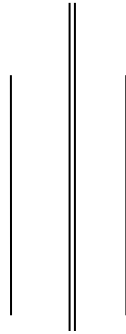


**ADVANCED COLLEGE OF
ENGINEERING AND MANAGEMENT**
INSTITUTE OF ENGINEERING
TRIBHUVAN UNIVERSITY



BACHELOR OF ENGINEERING
IN
ELECTRONICS & COMMUNICATION ENGINEERING



A Minor Project Proposal On:
“FACE IDENTIFIER”

Submitted by

Deepen Upreti (207/ BEX /408)

Dixit Mani Khanal (2071/ BEX /410)

Malcolm John Tamang (2071/ BEX /413)

Nawaraj Bedari (2071/ BEX /414)

Lalitpur, Nepal

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ABSTRACT

In the modern world of today, the people have been living a technologies based life. The progression of human society has developed most of its aspects into new standards. Machineries and technologies have leapt through the times in a tremendous pace into development. As the luxury increases, so does the problems and security. Thus, the difficulty in keeping the world safe has been the tricky thing to do so far; in fact in economic base and efficient way.

This project is developed for identifying face of a person. The project basically involves Facial Recognition tool embedded in Raspberry Pi and a GSM Module. The tool is used to recognize the face and give information to the GSM module so that it will be able to send the saved text message to authorize personal. In this system, a webcam is placed directly in front of the door around public places like Restaurant, Discos, hospitals etc. The facial recognition software runs on Raspberry Pi which when detecting a face on the database sends text message to the person requested using GSM Module.

The main application of this project is that it can be used to recognize the criminal faces which are on the most wanted list or the missing person and so on. This could be a helping hand for the Police and Department of Crime Control. So, it can be used in security purpose. Further it can be exaggerated to use in subjects like tracking a person, image search etc.

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1. INTRODUCTION

The main purpose of our project is related to the field of criminal control. We are proposing to install webcams in front of the door of the places where people frequently pass like hotels, restaurants, discos, hospitals etc. The main theme of our project is to identify the faces of people who are enlisted under most wanted list or most searched criminal list. This project will also be beneficial in context of finding the people who are filed in the police as missing.

The system we proposed here is concerned with face detection & its recognition. There are many systems in use which can detect faces but our system consist GSM module which can inform responsible authorities when in action. The main working mechanism of our system is based on Image Processing Tools with machine learning technique in Open Computer Vision (Open cv) using Python Programming Language approach. We are using “Fisher Algorithm for Face Detection” in this project, which is based on Linear Discriminant Analysis (LDA).

Our project includes a webcam for constant image input, Raspberry Pi for processing and manipulating database and GSM Module for notifying the concerned authority. In our system, the database of the images to be recognized are saved in the memory in Raspberry Pi. The webcam captures the images, the captured images are then processed and the sample of detected faces are verified with the database, if the sample matches content in the database, the GSM Module then sends message to notify the responsible authority whose phone number is on the command. Such a system proves to be helpful for immediate information transfer.

This system has a great use in the field of Security purpose. We can also exaggerate this technology by writing complex programming algorithm for developing into a Face tracking robot. By using the image processing approach we can also build a robot which is capable of performing object detection and other bio signatures for authentication and home security. With proper implantation of techniques and feature our project can serve best.

2. OBJECTIVES

In present context of technology, Machine Learning and image processing have huge importance and application. In few years they will be core for any Robotic and Mechanical Projects. This type of technique simplify the task but are complex in formation. The task of our projects might be generalized in any field but the main objective of our project is:

- To use face recognition in security purpose.
- To aid in searching Most wanted criminal roaming in public places.
- To find the missing people.

3. LITERATURE REVIEW

The idea of using principal components to represent human faces was developed by Sirovich and Kirby (Sirovich and Kirby 1987) and used by Turk and Pentland (Turk and Pentland 1991) for face detection and recognition. Rectangular ratio is used to decide face region, mouth and eye map is applied for confirmation of face. Literature studies reveal that faces can be recognized in a restricted environment with high accuracy.

Face recognition is an evolving area, changing and improving constantly. This section gives the overview of various approaches and techniques along with their advantages and disadvantages. Different approaches of face recognition can be categorized in three main groups such as :

Geometry Feature-based Approach

The geometry feature-based approach methods analyze local features such as nose, eyes and their geometric relationships. Sometimes this approach is known as only feature-based approach . Examples of this approach are Elastic bunch graph matching algorithm. This technique is not used now days.

Holistic Approach:

Many researchers followed this approach. In the holistic approach whole face region is taken into account as input data to the system. Various methods comes under this approach are eigen faces, fisher faces, support vector machine, hidden markov model (HMM). They all are based on principal component analysis (PCA).

Hybrid-Approach:

Under the hybrid approach the combination of local feature and whole feature is used .Modular eigen face, hybrid local feature methods are for hybrid approach. Human facial feature plays important in face recognition. Research and studies have determined that eyes, mouth and nose are amongst the most significant feature for recognition.

4. FEASIBILITY STUDY

Technical feasibility

The project “FACE IDENTIFIER” is a feasible project in terms of availability and installation ease. The project can be easily completed with the available electronic components, installed at desired location and handled by common person.

Economic Feasibility

The total expenditure of the project is under affordable budget. The expenditure is very small if we look at the usefulness and efficiency of the project. The electronic modules and components required for the project are easily available at local level in the reasonable price. Since, all the required modules and components are easily available at our market; the project is economic in terms of effectiveness.

Operational Feasibility

The hardware is so portable that it can be taken to any place and installed there with no difficulties. The geography does not affect the setting up of the project as all the bulky part have already been reduced. There is no difficulty in handling the project as the running procedure is quite simpler. Once the hardware has been set even semi-skilled person can handle it on giving minor instructions.

Schedule Feasibility

The project is expected to be carried out within the specified time. It seems quite feasible that with the given resources and knowledge, the project will be finished completely and successfully before due time.

5. METHODOLOGY

The project revolves around the concept and technique of Image Processing under Machine Learning Approach. We programmed the code in Python Programming Language in Raspberry Pi. The block diagram of proposed theory is shown below:

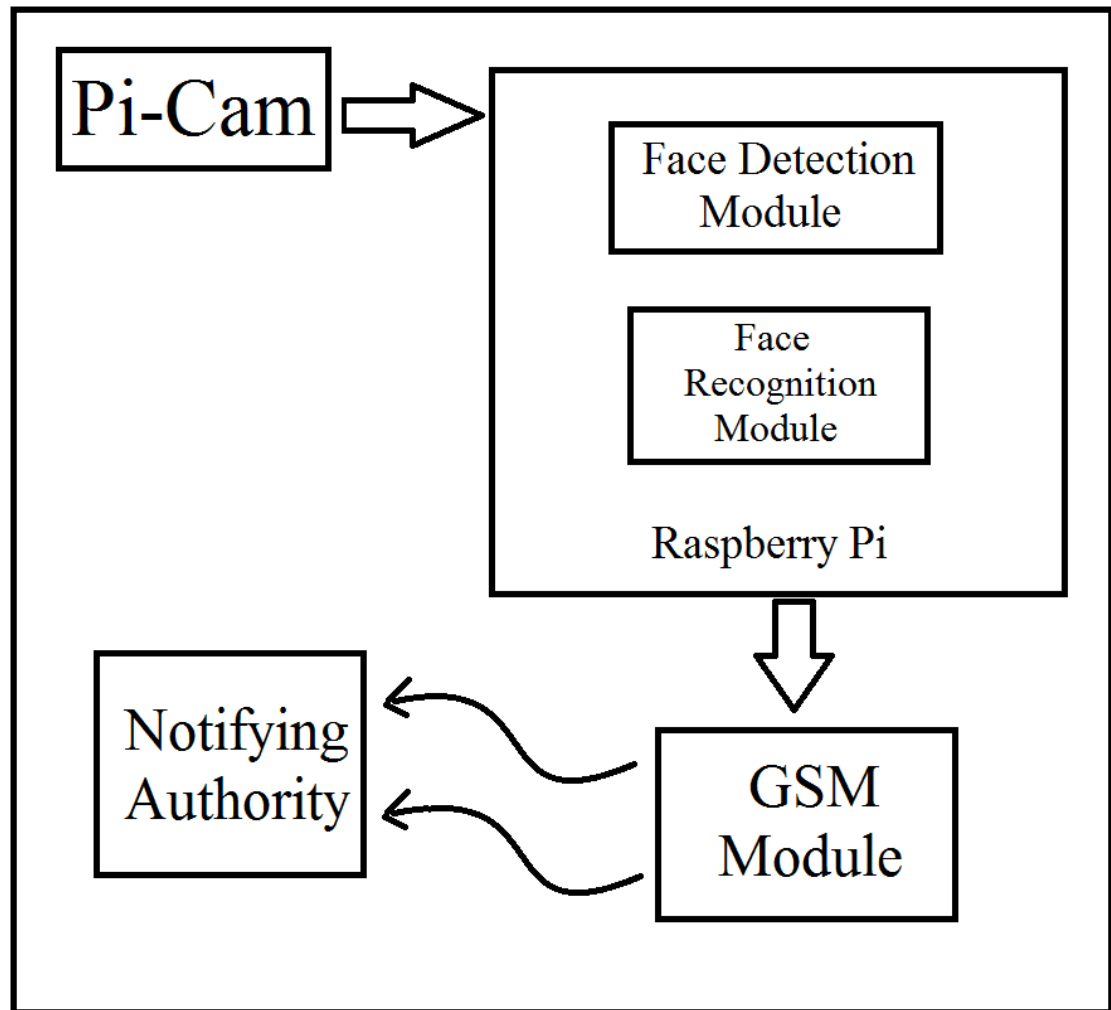


Fig : Block Diagram of Proposed “Face Identifier” Project

Pi-Cam:

The image under the surveillance of the Pi-Cam is captured which is our sample image. The sample image is sent for further processing. The sample image might not contain a face. Pi-Cam sends the captured image to Raspberry Pi for further processing.

Face Detection Module :

The image sample captured by Pi-Cam is fed to Raspberry Pi. The Face detection Module identifies if any face is present in the sample image. If a face is detected among the sample images, it is sent for the verification & process. This reduces the memory size and only the legitimate data is sent further for processing.

Face Recognition Module:

The image where face has been detected is only fed for recognition process. In this Module, the sample images with detected faces are verified using our program. This is done using an algorithm called “Fisher Algorithm for face Detection”.

GSM Module:

Here, GSM module contains a GSM Sim Card. GSM module is programmed to send message to the allocated responsible authorized person immediately after the Face is recognized from the database.

Notifying Authority:

After completion of recognition, the system will notify the authorized person. For notification we used a GSM Module which will notify immediately after the system detected the sample and matching it with our pre-recognized sample.

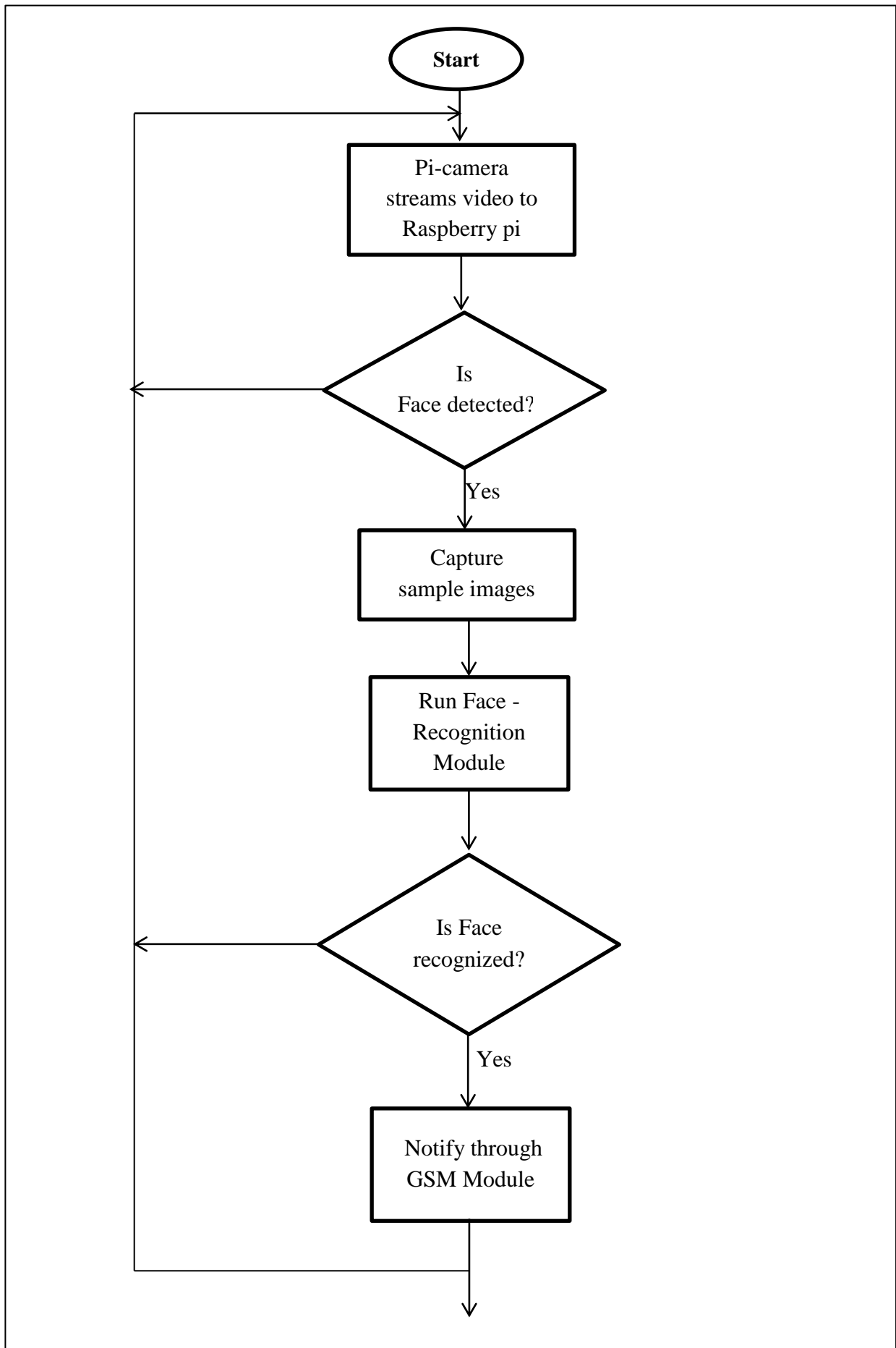


Fig : Flowchart of our Proposed System

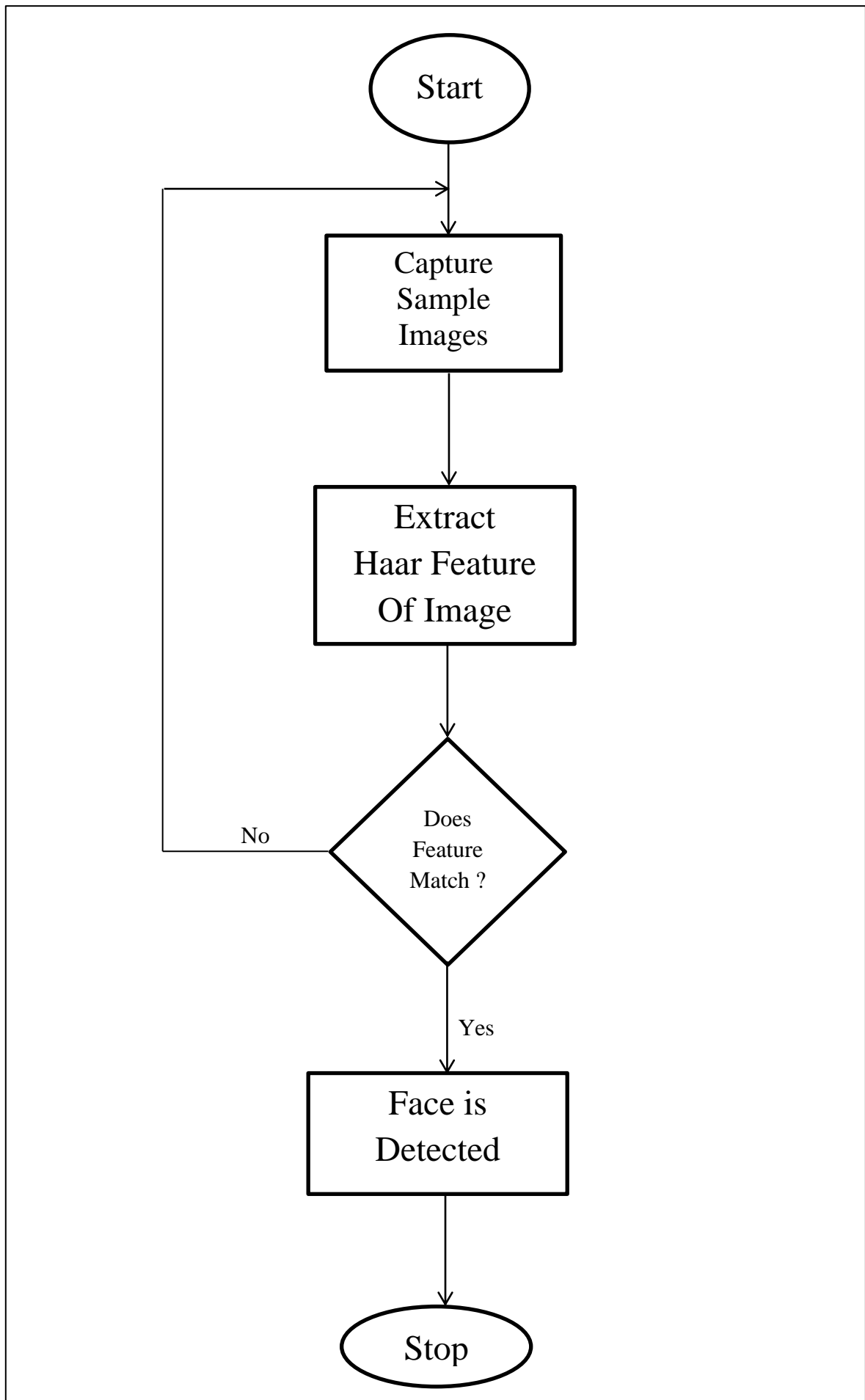


Fig : Flow Chart of Face Detection Algorithm

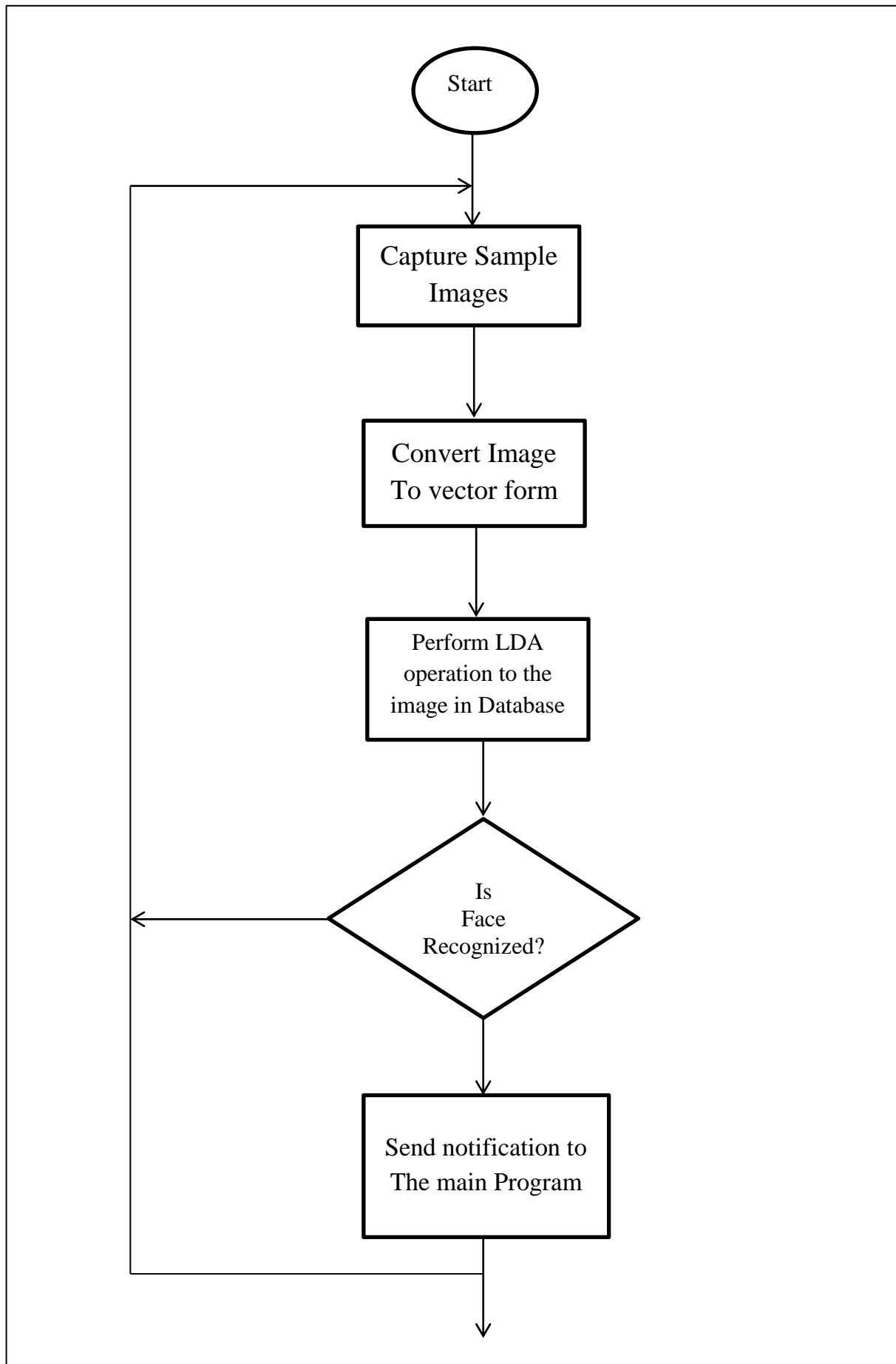


Fig: Flowchart of Face Recognition Algorithm

6. DESCRIPTION OF PROPOSED SYSTEM:

The proposed system is optimum circuit we could design with the components in hand. We used different source to find out about the components and the description of the component used are:

Raspberry Pi:



Fig : Raspberry Pi

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries.

It's following distinctive features:

- A 1.2GHz 64-bit quad-core ARMv8 CPU
- 802.11n Wireless LAN
- Bluetooth 4.1
- Bluetooth Low Energy (BLE)
- 1GB RAM
- 4 USB ports
- 40 GPIO pins
- Full HDMI port
- Ethernet port

We will use Raspberry Pi 3 with the above mentioned feature to execute coding part and process the observed sample to generate result. We will also connect our Webcam to the Raspberry Pi.

GSM Module:



Fig : GSM Module

GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate.

Webcam (Pi-Cam):

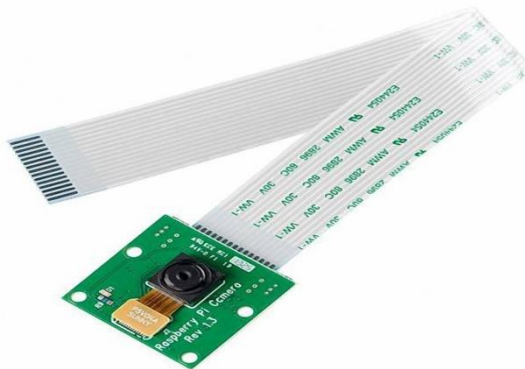


Fig : Pi-Cam

A webcam – short for ‘web camera’ – is a digital camera that’s connected to a computer. It can send live pictures from wherever it’s sited to another location by means of the internet.

Pi-cam is the external camera used in Raspberry Pi which can be used to work as a webcam to capture video stream and photos using Python interfacing module. Pi cam is directly connected to the Raspberry Pi. It will capture sample image for face detection and later for face recognition.

Miscellaneous:

- Programming Approach:
 - Python Programming Language
 - Open CV Library used mainly for Image Processing purpose.
 - Numpy module to handle numerical values in array and matrix form.
 - Scipy module used for Machine Learning propose.

- Algorithm Used:
 - Voila Jone Algorithm For Face Detection.
 - Fisher Face Algorithm For Face Recognition.

7. TIME SCHEDULE:

The task of the project is being divided into several Sub-Task. The time duration is allocated on the basis of Task's weightage and estimated required time to perform that task. The time schedule until projects completion is routined as shown in table below:

Time Duration	Work
2074/02/16 – 2074/02/24	<ul style="list-style-type: none">➤ Research on Project➤ Construct power supply
2074/02/25 – 2074/02/31	<ul style="list-style-type: none">➤ Prepare complete layout of project
2074/03/01 – 2074/03/16	<ul style="list-style-type: none">➤ Implement algorithm and write code➤ Testing program
2074/03/17 – 2074/03/22	<ul style="list-style-type: none">➤ Complete circuit design➤ Connect hardware & software
2074/03/23 – 2074/03/25	<ul style="list-style-type: none">➤ Testing phase 1
2074/03/26 - 2074/04/02	<ul style="list-style-type: none">➤ Debugging
2074/04/03 - 2074/04/05	<ul style="list-style-type: none">➤ Final phase testing
2074/04/06 - 2074/04/15	<ul style="list-style-type: none">➤ Completion of project

8. ESTIMATED COST:

We have accounted our component in use and with the market value of the component, estimated cost of the component is listed in table below:

S.N.	PARTICULARS	COST (in Rs,)
1.	Raspberry Pi	7,600/-
2.	GSM Module	5,000/-
3.	Pi-Camera	3,000/-
4.	GSM SIM	100/-
5.	Memory Card	1,000/-
	Total	16,700/-

9. ESTIMATED/EXPECTED OUTPUT:

With the proper conduction of the project and the availability of the components the output of the system is expected as:

- The Camera should only capture sample with faces in the image frame.
- And finally the faces are verified within the database and If any match is found the GSM Module should send notification text message to the phone number programmed in the Module in Real Time.

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