**ATTENDANCE SYSTEM USING FACIAL RECOGNITION**

**A CAPSTONE PROJECT REPORT**

*Submitted in partial fulfillment of the*

*requirement for the award of the*

*Degree of*

**BACHELOR OF TECHNOLOGY**

**IN**

**COMPUTER SCIENCE ENGINEERING**

*by*

**ITTA SAI ABHISHEK (18BCN7116)**

*Under the Guidance of*

**DR. PRIYADHARSHINI**



SCHOOL OF COMPUTER SCIENCE ENGINEERING

VIT-AP UNIVERSITY

AMARAVATI- 522237

*JANUARY 2022*

**CERTIFICATE**

This is to certify that the Capstone Project work titled “**ATTENDANCE SYSTEM USING FACIAL RECOGNITION**” that is being submitted by **I SAI ABHISHEK (18BCN7116)** is in partial fulfillment of the requirements for the award of Bachelor of Technology, is a record of bonafide work done under my guidance. The contents of this Project work, in full or in parts, have neither been taken from any other source nor have been submitted to any other Institute or University for award of any degree or diploma and the same is certified.

Dr. PRIYADHARSHINI

Guide

**The thesis is satisfactory / unsatisfactory**

**Internal Examiner External Examiner**

**Approved by**

**PROGRAM CHAIR DEAN**

B. Tech. ECE School of Computer Science Engineering

**ACKNOWLEDGEMENTS**

**ABSTRACT**

In this digital age, where simple everyday life tasks are being automated one of such task ”Attendence marking” is still being taken manually. There should be and there should be a change in this absence in order to be faster and more efficient over time. We can use facial recognition to record the presence of everyone present in the organization. In this facial recognition, many algo-rithmes were developed to provide and capture images of someone's face, such as machine reading and in-depth study. With this algorithm system, the system can detect a person's face and record the presence of that person so that the presence functions can be more efficient and faster.

Face recognition is among the most productive image processing applications and has a pivotal role in the technical field. Recognition of the human face is an active issue for authentication purposes specifically in the context of attendance of students. Attendance system using face recognition is a procedure of recognizing students by using face biostatistics based on the high definition monitoring and other computer technologies. The development of this system is aimed to accomplish digitization of the traditional system of taking attendance by calling names and maintaining pen-paper records. Present strategies for taking attendance are tedious and time-consuming. Attendance records can be easily manipulated by manual recording. The traditional process of making attendance and present biometric systems are vulnerable to proxies. This paper is therefore proposed to tackle all these problems. The proposed system makes the use of Haar classifiers, KNN, CNN, SVM, Generative adversarial networks, and Gabor filters. After face recognition attendance reports will be generated and stored in excel format. The system is tested under various conditions like illumination, head movements, the variation of distance between the student and cameras. After vigorous testing overall complexity and accuracy are calculated. The Proposed system proved to be an efficient and robust device for taking attendance in a classroom without any time consumption and manual work. The system developed is cost-efficient and need less installation.

**TABLE OF CONTENTS**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No.** | **Chapter** | **Title** | **Page Number** |
| **1.** |  | **Acknowledgement** | **3** |
| **2.** |  | **Abstract** | **4** |
| **3.** |  | **List of Figures and Table** | **6** |
| **4.** | **1**  **1.1**  **1.2**  **1.3** | **Introduction**  **Objectives**  **Background and Literature Survey**  **Organization of the Report** | **8**  **9**  **10**  **11** |
| **5.** | **2**  **2.1**  **2.2**  **2.3**  **2.4**  **2.4.1**  **2.4.2** | **Vehicle Service Management and Live Monitoring System**  **Proposed System**  **Working Methodology**  **Standards**  **System Details**  **Software**  **Hardware** | **12**  **12**  **13**  **13**  **14**  **14**  **25** |
| **6.** | **3**  **3.1** | **Cost Analysis**  **List of components and their cost** | **37**  **37** |
| **7.** | **4** | **Results and Discussion** | **38** |
| **8.** | **5** | **Conclusion & Future Works** | **40** |
| **9.** | **6** | **Appendix** | **41** |
| **10.** | **7** | **References** | **50** |

**List of Tables**

**Table No. Title Page No.**

1. Cost Analysis 37

**List of Figures**

|  |  |  |
| --- | --- | --- |
| **Figure No.** | **Title** | **Page No.** |
| 1 | Automobile Sales | 8 |
| 2 | System Block Diagram | 12 |
| 3 | Screen 1 | 15 |
| 4 | Screen 2 | 15 |
| 5 | Block Editor for Screen 1 | 16 |
| 6 | Block Editor for Screen 2 | 16 |
| 8  9.a  9.b  10  11    12  13  14  15  16  17  18  19  20  21  22  23  24  25  26  27  28  29  30  31  32  33  34  35  36  37 | Home Page  Main Page  Manage Automobile Service  Manage Automobile Service  Edit Profile  Firebase Authentication Key  Firebase Console  Garage Owner Main Page  Live Streaming Setting  Live Monitoring  Link for Live Video  Raspberry Pi  Copying to Sim Card  Raspberry Pi  Powering Raspberry Pi  Raspbian Desktop  Raspberry Pi Welcome Screen  VNC Viewer  VNC Viewer Address  VNC Server  VNC Properties Window  Arduino  Hall Effect Module  Linear Potentiometer  SIM 808  3- Axis Accelerometer  LM35  Voltage Detection Sensor  Hardware Setup  R Pi Receiving data  R Pi Receiving data | 17  18  19  19    20  21  21  22  23  23  24  25  26  27  27  28  28  29  31  31  32  33  33  34  34  35  36  36  38  39  39 |

**CHAPTER 1**

**INTRODUCTION**

A facial recognition system is a technology that can detect, and match a given human face from a digital image or a video against a database of faces stored in xml or json formats. It works by locating and measuring facial features such as distance between both the eyes, width of nose etc. from a given image and is commonly used to authenticate a person’s physical presence.

A picture containing shape

Description automatically generated

Figure 1 Measuring Facial Features

In just a few years, facial recognition technology has advanced considerably. According to tests conducted by the National Institute of Standards and Technology(NIST), the best face identification algorithm has an error rate of under 0.08 percent as of April 2020, compared to 4.1 percent for the major used algorithm in 2014.

Keeping a track of attendance is crucial for both teachers and students in a learning environment. As a result, marking attendance on daily basis manually is a hectic task. Also, the bio-metric systems which are more popularly used to avoid proxy consume a lot of time to mark attendance with huge class strengths. As a result, an automatic attendance system which can mark attendance by detecting the facial features can alleviate all these concerns.

* 1. **Objectives**

The following are the objectives of this project:

* Reducing time wastage during conventional class attendance marking methods.
* Automating the entire attendance system functionalities which requires minimal monitoring and has complete digital environment.
* Evidently narrowing the possibilities for marking proxy attendance.
* Encouraging the use of latest technology trends in daily lives.
  1. **Background and Literature Survey**

The process flow of a face detection and identification system starts with the ability to identify facial characteristics from a live or an image stored in the memory. The system analyses the taken image and determines the number of faces in the image using various system learnt patterns to filter out and compare them. This image processing employs several algorithms that consider face expressions and various facial structures and dimensions and compare them to a database of known features.

* 1. **Previous Work**

This is a project done by students as a final year project at University Tunku in 2018 The approach performs face recognition-based student attendance system. This method is also like others and begins with the input of an image either loaded from memory or from camera. Then it pre-processes the facial features and extracts it followed by subjective selecting and then the recognition of the facial images from known database. Both LBP and PCA feature extraction methods are studied in detail and computed in this approach to make comparisons. LBP is enhanced in this approach to reduce the illumination effect. An algorithm to combine enhanced LBP and PCA is also designed for subjective selection to increase the accuracy.

**Diagram

Description automatically generated**

Figure 2 Block Diagram of Previous Work

**1.4 Organization of the Report**

The remaining chapters of the project report are described as follows:

* Chapter 2 contains the proposed system, methodology, hardware, and software details.
* Chapter 3 gives the cost involved in the implementation of the project.
* Chapter 4 discusses the results obtained after the project was implemented.
* Chapter 5 concludes the report.
* Chapter 6 consists of codes.
* Chapter 7 gives references.

**CHAPTER 2**

**ATTENDENCE MANAGEMENT SYSTEM**

This Chapter describes the proposed system, working methodology, software, and hardware details.

**2.1 Proposed System**

The following block diagram (figure 2) shows the system architecture of this project.

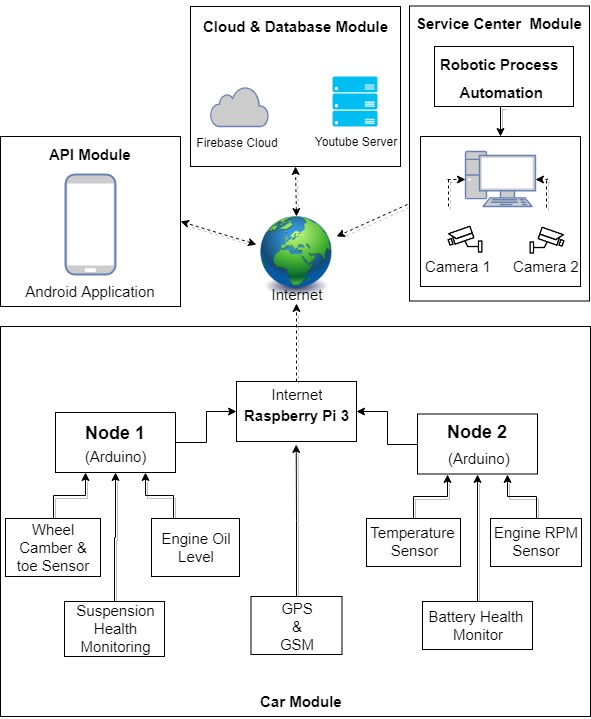


Figure System Block Diagram

**2.2 Working Methodology**

The system has two sections, python-based GUI System with image recording and attendance posting options and an online web-portal for attendance view option. Both the GUI System and web portal is linked to a SQL Server where the data will be stored.

Python-based GUI System is a software application that is installed on the system admin and class handing faculty systems. This GUI System allows admin to take new images of students for new registrations or delete the images of past students and re-train the existing model accordingly. Faculty on the other hand can start taking the attendance of the class automatically by triggering the system to switch on the cameras and predict the faces recorded and mark the attendance for the same. The attendance marked is stored in the local memory of faculty system and faculty can view/edit the stored data and post the marking into the database after verification.

Online Web-Portal allows students to login and view all their attendance markings. Also, faculty and admin later can login to their respective account and can view/add/edit/delete any record as per need on the website

**2.3 Software Details**

This Section describes the software applications used for the development of system

**2.3.1 Tkinter GUI**

Tkinter (TK Interface) is a standard cross-platform package for implementing graphical user interface (GUI) using python programming language. It consists of all the required libraries as a single package and can be also used additionally with the other libraries as per requirement.

Importing Tkinter in PYTHON Ver 2.x and above

> import Tkinter as tk

> import tkFileDialog as filedialog

> import ttk

**2.3.2 OPENCV**

OpenCV is a tool for image processing and computer vision applications. It is an open-source library for tasks including face identification, objection tracking, landmark detection, and many more image recognition applications. Python, Java, and C++ are among the popular languages supported.

Installing OpenCV for WINDOWS

> pip install opencv-python

> import cv2 as cv

**2.3.3 Haar Cascade Classifier**

Haar Cascade Classifier is an effective approach for object detection which was proposed by Paul Viola and Michael Jones through their paper “Rapid Object Detection Using a Boosted Cascade of Simple Features” in the year 2001. This is classifier basically a machine learning based approach in which a group similar and non-similar kind of images are used to train a cascade function through which new images are detected by pattern matching. There are many huge individuals of .xml files with a lot of feature sets and each xml corresponds to a very specific type of use case or pattern to be verified. As we need to identify the facial features and detect the person in this project we will be using “**haarcascade\_frontalface\_default.xml” for the same.**

**2.3.4 XAMPP Server**

XAMPP is a popular cross-platform web server that allows programmers to write and test their code on a local web server. XAMPP is abbreviated as follows, X stands for Cross-Platform, A stands for Apache, M stands for [MY-SQL](https://www.javatpoint.com/mysql-tutorial), and the two P‘s stand for PHP and Perl respectively. It is an open-source web solution package that incorporates Apache distribution for servers and command-line executables with modules such as Apache server, [MariaDB](https://www.javatpoint.com/mariadb-tutorial), PHP, and Perl. In the current project we will be using PHP for the server-side programming and MYSQL as the database.

**2.4 Face Detection**

Detailed explanation of functioning of facial recognition is done in this section

https://towardsdatascience.com/computer-vision-detecting-objects-using-haar-cascade-classifier-4585472829a9

**2.4.1 LBPH Algorithm**

**https://www.analyticsvidhya.com/blog/2021/07/understanding-face-recognition-using-lbph-algorithm/**

LBPH (Local Binary Pattern Histogram) is a Facial Detection algorithm used to identify the individual using his/her facial features. Every image is represented in the form of a matrix composed of rows and columns combining to form many individual cells. These individual cells are called as pixels. A single pixel is normally defined as least possible information of a bit of image. For every pixel in an image the value ranges from 0 to 255.

**2.4.2 Training the Model**

Initially we proceed by taking multiple images of the face of the person we are about to save in our model

**2.4.3 Recognition the Image**

We will be using **haarcascade\_frontalface\_default.xml to detect the face of individuals through the given image. To train the model all the images taken must be scaled down to uniform dimensions and can be done using the code in the image below.**

Text

Description automatically generated

**Figure 1 - Scale down image**

**Once we scale down all the images to uniform dimensions, we now use Cascade Classifier function of OpenCV to point to the path of the haarcascade\_frontal\_default.xml in the code below.**

        harcascadePath = "haarcascade\_frontalface\_default.xml"

        detector = cv2.CascadeClassifier(harcascadePath)

**Now we load all the images and convert them into grayscale. We perform this operation to remove the RGB (Red, Green, Blue) format in the image and bring down all the computations to 256 bits i.e., Black and White**

gray = cv2.cvtColor(img, cv2.COLOR\_BGR2GRAY)

**Once the images are converted to greyscale from RGB format we try to collect all the facial features in the images using an inbuilt method called detectMultiScale as below.**

faces = detector.detectMultiScale(gray, 1.3, 5)

In the above code we are trying to use face\_classifier which is an object that is loaded with haarcascade\_frontal\_default.xml file. This function detects the facial features and record in the object assigned to.

The object from the above step (i.e., faces) in our code returns four values and they are X-Coordinate, Y-Coordinate, Width, Height of the detected face and store the processed images in the memory using below code.

for (x, y, w, h) in faces:

    cv2.rectangle(img, (x, y), (x + w, y + h), (255, 0, 0), 2)

    sampleNum = sampleNum + 1

  cv2.imwrite("TrainingImage\"+Id+'.'+str(sampleNum)+".jpg",gray[y:y+h,x:x +w])

    cv2.imshow('Taking Images', img)

    if cv2.waitKey(100) & 0xFF == ord('q'):

        break

    elif sampleNum > 100:

        break

Once the images are stored we start training the model using recognizer method and save the trained data in the format of .yml

recognizer = cv2.face\_LBPHFaceRecognizer.create()

    harcascadePath = "haarcascade\_frontalface\_default.xml"

    detector = cv2.CascadeClassifier(harcascadePath)

    faces, ID = getImagesAndLabels("TrainingImage")

    try:

        recognizer.train(faces, np.array(ID))

    except:

        print(Exception while training model!)

        return

    recognizer.save("TrainingImageLabel\Trainner.yml")

On successful execution of above code, the recorded images are processed, trained and model is saved as Trainner.yml on the local drive.

**2.5 Python GUI System**

**2.5.1 Admin Panel**

**2.5.2 Faculty panel**

**2.6 Web Portal**

**REFERENCES**

[1] Jr-Jen Huang, Yi-Yu Chu, and Yen-Jen Chen, “The System Design and Implementation of Vehicle Management”, Journal of Advances in Computer Networks, Vol. 1, No. 1, March 2013

[2] Rohit Dhall, Vijender Solanki, “An IoT Based Predictive Connected Car Maintenance Approach”,

International Journal of Interactive Multimedia and Artificial Intelligence, Vol. 4, Nº3

[3] MIT App Inventor http://ai2.appinventor.mit.edu/

[4] K.N. Manoj Kumar, Kailasa Akhi, Sai Kumar Gunti, M. Sai Prathap Reddy, “Implementing smart home using firebase”, International Journal of Research in Engineering and Applied Sciences (IJREAS), Vol. 6 Issue 10, October - 2016, pp. 193~198

[5] Navdeep Singh, “Study of Google Firebase API for Android”, International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 9, September 2016

[6] Sonam Khedkar, Swapnil Thube, “Real Time Databases for Applications”, International Research Journal of Engineering and Technology (IRJET) Real Time Databases for Applications, Volume: 04 Issue: 06 | June -2017

[7] Harshada Chaudhari, “Raspberry Pi Technology: A Review” International Journal of Innovative and Emerging Research in Engineering Volume 2, Issue 3, 2015

[8] Cheah Wai Zhao, Jayanand Jegatheesan, Son Chee Loon, “Exploring IOT Application Using Raspberry Pi”, International Journal of Computer Networks and Applications Volume 2, Issue 1, January - February (2015)

[9] How to set up Raspberrypi https://www.raspberrypi.org/help/videos/

[10] Connecting an Arduino to Raspberry Pi for the best of both worlds <https://conoroneill.net/2013/06/05/connecting-an-arduino-to-raspberry-pi-for-the-best-of-both-worlds/>

[11] Maria-Alexandra Paun, Jean-Michel Sallese and Maher Kayal, “Hall Effect Sensors Design, Integration and Behavior Analysis” Journal of Sensor and Actuator Networks ISSN 2224-2708, Published: 8 February 2013

[12] Paun, M.A.; Sallese, J.M.; Kayal, M. “Temperature Considerations on Hall Effect Sensors

Current-Related Sensitivity Behaviour”, In *Proceedings of the 19th IEEE International* Conference *on Electronics, Circuits, and Systems (ICECS)*, Seville, Spain, 9–12 December 2012

[13] Electronics Basics – How a Potentiometer Works https://randomnerdtutorials.com/electronics-basics-how-a-potentiometer-works/

[14] J. Parthasarathy, “POSITIONING AND NAVIGATION SYSTEM USING GPS”, International Archives of the Photogrammetry, Remote Sensing and Spatial Information Science, Volume XXXVI, Part 6, Tokyo Japan 2006

[15] Phongsak Keeratiwintakorn, “Real-Time Tracking Management System Using GPS, GPRS and Google Earth”, Conference Paper, June 2008

[16] Anas Siddiqui, Usman Saleem, Abdul Ur Rehman, Sohaib, Shiraz Latif, “GPS and GSM Based Advanced Vehicle Monitoring and Information System”, First International Conference on Modern Communication & Computing Technologies (MCCT'14)

[17] Accelerometer Basics: https://learn.sparkfun.com/tutorials/accelerometer-basics/all

[18] Infrared Temperature Measurement Theory and Application Author and Presenter: John Merchant, Sales Manager, Mikron Instrument Company Inc.

[19] Paun, M.A.; Sallese, J.M.; Kayal, M., “Temperature Influence Investigation on Hall Effect Sensors Performance Using a Lumped Circuit Model”. In *Proceedings of the 11th IEEE Sensors Conference*, Taipei, Taiwan, 28–31 October 2012

[20] Working Principle of Temperature Sensor and Its Application

<https://www.efxkits.us/lm35-temperature-sensor-circuit-working/>

[21] What is Voltage Detector Used For https://www.wonkeedonkeetools.co.uk/voltage-

detectors-and-testers/what-is-a-voltage-detector-used-for/

**BIODATA**

Photo

Name : xxxxx

Mobile Number : 123456789

E-mail : xx.xxxx@vitap.ac.in

Permanaent Address :

**NOTE:** Its **MANDATORY** for a student to attach all the PPT’s, Sample Materials, Specification Sheets, Programming Codes and a 5-10 minutes demo Video of the Project Digitally In CD . Stick the Compact Disk (CD) in the final page of the Thesis after binding it.