COVID-19 SURVEILLANCE SYSTEM

MINI PROJECT REPORT

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Submitted for the University Project Viva Voce conducted on……..

INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

The software solution proposed gives the efficient way for facial recognition at any angle which helps with attendance management. The attendance of the registered employees are marked as soon their face is detected in any of the CCTV feeds, which can be further used for payroll and salary calculations. The Admin is given the use case of detecting a suspect to be searched through feeding facial inputs as well as personal information. All the CCTV feeds are hosted in a single server, therefore multiple suspects with COVID-19 symptoms are tracked in multiple CCTV feeds with highlighted timestamps. Thermal cameras are used in the system to detect the temperature of an individual hence the system will alert if the detected temperature of the individual is beyond normal temperature .If the individual scanned is not wearing a mask, a message is triggered to the Department Head along with the individual as a caution. The software gives an additional feature to set the condition for wearing a mask to compulsory or not depending on the prevailing COVID situation. A report will be generated on the admin's request on the basis of gender, age or any personalized information. The system will be able to handle people with any age, sex, facial features, skin tone.

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CHAPTER 1

INTRODUCTION

1.1 PROJECT DEFINITION

Design of an automatic class attendance system using face detection algorithm of LabVIEW software. The system requires a video capture device and the running LabVIEW algorithm to be implemented successfully. It detects the faces and mark attendance accordingly. This system will prevent unnecessary wastage of time of classes that is usually wasted in form of class roll calls.

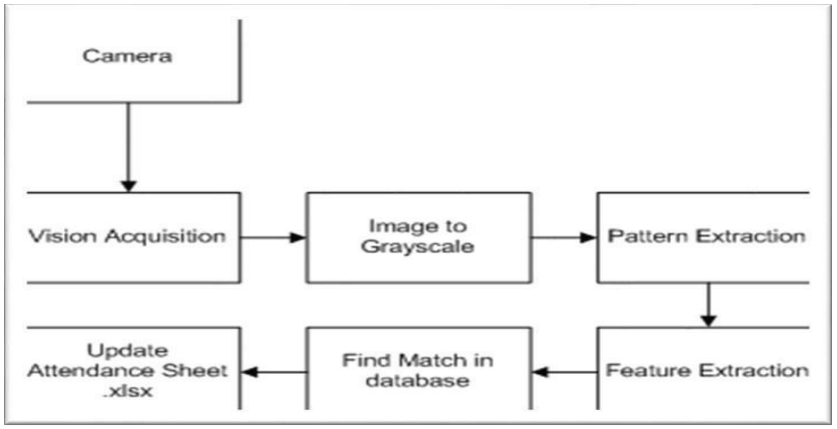
1.2 PROJECT OBJECTIVES

To ensure early identification of cases among students and staff in orderto conduct contact tracing and initiate prevention and control measures, thereby reducing further transmission.To identify infection in students and staff at high risk of developing severe disease due to underlying conditions. Prevention of wide spread of the disease by ensuring strict monitoring of safety protocols. Reducing time wastage during conventional class attendance. Reducing time wastage during conventional class attendance. Utilizing latest trends in machine vision to implement a feasible solutionfor class attendance system. Automating the whole process so that we have digital environment. Preventing fake roll calls as one to one attendance marking is possible only. Encouraging the use of technology in daily lives.

1.3 PROJECT SPECIFICATIONS

Uses Pattern Matching algorithm for face detection.Score of minimum 600 required to perfectly match a face.Metric: Camera Resolution.For prototype fixed to 10 users only but scalable design.Requires good lighting condition for better camera capture capability.Attendance sheet is .xlsx format and can be digitally distributed andmaintained.

1.4 PRODUCT ARCHITECTURE AND COMPONENTS



Functional Diagram

FIGURE 1.1: BLOCK DIAGRAM OF THE SYSTEM

The subsystem description is as follows:

Camera: The camera is the only hardware component required to capture live video feed of class.

Vision Acquisition: This module allows image to be captured by camera into LabVIEW for programming. It includes IMAQ submodules such as IMAQ Create, IMAQdx Open, IMAQdx Grab. They all combine to provide Continuous Acquisition of video feed from camera module.

Image to Grayscale: This process is performed using IMAQ

ExtractSingleColorPlane VI to convert a 32/16bit image to 8bit image. This is a requirement for our pattern matching algorithm to work completely.

Feature Extraction: This feature is used to extract important features out of image. It compares them with templates, saves in database and provides a score of comparison.

Find Match in database: Our database has preserved templates or images of students which we aim to recognize and mark attendance. This database can be updated or appended according to requirement . This database is used for comparison with extract features of image to confirm a successful hit.

1.5 BENEFITS OF FACIAL RECOGNITION BASED ATTENDANCE SYSTEM

To make the system efficient and user friendly. “Covid-19 Surveillance System” has been designed to computerize the following functions that are performed by the Website. This site is about various travel packages and activities to do around the world. The person who visits the site can book the seats online. The main goal of surveillance during outbreak management is to detect cases early in order to mount effective public health action to reduce the transmission. The FCTCOVID-19 surveillance system exhibits some of the attribute of a good surveillance system, however, poor stability, data quality and timeliness were limitation. Our findings showed that the surveillance system had an overall moderate performance, this implies that the system was not performing optimally although the system meets the initial objective of the surveillance.Covid-19 Surveillance System gives the efficient way for facial recognition at any angle which helps with attendance management and salary calculations. Suspects are tracked in multiple CCTV feeds with highlighted timestamps by hosting them on a single server. The system will alert if the detected temperature of the individual is beyond normal temperature. If the individual scanned is not wearing a mask, a message is triggered to the Department Head along with the individual as a

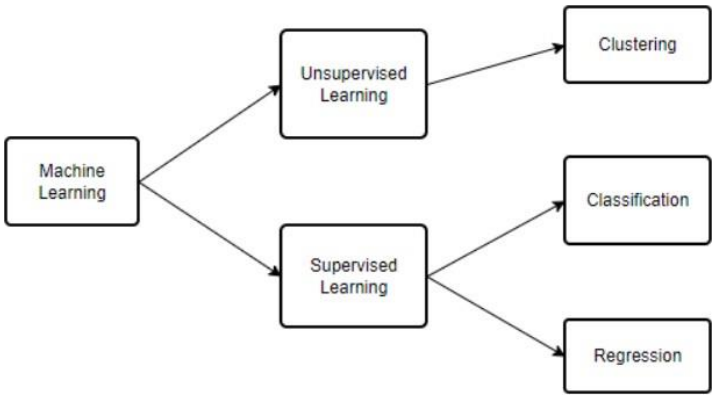
caution.

1.6 MACHINE LEARNING

Machine learning is a data analytics technique that teaches computers to do whatcomes naturally to humans and animals: learn from experience.

Deep learning is a special form of machine learning. Machine learning uses two techniques: supervised learning, which trains a model on known input and output data to predict future outputs, and unsupervised learning, which uses hidden patterns or internal structures in the input data.

Machine learning is an important component of the growing field of data science. Through the use of statistical methods, algorithms are trained to make classifications or predictions, uncovering key insights within data mining projects. These insights subsequently drive decision making within applications and businesses, ideally impacting key growth metrics.



1.6.1 SUPERVISED LEARNING

Supervised machine learning creates a model that makes predictions based

evidence inthe presence of uncertainty. A supervised learning algorithm takes a known set of input data and known responses to the data (output) and trains a model to generate reasonable predictions for the response to the new data. Use supervised learning if youhave known data for the output you are trying to estimate.

Supervised learning uses classification and regression techniques to develop machine learning models.

Classification models classify the input data. Classification techniques 3 predict discrete responses. For example, the email is genuine, or spam, or the tumor is cancerous or benign. Typical applications include medical imaging, speech recognition, and credit scoring.

Regression techniques predict continuous responses - for example, changes in temperature or fluctuations in electricity demand. Typical applications include power load forecasting and algorithmic trading.

1.6. UNSUPERVISED LEARNING

Detects hidden patterns or internal structures in unsupervised learning data. It is used to eliminate datasets containing input data without labeled responses.

Clustering is a common unsupervised learning technique. It is used for exploratory data analysis to find hidden patterns and clusters in the data. Applications for cluster analysis include gene sequence analysis, market research, and commodity identification.

It’s also used to reduce the number of features in a model through the process of dimensionality reduction; principal component analysis (PCA) and singular value decomposition (SVD) are two common approaches for this. Other algorithms used in

unsupervised learning include neural networks, k-means clustering, probabilistic clustering methods, and more.

FEATURES OF MACHINE LEARNING

- ❖ It can learn from past data and improve automatically.
- ❖ It is a data-driven technology.
- ❖ Machine learning is much similar to data mining as it also deals with the huge amount of the data.

1.7 ALGORITHMS

What is an Algorithm?

Algorithm is a step by step procedure to solve a problem. Problem is a kind of task that we need to solve. To solve a problem means to find a solution for each input.

1.7.1 FEATURES OF AN ALGORITHM

- ➢ **Finiteness**–an algorithm should end in a finite number of steps.
- ➢ **Definiteness** – each step of an algorithm should have precise definition.

  And it means that for the same inputs we will obtain the same results.
- ➢ **Input**–an algorithm may have inputs, they are taken from some set of objects.

1.8 PROJECT BACKGROUND

In the face detection and recognition system, the process flow is initiated by being able to detect the facial features from a camera or a picture store in a

memory. The algorithm processes the imagecaptured and identifies the number of faces in the image by analyzing from the learned pattern andcompare them to filter out the rest. This image processing uses multiple algorithm that takes facialfeatures and compare them with known database.

The motivation behind this project is to simplify the means by which attendance is taken during lectures and how much time it takes. The use of ID cards or manually calling out attendance and writing it down on sheets is not productive and efficient. This system will detect the number of faces on the class and will also identify them from the store database. With the face detection and recognition system in place, it will be easy to tell if a student is actually present in the classroom or not.

CHAPTER -2

LITERATURE REVIEW

This is a project done by students as a final year project at Kingston UniversityLondon in 2018.The system will be presented an image either via camera or from memory and it must detect the number of faces on it automatically. After identifying faces, the system should crop the faces from the image and store them in memory for image recognition which will be done in the second step. The system should be able to automatically count the number of faces detected on the image.

The second step will be the recognition part where the system will be able to match faces from the stored dataset and compare it to the input data fromthe first step. A software will be usedfor this system which automatically sorts out the faces. The software will be inter-active so to facilitate interaction between multiple tasks as required. Because the system has two steps, the second phase of the system will involve the training of images on a dataset that are to be used for recognition.The system behavior has been explained in the following flowchart

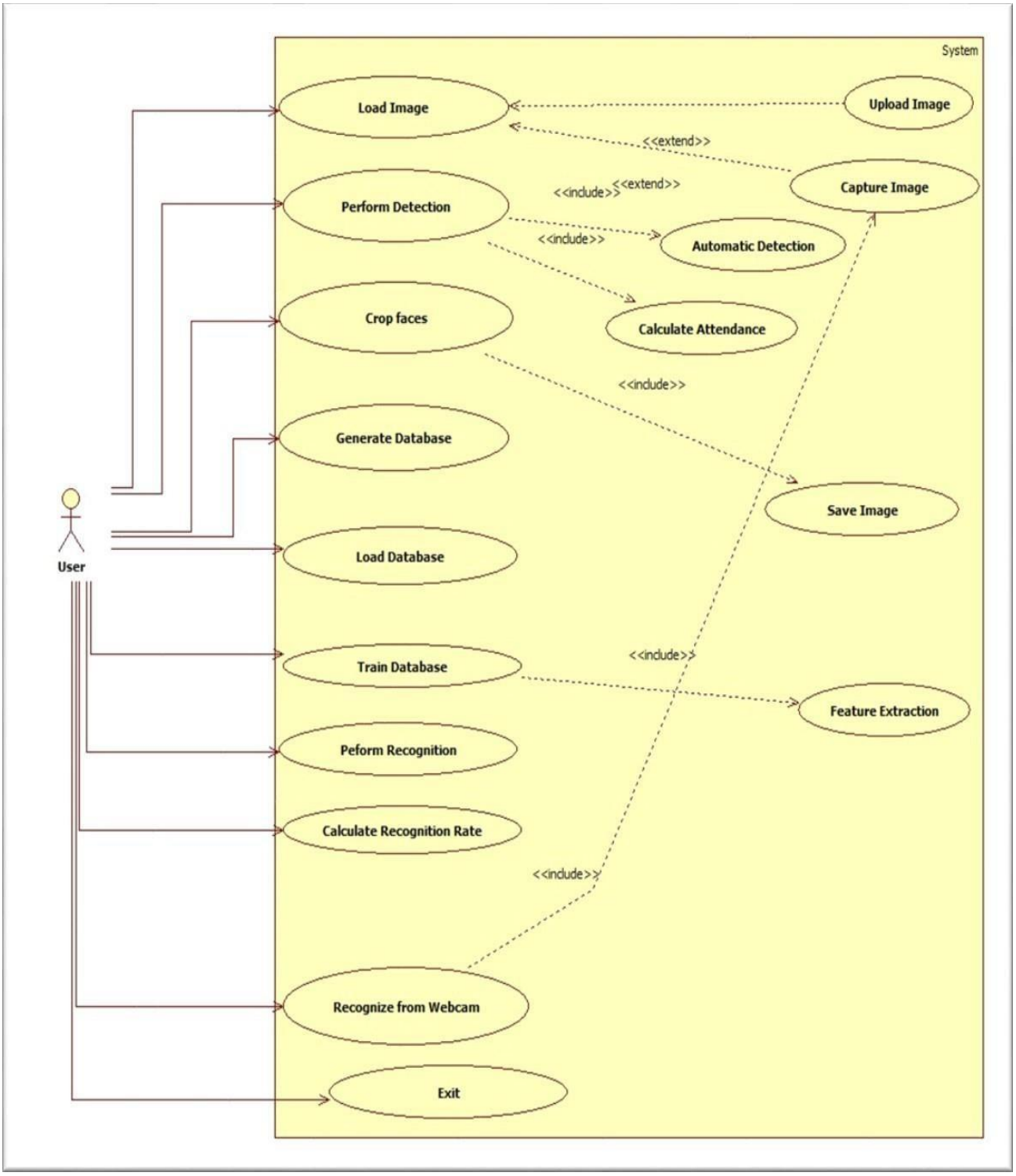


FIGURE 2.1: BLOCK DIAGRAM OF PREVIOUS PROJECT #1

Following flowchart explains the process of the flow of information throughout the process.

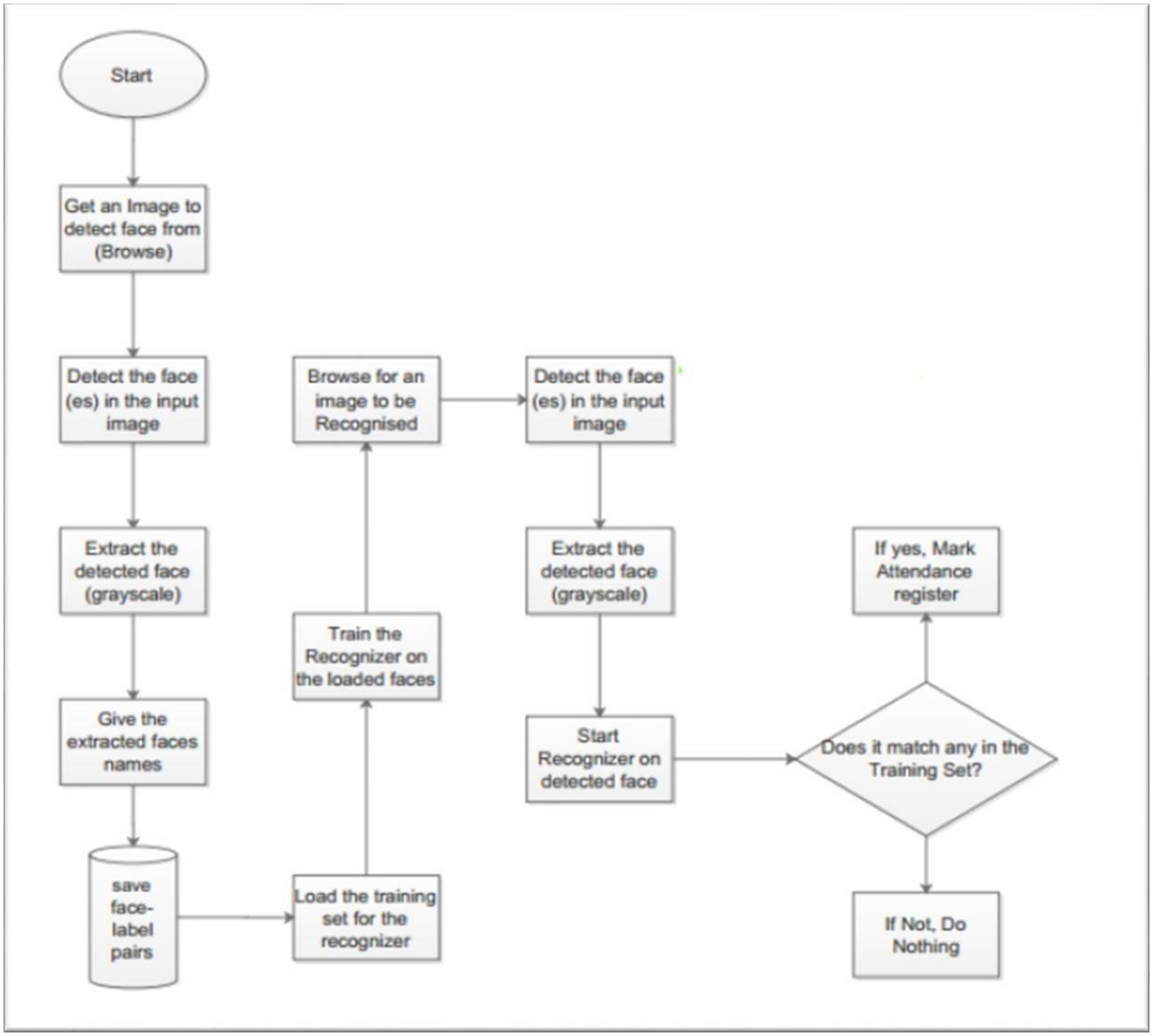


FIGURE 2.2: BLOCK DIAGRAM OF PREVIOUS PROJECT #2

Technology Used

The following tools will be used in the implementation of the designed system. They've been divided in to two categories; Mobile and Desktop tools.

- **Mobile Tools**

The face detection module will use OpenCV library for implementation by use of the frontal HaarCascade face detector in either Android studio.

OpenCV for Android Library - (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision.

Android Studio/ Eclipse IDE - Android Studio is the official IDE for Android application development, based on IntelliJ IDEA.

- **Desktop Tools**

EmguCV Library - EmguCV is a cross platform .Net wrapper to the OpenCV image processinglibrary. OpenCV/EmguCV uses a type of face detector called a Haar Cascade. The Haar Cascadeis a classifier (detector) trained on thousands of human faces.

This is a project done by students as a final year project at Universiti Tunku in2018. The approach performs face recognition-based student attendance system. This method is also similar to 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 thefacial images from known database. Both LBP and PCA feature extraction methods are studied in detail and computed in this approach in order to make comparisons. LBP is enhanced in this approach to reduce the illuminationeffect. An algorithm to combine enhanced LBP and PCA is also designed for subjective selection in order to increase the accuracy.

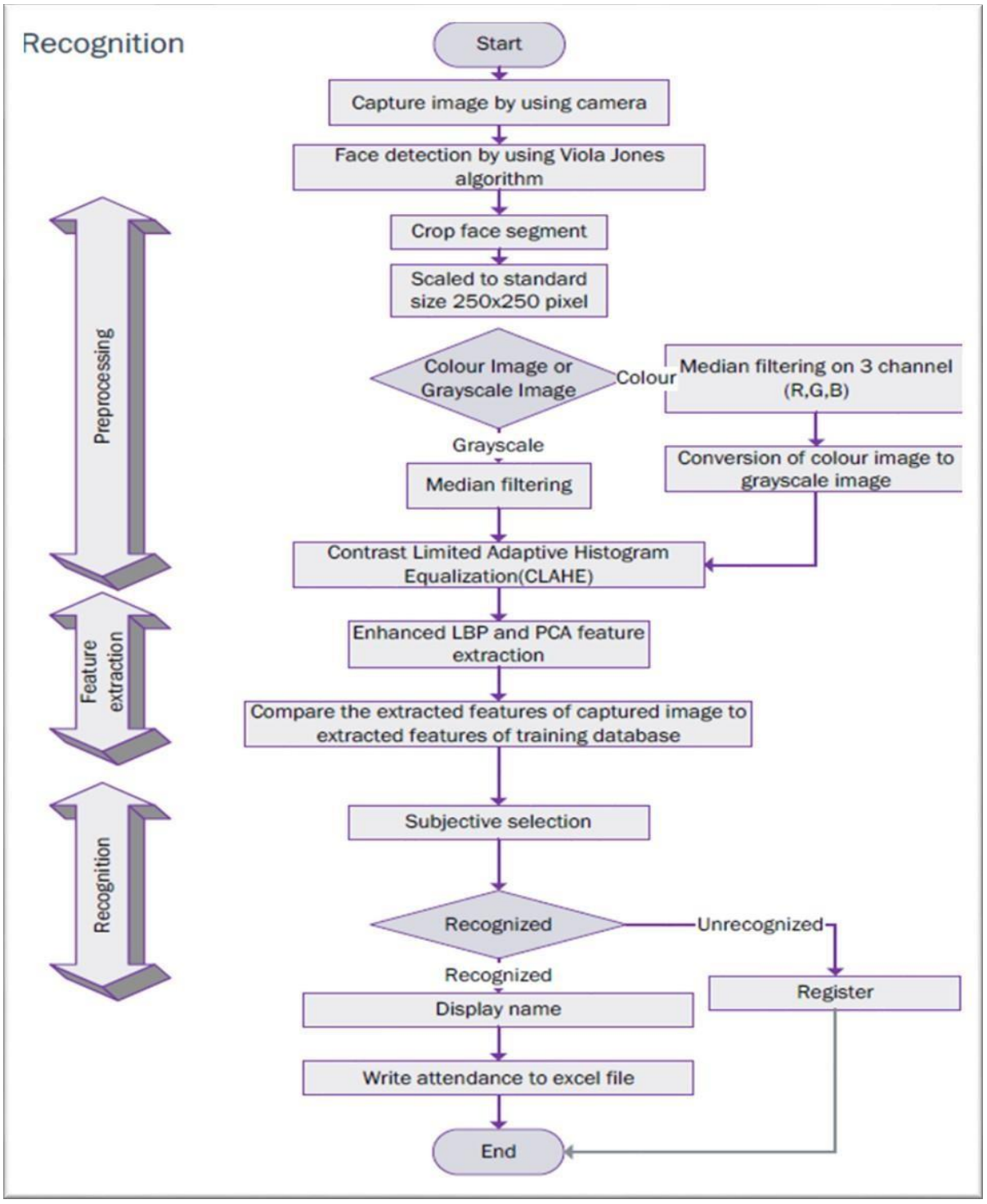


FIGURE 2.3: BLOCK DIAGRAM OF PREVIOUS PROJECT #3

The project is completely built in MATLAB with OpenCV libraries implemented in it.

2.3 COMPARATIVE STUDY

Our project is different than all the previous projects made and mentioned above.

They have purelyused the core of machine vision to implement a face detection

mechanism. None of the above- mentioned projects have realized the power of LabVIEW programming and LabVIEW Vision modules in which not only pattern matching but other machine vision algorithms like edge tracking, geometric matching can be implemented with ease.

Though the general mechanism and flow of events is similar in above projects and our current project however, the mechanism of face detection is completely unique and different.

Projects	1	2	3	Our Project
Face Recognition & Detection	√	√	√	√
Communication GSM, Zigbee, WiFi	GSM	GSM	Wi-fi	Wi-Fi
Time Saving	√			√
Market Demand	√	√	√	√
Local Usage in Schools		√	√	√
Data Saving in Record (Monitoring)	√			√

FIGURE 2.4: COMPARESSON BETWEEN ALL PROJECTS

CHAPTER-3

SYSTEM SPECIFICATION

LANGUAGE USED :

Python

WEB DEVELOPMENT FRAMEWORK :

FLASK

DATABASE :

MONGODB ATLAS

FRONTEND TOOL:

HTML

CSS

3.1 SOFTWARE REQUIREMENTS

OPERATING SYSTEM: Windows 7 or higher

TOOL: Pycharm

3.2 HARDWARE REQUIRMENTS

Hard Disk : Processor 500 GB or Higher.

RAM: 4 GB

System with internet connectivity

CHAPTER-4

SOFTWARE DESCRIPTION

4.1 PYTHON

Python is a computer programming language often used to build websites and software, automate tasks, and conduct data analysis. Python is a general purpose language, meaning it can be used to create a variety of different programs and isn't specialized for any specific problems.

This versatility, along with its beginner friendliness, has made it one of the most-used programming languages today.

ADVANTAGE OF USING PYTHON

Python is commonly used for developing websites and software, task automation, dataanalysis, and data visualization. Since it's relatively easy to learn.

Python has been adopted by many non-programmers such as accountants and scientists, for a variety of everyday tasks, like organizing finance.

Python is often used to develop the back end of a website or application—the parts that a user doesn't see. Python's role in web development can include sending data to and from servers, processing data and communicating with databases, URL routing, and ensuring security.

- Simple syntax •
- Versatility •
- Beginner friendly •
- Open source •
- Archive of modules and libraries
- Large and active community.

The software is a set of procedures of coded information or a program which when fed into the computer hardware enables the computer to perform the various tasks. Software is like a current inside the wire, which cannot be seen but its effect can be felt.

Operating system: Windows 11(professional)

IDE Used : Visual studio

Back-End: MongoDB

- An important aspect of is to make sure that the new design is implemented to establish standards.
- The term implementation has different meanings, ranging from the conversion of a basic application to a complete replacement of a computer system.
- Implementation is 94 used here to mean the process of converting a new or revise system into an operational one.
- Conversion is one aspect of implementation.
- Conversion means changing form one system to another.
- The objective is to put the tested system into operation while holding costs, risks, and personnel irritation to a minimum.
- It involves creating computer compatible files, training the operation staff, and installing terminal and hardware.
- A critical aspect of conversion is not disrupting the functioning of the organization.

4.2 SOFTWARE TOOLS USED

OpenCV

OpenCV was started at Intel in 1999 by **Gary Bradsky**, and the first release came outin 2000. **Vadim Pisarevsky** joined Gary Bradsky to manage Intel's Russian software OpenCV team. In 2005, OpenCV was used on Stanley, the vehicle that won the 2005 DARPA Grand Challenge. Later, its active development continued under the support of Willow Garage with Gary Bradsky and Vadim Pisarevsky leading the project.
OpenCV now supports a multitude of algorithms related to Computer Vision and Machine Learning and is expanding day by day.

OpenCV supports a wide variety of programming languages such as C++, Python, Java, etc., and is available on different platforms including Windows, Linux, OS X, Android, and iOS. Interfaces for high-speed GPU operations based on CUDA and OpenCL are also under active development.

OpenCV-Python is the Python API for OpenCV, combining the best qualities of the OpenCV C++ API and the Python language.

OpenCV- Python

OpenCV-Python is a library of Python bindings designed to solve computer vision problems.

Python is a general purpose programming language started by **Guido van Rossum** that became very popular very quickly, mainly because of its simplicity and code readability. It enables the programmer to express ideas in fewer lines of code without reducing readability.

Compared to languages like C/C++, Python is slower. That said, Python can be easily extended with C/C++, which allows us to write computationally intensive code in C/C++ and create Python wrappers that can be used as Python modules. This gives us two advantages: first, the code is as fast as the original C/C++ code (since it is the actual C++ code working in background) and second, it easier to code in Python than C/C++. OpenCV-Python is a Python wrapper for the original OpenCV C++ implementation.

OpenCV-Python makes use of **Numpy**, which is a highly optimized library for numerical operations with a MATLAB-style syntax. All the OpenCV array structures are converted to and from Numpy arrays. This also makes it easier to integrate with other libraries that use Numpy such as SciPy and Matplotlib.

TENSORFLOW

The TensorFlow platform helps you implement best practices for data automation, model tracking, performance monitoring, and model retraining. Using production- level tools to automate and track model training over the lifetime of a product, service,or business process is critical to success.

MONGODB ATLAS

MongoDB Atlas is a fully-managed cloud database that handles all the complexity of deploying, managing, and healing your deployments on the cloud service provider of your choice (AWS , Azure, and GCP). MongoDB Atlas is the best way to deploy, run,and scale MongoDB in the cloud.

IDE USED:

Visual Studio:

Visual Studio, also known as Microsoft Visual Studio and VS, is an integrated development environment for Microsoft Windows.

It is a tool for writing computer programs, websites, web apps, and web services. It includes a code editor, debugger, GUI design tool, and database schema designer, and supports most major revision control systems. It is available in both a free "Community" edition and a paid commercial version.

Language : HTML, CSS, JS, BOOTSTRAP.

CHAPTER-5

SYSTEM ANALYSIS

5.1 EXISTING SYSTEM

In the present system a person has to monitor the body temperature and mask detection of the users or members of the organization manually.This often requires a lot of time and effort.A customer may not get the desired information from these offices and often the customer may be misguided.It is tedious for a customer to plan a particular journey and have it executed properly

5.2 PROPOSED SYSTEM

The proposed system is a Web based application and maintains a centralized repository of all related Information. The system allows one to easily access the relevant information and make necessary travel arrangements .Users can decide about places they want to visit and make bookings online for travel and accommodation.

CHAPTER- 6

SYSTEM DESIGN

6.1 DESIGN STRUCTURE

The design document that we will develop during this phase is the blueprint of the software. It describes how the solution to the customer problem is to be built. Since solution to complex problems isn't usually found in the first try, iterations are most likely required.

This is true for software design as well. For this reason, any design strategy, design method, or design language must be flexible and must easily accommodate changes due to iterations in the design.

Any technique or design needs to support and guide the partitioning process in such a way that the resulting sub-problems are as independent as possible from each other and can be combined easily for the solution to the overall problem. Sub-problem independence and easy combination of their solutions reduces the complexity of the problem.

6.2 DESIGN OVERVIEW

In analyzing the present system a great deal of information was collected during the investigation and feasibility phases through list of problems and requirements, interview reports, question, onsite observations, manuals and determining potential solutions. It is important to record this information in an unambiguous, concise manner which will be clear and accessible to others, and which can be used by other analysts and designers involved in developing the system. Structured techniques help us to record the, using diagrams and minimum amount of the text.

6.3 NEED OF COVID-19 SURVEILLANCE SYSYTEM

The following steps that give the detailed information of the need of proposed system are:

6.3.1 PERFORMANCE

During past several months, the Covid-19 is one of the most dreadful disease the has resulted in the death of many people.

This has provided an early insight into the performance of Covid-19 surveillance system , highlighting information necessary for health.

Despites its many strengths, some significant weakness and gaps were identified in the Covid-19 surveillance system during this evaluation.

The manual handling of the record is time consuming and highly prone to error. To improve the performance of the detection of Covid-19, the online software is to be undertaken.

The computerized Covid-19 Surveillance project is fully computerized and user friendly.

6.3.2 EFFICIENCY

The basic need of the project is efficiency. The project should be efficient so that whenever a user open this site he will get the knowledge.

6.3.3. CONTROL

The complete control of the project is under the hands of authorized person who has the password to access this project and illegal access is

not supposed to deal with.

All the control is under the administrator and the other members have the rights to just see the records not to change any transaction or entry.

6.3.4 SERVICE AUTOMATION

The most valuable benefit of our software is that it makes your attendance , mask detection and body temperature screening automated.

This improves efficiency and saves your experience with a better automated monitoring workflow.

CHAPTER-7

SYSTEM IMPLEMENTATION

7.1 MODULE DESCRIPTION

1.ADMINISTRATOR MODULE:

This module provides administrator related functionality. The admin will be responsible for controlling the attendance system of the users of the organization and the further data is sent to the payroll for salary calculations. The software will fail to mark the attendance if an individual entering the building is wearing a cap. When an individual of suspicion is identified by the admin, the facial input or any personalized information like, name, age , gender of the suspect is fed to our application and simultaneously tracked in all the CCTV feeds which will be hosted on a single server which will be effective for detecting multiple suspects in multiple feeds.

2.HEAD MODULE:

The head can monitor the body temperature and detect mask of an individual. If the temperature is higher than the threshold or the individual is not wearing mask an alert is instantly sent .

3. USER MODULE:

This module provides functionalities that allow a user to receive notificationThe individual not wearing mask is notified immediately after detection by our software.

4. TESTIMONIALS MODULE:

Users of this application can post their opinions, complaints and suggestions

regarding this portal and services to the administrator. Accordingly, the administrator can take various steps to act on the complaints and suggestions.

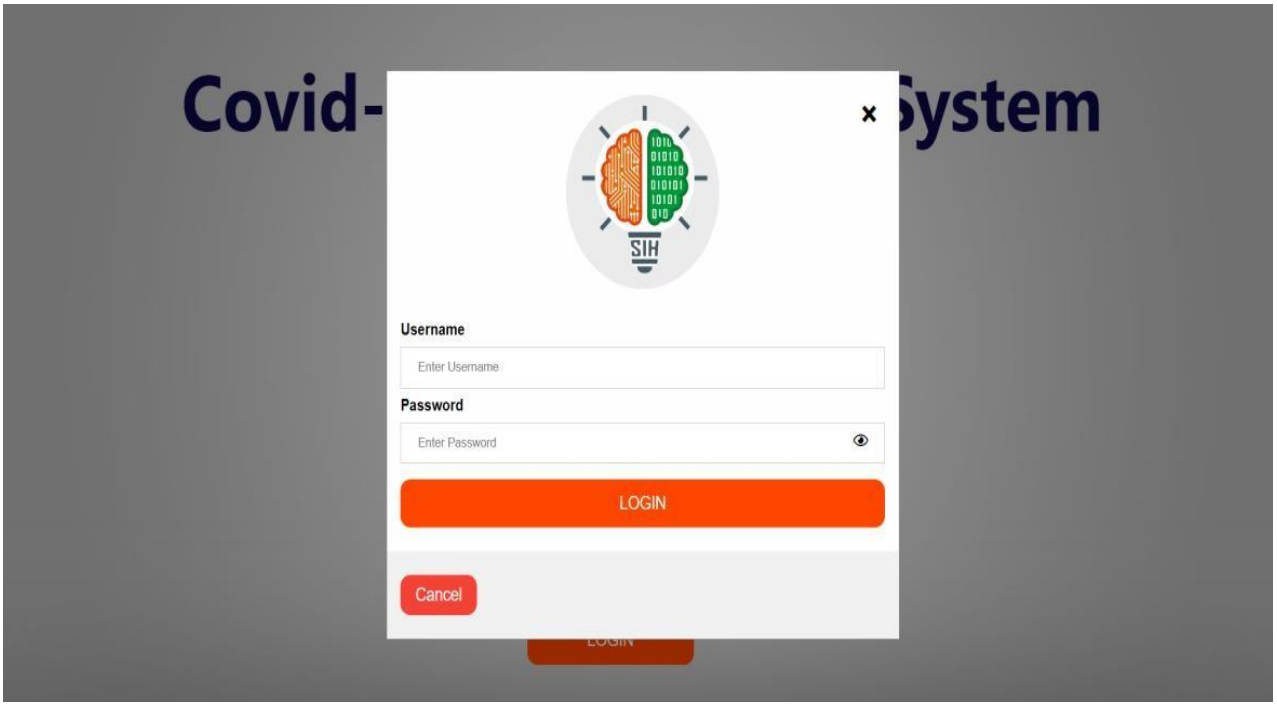
5. REPORT MODULE:

The software gives an additional feature to set the condition for wearing a mask to compulsory or not depending on the prevailing COVID situation. A report will be generated on the admin's request on the basis of gender, age or any personalized information. The system will be able to h andle people with any age, sex, facial features, skin tone.

7.2 SCREEN SHOTS

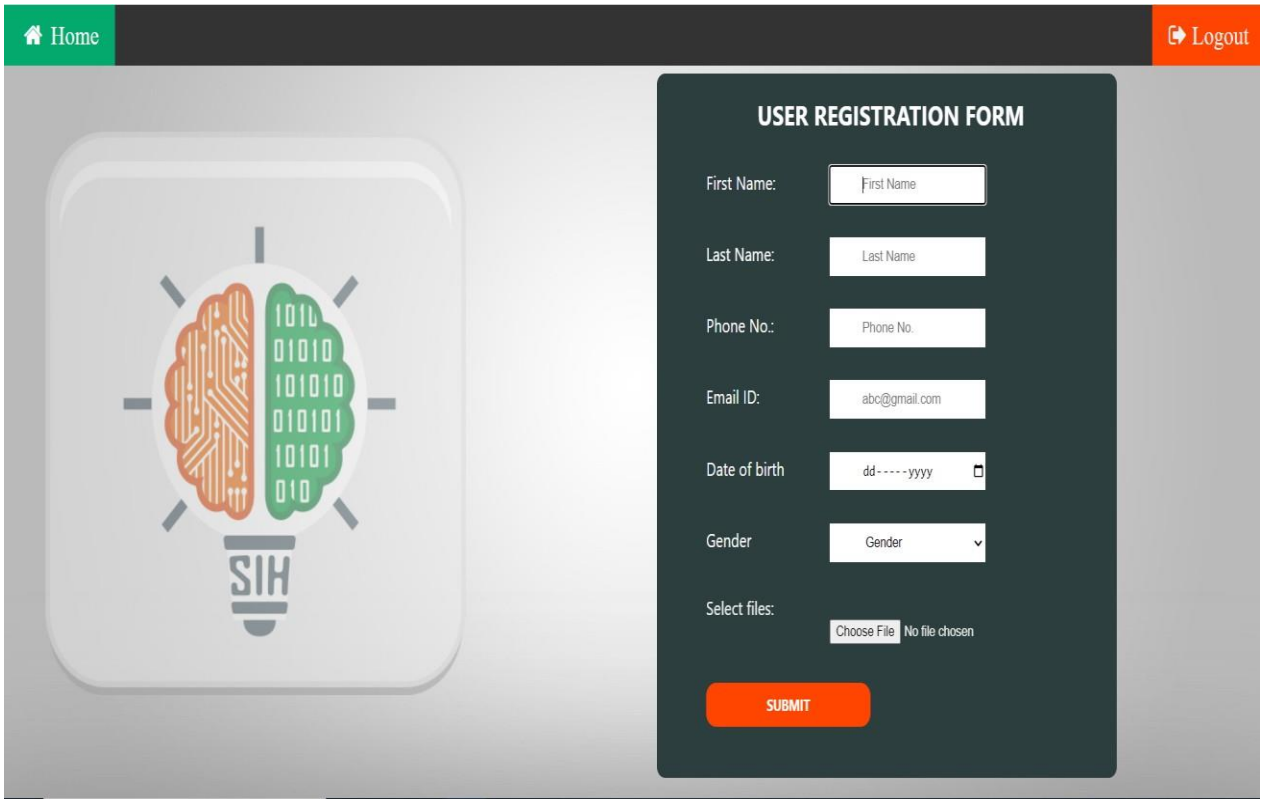
FRONT PAGE:

LOGIN PAGE:



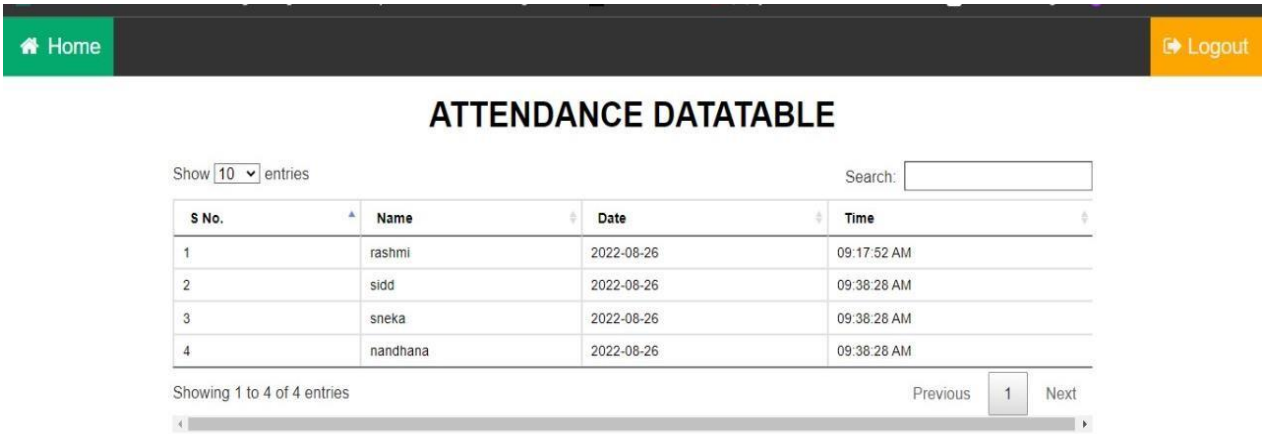
DASHBOARD:

USER REGISTRATION:

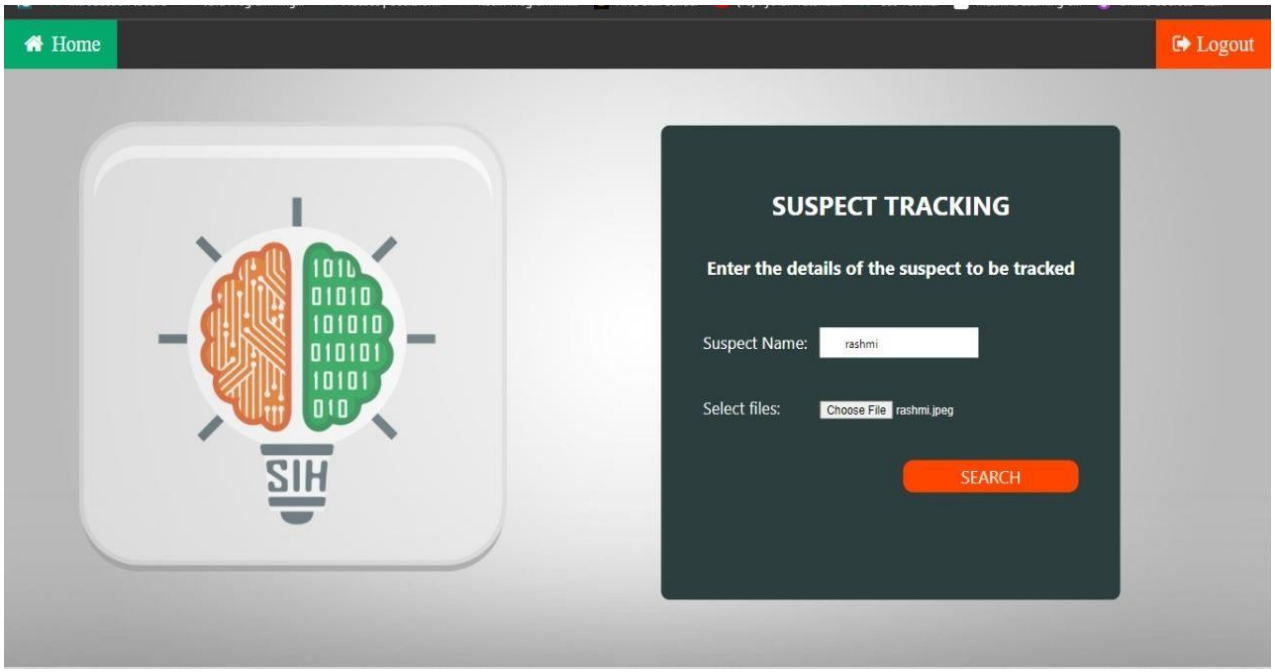


FACE RECOGNITION:

DATABASE PAGE:



TRACK SUSPECT:



SUSPECT SEARCHING VIA LIVE AND STORED FEEDS:

CHAPTER-8

8.4 CONCLUSION

The coronavirus disease continues to spread across the world following a trajectorythat is difficult to predict. The health, humanitarian and socio-economic policies adopted by countries will determine the speed and strength of the recovery.A coordinated global effort is required to support countries that currently do not havesufficient fiscal space to finance social policy, in particular universal social protection systems. Our software helps to ensure safety in all organizations even under budget restraint situation.

The COVID-19 Pandemic has let to loss of lives and downfall of the country's economy. The prevailing situation was mainly due to poor monitoring. Checking the temperature of each and every individual was a tedious job especially when in large crowd. Another huge disadvantage was that an individual was not able to recognize the COVID symptoms and unknowingly spread COVID-19 across the country. The solution proposed to this problem is through our application which provides the following features (i) temperature detection of individual entering a building (ii)detection of suspects with COVID-19 (iii) detecting if an individual is wearing a mask and other alerts. Coming up with the use cases, the whole system will be dependent on three users, that is, the admin, the user and the head. For better understanding let us take an example of a college institution. The admin here will be the college management. The admin will be responsible for controlling the attendance system of the users of the organization and the further data is sent to the payroll for salary calculations. The software will fail to mark the attendance if an individual entering the building is wearing a cap. When an individual of suspicion is identified by the admin, the facial input or any personalized information like, name, age , gender of the suspect is fed to our application and simultaneously tracked in all the CCTV feeds which will be hosted on a single server which will be effective for

detecting multiple suspects in multiple feeds. Moving on to the next use case will be the head. Coming to our example which will be our department head. The head can monitor the body temperature and detect mask of an individual. If the temperature is higher than the threshold or the individual is not wearing mask an alert is instantly sent .the last use case will be the user, the individual not wearing mask is notified immediately after detection by our software. The following are the technologies to develop our software:(i) Tensor flow for writing machine learning algorithms-facial features extraction (ii) full stack development (iii) Django- web application (iv)Python framework OpenCV for facial Detection. Briefing about the system the first requirement will be thermal cameras which are used for the screening of body temperature because normal CCTV cameras can not capture the thermal structures of an individual. The next requirement would be proper functioning CCTV cameras which will be used for monitoring and suspect detection for the mass entering the building.

8.3 SCOPE OF IMPROVEMENT

Utmost care and back-up procedures must be established to ensure 100% successful implementation of the computerized system. In case of system failure, the organization should be in a position to process the transaction with another organization or if the worst comes to the worst, it should be in a position to complete it manually.

8.2 FUTURE ENHANCEMENT

"Prevention is better than cure"

The entire world will soon be under covid attack. We did not have the technologies to face last wave , but this time we have come up with the measures to control and prevent the covid-19 spread.This software will be in demand in future as our

software plays a major role in prevention and control by strict monitoring of the safety measures ensured in any enterprise or organization.In a world beyond the COVID-19 pandemic, project management remains the key to success for many businesses. Let’s examine the future of project management through remote working, upskilling, and the residual effects of the pandemic on our industry.

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