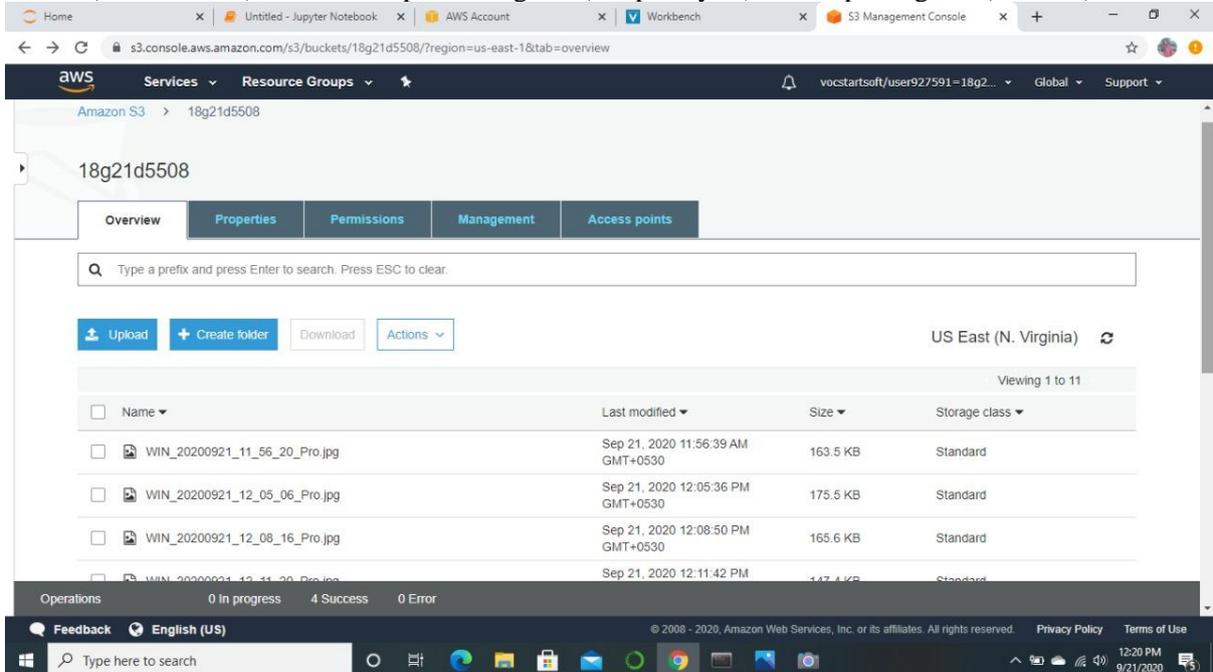


Fig. AWS Console Screen

Above screen shot represents the Internet of Things implementation in Amazon Web Services in client side implementation.

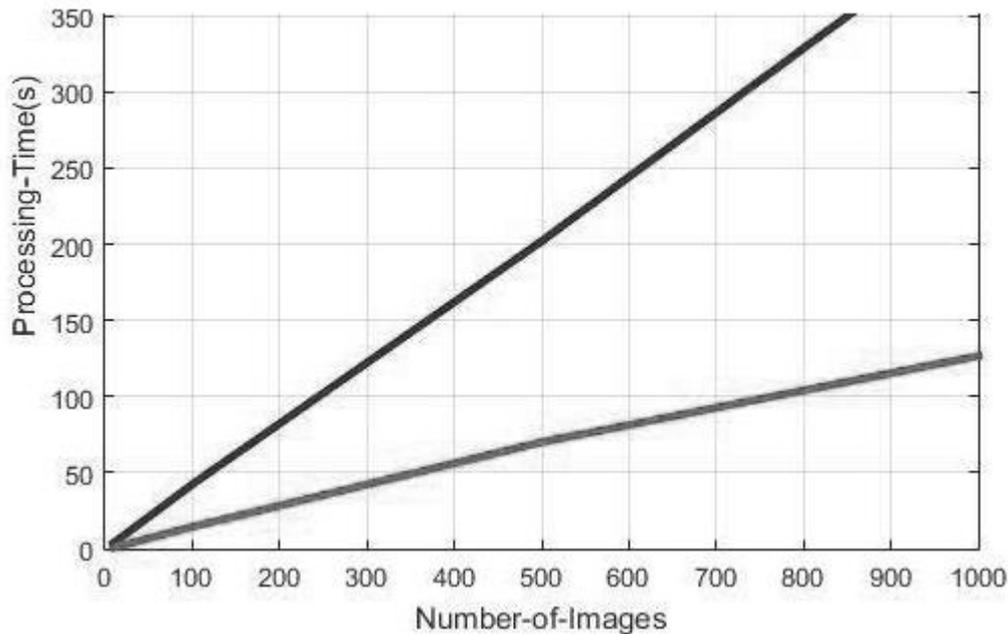


Fig: Comparative Analyses of recognition processing

Above simulation results shows the comparative timing analyses of proposed technique with existing method. Approximately 50% time is saved throughout recognition process.

CONCLUSION:

The proposed method worked well under crowded situations and fulfilled the application of a security system although there are problems when the person is very far from the camera. The efficiency of the system was analyzed in terms of face detection rate. The analysis revealed that the present system shows excellent performance efficiency and can be used for face detection even from poor quality images and fast mails sending service using AWS SES.

FUTURE SCOPE: Using raspberry pi the current project can be modified by an Infrared camera interfacing it can be used in Smart Surveillance Monitoring security system which any type of public security is using Living body detection or spying. Also it can be used in Attendance system of the class, Also some profound applications can be implemented using interfacing of Raspberry pi and Arduino UNO board like sensor application of smartcard swapping, finger detection, alcohol detection, agriculture humidity sensing, Temperature sensing using web server, and many more.

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