SMART GUJARAT FOR NEW INDIA HACKATHON 2019-20

PROJECT REPORT ON

STUDENT ATTENDENCE USING FACE RECOGNITION

(SGH110)

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Problem ID	SGH110
Name of the Industry	Dr J N Mehta Government Polytechnic, Amreli
Type of Industry	Government Department
Problem Statement	Student attendance system using face recognition
Challenge description with context	Our institute enrols approximately 500 students per year. Existing paper-based method is time consuming and distracting to both students as well as faculties. It is also prone to human errors. We propose face recognition based smart attendance system. Student attendance can be made more robust. This also reduces the administrative work of faculties. The attendance data can be stored on cloud for further processing.
Exact Problem	We propose face recognition with help of raspberry pi computer and mini camera based smart attendance system. By that way student attendance can be made more robust. This also the reduces the administrative work of faculties. The attendance data can be stored on cloud for further processing. That way we can sort out irregular students, less attendant student, punctual students in real time basis
Users	Any institute like Polytechnics, Degree colleges, Pharmacy Colleges, Medical Colleges, Any industry, Traffic points, Stampede prone area. students, faculty, HOD, Principal will be stake holders of the system
Expected Outcomes	The project aims to streamline the communication system in the organization. One of the biggest impacts will be ease of communication and less dependence on paper-based system. The project will reduce the communication time between different stakeholders and it can lead to higher efficiency of work. Also, using the single communication medium can increase the data security and data availability. Past data can also be easily be searched and recorded in organised manner.
Potential Impact	The project aims to streamline the communication system in the organization. One of the biggest impacts will be ease of communication and less dependence on paper-based system. The project will reduce the communication time between different stakeholders and it can lead to higher efficiency of work. Also, using the single communication medium can increase the data security and data availability. Past data can also be easily be searched and recorded in organised manner.
Probable Discipline	Computer/IT, Electronics and Communication

ABSTRACT

Face recognition, as one of the most successful applications of image analysis, has recently gained significant attention, especially during the past several years. Our idea proposes an automatic face recognition attendance system for students using raspberry pi and mini cameras based on deep learning and narrowband Internet of things. The system automatically detects and identifies faces and mark present/absent of students with the help of face detection and it points out the technical challenges of building a face recognition system. The system will automatically update the student's presence in the class to the student's database and update all the data to the cloud as well as sends It will message to the guardians of absentees and also to the Head of the department. Face recognition processing, including major components such as face detection, tracking, alignment, and feature extraction, and it points out the technical challenges of building a face recognition system. We focus on the importance of the most successful solutions available so far. The final part of the chapter describes chosen face recognition methods and applications and their potential use in areas not related to face recognition.

LITERATURE REVIEW

1: A plan and execution of a remote iris acknowledgment participation in the board framework. Iris's acknowledgment check is one of the most dependable individual recognizable proof techniques in biometrics. This framework-based biometrics and remote method takes care of the issue of misleading participation and the issue of laying the relating system.

2: Strong Face Recognition by means of Adaptive Sparse Representation. Inadequate Representation (or coding) based Classification (SRC) has increased incredible accomplishment in face acknowledgment as of late.

Existing System:

A conventional method for checking participation includes an ordinary circumstance of understudies sitting in homeroom and the educator getting out the names of the understudies separately to stamp their participation. The participation is typically stamped utilizing hard assets - pen and paper.

Problem of existing system

• It is bulky to keep up a tremendous arrangement of records. • It is tedious. • Error-inclined. • Its prompts wastage of Resources.

TECHNOLOGY TO ADDRESS THIS PROBLEM

Raspberry Pi 3 (Model B)

The Raspberry Pi just got juicer! Now with a Quad-Core 64bit CPU, Wi Fi & Bluetooth. The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B.

- 1.2GHz Quad-Core ARM Cortex-A53
- 802.11 ban Wireless LAN and Bluetooth 4.1 (Bluetooth Classic and LE)
- 1GB RAM
- 64 Bit CPU
- 4 x USB ports
- Now 10x Faster - Broadcom BCM2387 ARM Cortex-A53 Quad Core Processor powered Single Board Computer running at 1.2GHz!
- 1GB RAM so you can now run bigger and more powerful applications
- Micro SD slot for storing information and loading your operating systems.

Raspberry Pi Camera V2

The Raspberry Pi Camera Module v2 is a high quality 8-megapixel Sony IMX219 image sensor custom designed add-on board for Raspberry Pi, featuring a fixed focus lens.
It's capable of 3280 x 2464-pixel static images, and also supports 1080p30, 720p60 and640x480p90 video.

- Fixed focus lens on-board
- 8-megapixel native resolution sensor-capable of 3280 x 2464-pixel static images
- Supports 1080p30, 720p60 and 640x480p90 video
- Size 25mm x 23mm x 9mm
- Weight just over 3g
- Connects to the Raspberry Pi board via a short ribbon cable (supplied)

- Camera v2 is supported in the latest version of Raspbian, Raspberry Pi's preferred operating system

Tensor flow

If you're working on image recognition, you probably have a large dataset of face images and need to run experiments on multiple machines and GPUs.

It also helps manage and update your training datasets without having to manually copy files, view hyper parameters and metrics across your entire team, manage large data sets, and manage large scale experiments easily.

AWS Cloud

In the Amazon Web Service Cloud "S3" (simple storage service) is used to store the captured images, those captured images are analysed and compared using. We will upload our all data in the AWS Cloud.

SOFTWARE DESCRIPTION

- **Python IDLE:** IDLE is an integrated development environment for editing and running python2.x or python 3 programs. Where we can see or check the output.

- **Raspbian O.S:** Raspbian is a free operating system that is used to run the applications. To run our applications, install the Raspbian OS. Raspbian is best for Ras-pi 3 controller for developing our system.

- **NOOBS:** NOOBS -New Out of Box Software is an installation manager for the Raspberry Pi. We install this manager in SD card of Raspberry pi.

- **Python:** Python is a programming language. Which has easy syntaxes to read that allows fewer lines of code to the programmers. This language is also suitable for other customized applications.

- **Arduino IDE:** Arduino IDE is an open-source software where we can write, execute and upload to the board. It can be installed in any PC's like Windows, Linux, etc. In Arduino IDE we can write different languages like C, C++, embedded C. I have written the program in embedded C and uploaded to the hardware board by connecting USB.

- **Embedded C:** Embedded c is preferred language compare to others because it is an efficient code used for microcontroller-based applications. The embedded c programs were small and efficient they must be optimized for size and speed.

- **PHP:** PHP (Hypertext Pre-processor), It is backend language used for the development of Web Application.

- **HTML:** HTML stands for Hypertext Mark-up Language. HTML is used for creating web applications With Cascading Style Sheets and JavaScript.

- **AWS Cloud:** In the Amazon Web Service Cloud "S3"(simple storage service) is used to store the captured images, those captured images are analysed and compared using the dataset.

APPROACH TO SOLVE THE PROBLEM

The system consists of a camera that records the video of the class captures the images of the person then the image is sent to the image enhancement module. After enhancement, the image comes in the Face Detection and Recognition modules and then the attendance is marked. At the time of enrolment, samples of face images of individual persons are stored in the Face database.

- Face Detection:
- Face Recognition:
- The face recognition systems can operate basically in two modes
    - A) Verification or authentication of a facial image
    - B) Identification of facial recognition

Algorithm Used:

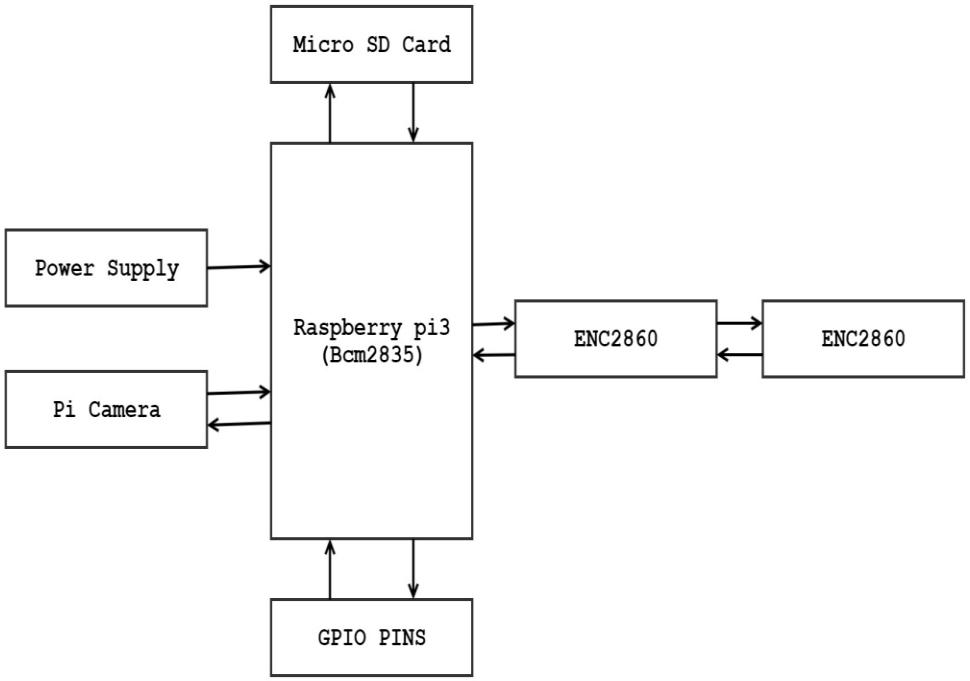
Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighbourhood of each pixel and considers the result as a binary number.

Extracting the Histograms:

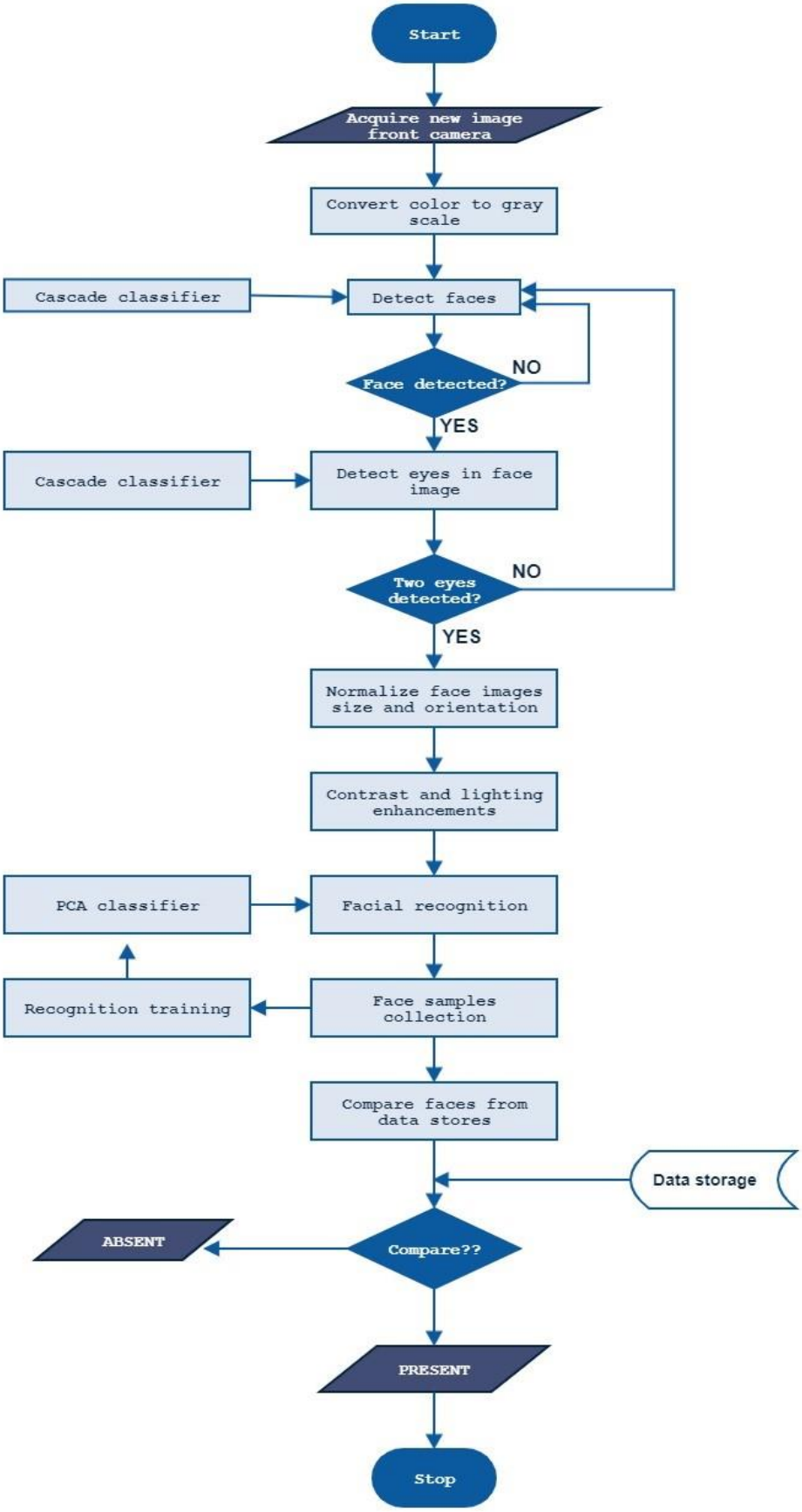
Now, using the image generated in the last step, we can use the Grid X and Grid Y parameters to divide the image into multiple grids, as can be seen in the following image: Based on the image above, we can extract the histogram of each region as follows: As we have an image in grayscale, each histogram (from each grid) will contain only 256 positions (0~255) representing the occurrences of each pixel intensity.

Performing face recognition: In this step, the algorithm is already trained. Each histogram created is used to represent each image from the training dataset. So, to find the image that matches the input image we just need to compare two histograms and return the image with the closest histogram. We can assume that the algorithm has successfully recognized if the confidence is lower than the threshold defined.

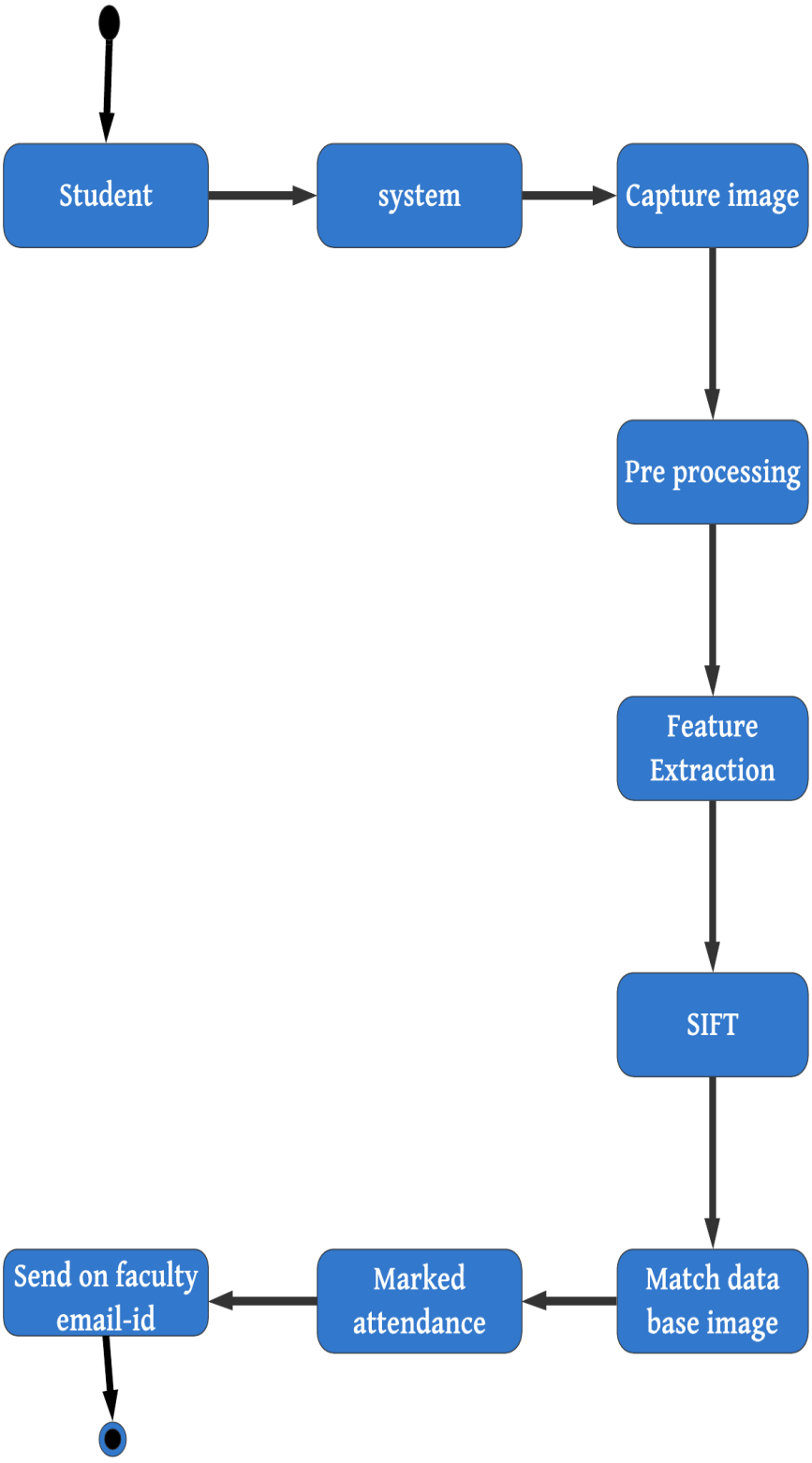
ROAD MAP/FLOW DIAGRAM



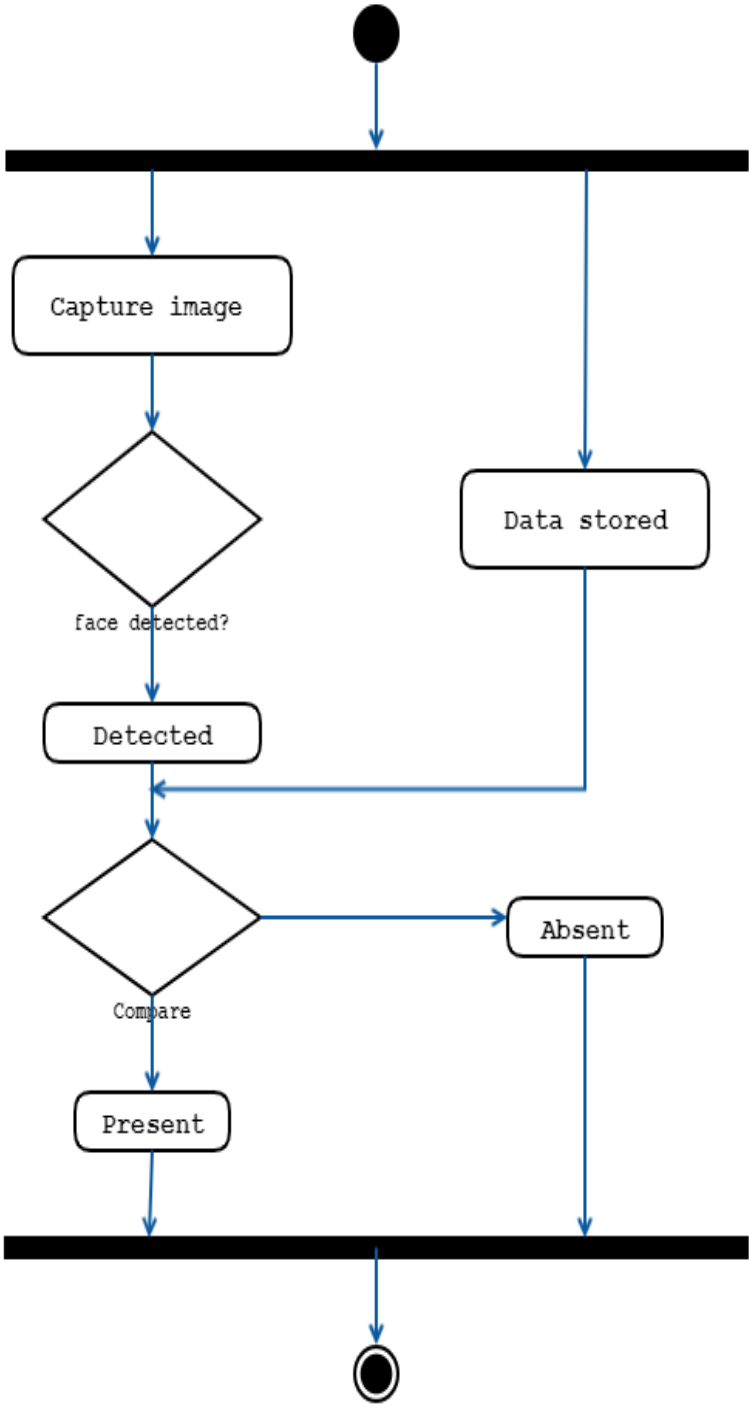
(This project presents a prototype system for recognition of the text present in the image using Raspberry Pi. Raspberry Pi is a credit card sized single-board computer)



(Flowchart for real-time face detection and recognition)



(Proposed system architecture. Face detection procedure is illustrated above:)



(Activity Diagram of real time face recognition system)

TOOLS AND TECHNOLOGIES TO BE USED

Raspberry Pi (Model B), Raspberry Pi Camera V2, Tensor flow, AWS Cloud.

CHALLENGES

To integrate the Raspberry pi 3 with Raspberry pi V2 camera module and then perform the command of recognition of student's face then store that data in AWS cloud and processed that data for attendance purpose is a very heavy task. To integrates these various devices and operate the whole system without any error is a very big deal and a single error may mark any students absent which affect the efficiency of the system. We have to take care of these all points to implementing the final prototype.

Factors Affecting :

- Illumination
- Background
- Aging
- Thermal image
- Iris
- Occlusion
- Facial expressions
- Poses
- Facial advances
- Complexity

POSSIBLE OUTCOME

The mathematical algorithms of biometric facial recognition follow several stages of image processing:

- Capture
- Extraction
- Comparison
- Matching
- Enhanced security
- Faster processing
- Seamless integration
- Automation of identification

But today, facial recognition is completely independent in the identification process and not only takes seconds but is also incredibly accurate.

CONCLUSION

By these we will conclude that the undertaking plans to streamline the correspondence framework in the association. One of the greatest effects will be simplicity of correspondence and less reliance on paper-based framework. The task will diminish the correspondence time between various partners and it can prompt higher effectiveness of work. Likewise, utilizing the single correspondence medium can build the information security and information accessibility. Past information can likewise be effectively be looked and recorded in composed way.