"CRIMINAL IDENTIFICATION USING 2D FACE RECOGNITION SYSTEM"

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Abstract :　This In practice, identification of criminal in Malaysia is done through thumbprint identification. However, this type of identification is constrained as most of criminal nowadays getting cleverer not to leave their thumbprint on the scene. With the advent of security technology, cameras especially CCTV have been installed in many public and private areas to provide surveillance activities. The footage of the CCTV can be used to identify suspects on scene. However, because of limited software developed to automatically detect the similarity between photo in the footage and recorded photo of criminals, the law enforce thumbprint identification. In this project, an automated facial recognition system for criminal database was proposed using known python programming language. This system will be able to detect face and recognize face automatically. This will help the law enforcements to detect or recognize suspect of the case if no thumbprint present on the scene.

I. INTRODUCTION

INTRODUCTION

Face recognition is one of the few biometric methods that possess the merits of both accuracy and low intrusiveness.For this reason since the early 70s, face recognition has drawn the attention of researchers in fields from security and image processing to computer vision. Face recognition has also proven useful in multimedia information processing areas. Face recognition is the task of identifying an already detected object as a known or unknown face. Often the problem of face recognition is confused with the problem of face detection. On the other hand is to decide if the face is someone known, or unknown, using for this purpose a database of faces in order to validate this input face. This project main objective is to create an efficient architecture for face recognition in playing videos using Neural Network. This product which two self contained Neural Network (CNNs) which are used to detect and recognize faces in regions containing a dense grouping of features from Accelerated Segment Test (FAST). Determining if the image of the face of any given person matches any of the face images stored in a database. This problem is hard to solve automatically due to the changes that various factors, such as facial expression, aging and even lighting, can cause on the image. Among the different biometric techniques facial recognition may not be the most reliable but it has several advantages over the others[2].It is widely used in various areas such as security and access control, forensic medicine, police controls and in attendance management system. The various techniques for marking person are: 1) Signature based System 2) Finger-print based System 3) Iris Recognition 4) RFID based System 5)

Face Recognition Amongst the above techniques, Face Recognition is natural, easy to use and does not require aid from the test subject.. It is a series of several related problems which are solved step by step: 1. To capture a picture and discern all the faces in it. 2. Concentrate on one face at a time and understand that even if a face is turned in a strange direction or in bad lighting, it is still the same person. 3. Determine various unique features of the face that can help in distinguishing it from the face of any other person. These characteristics could be the size eyes, nose, length of face, skin colour, etc. 4. Compare these distinctive features of that face to all the faces of people we already know to find out the persons name. Our brain, as a human is made to do all of this automatically and instantaneously. Computers are incapable of this kind of high-level generalization, so we need to teach or program each step of face recognition separately. Face recognition systems fall into two categories: verification and identification. Face verification is a 1:1 match that compares a face image against a template face images, whose identity is being claimed. On the contrary, face identification is a 1:N problem that compares a query face image.

2. RELEVANCE

In the recent years, Image processing which deals with extracting useful information from a digital image plays a unique role in the advent of technological advancements. It focusses on two tasks Improvement of pictorial information for human interpretation Processing of image data for storage, transmission and representation for autonomous machine perception. Also people have started to use image capturing devices never as before with the advent of smart phones and closed circuit television.

3. PROJECT UNDERTAKEN

Criminal Detection through Face Recognition is a challenging problem in the field of image processing. Images, acquired from different sources may be sensitive to noises and lighting conditions. Detection of face from noised and low resolution is difficult task. Tosolve these problems, there is need to perform some preprocessing "CRIMINAL IDENTIFICATION USING 2D FACE RECOGNITION SYSTEM" techniques. Preprocessed images are helpful to get better accuracy and to improve face recognition performance of the system

1.3.1Objectives:

1. To detect faces.

2. To identify the criminals.

3. To implement a windows based application using python.

4. PROJECT SCOPE AND LIMITATIONS

Project will be developed as a prototype model using Python technology. As the project is developed using webcam and open source libraries and softwares, it will limit the project accuracy.

5. METHODOLOGIES OF PROBLEM SOLVING

Python:
OpenCV (Open Source Computer Vision Library) is used to filter images taken from either a video stream, video files or image files. While using a supported programming language, you can create a program to use a camera, as a sensor, to detect and track elements within an image. If you can isolate elements within an image, you can detect and track the elements within video

streams.OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an en-tire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc. OpenCV has more than 47 thousand people of user community and estimated number of downloads exceeding 18 million. The library is used extensively in companies, research groups and by governmental.

LITERATURE SURVEY

Analysis Literature Survey:

Criminal record usually contains personal information concerning explicit person Alongside photograph. To spot any Criminal we need some identification related to person, that are given by viewer. In most cases the standard and backbone of the recorded image segments is poor and hard to identify a face. To beat this drawback, we tend to are developing code. Identification can be done in various ways like finger print, eyes, DNA etc. One in all applications is face identification. The face is our primary focus of attention in social inters course taking part in significant role in conveying identify and establishing emotion. Though the power to infer intelligence or character from facial look is suspect, the human ability to acknowledge face is outstanding.

In this paper, an automatic face recognition system for criminal info was proposed using known Principal Component Analysis approach. This technique are going to be ready to discover face and recognize face automatically. This can facilitate the law enforcements to detect or recognize suspect of the case if no thumbprint present on the scene. The results show that about 8

Proposed system is goes to spot criminals at numerous security place like airdrome, railway etc. Video Camera captures a hard and fast range of frames of a person coming in front of sign on counter. Proposed system compares these captured pictures taken through the camera with the pictures of the Criminals which are stored in the database. Proposed system is connection of two stages Face detection using.Hear Based Cascade classifier and recognition using Principle Component analysis with Eigen Face. The goal is to implement the system (model) for a selected face and distinguish it from an oversized range of stored faces with some period of time variations as well.[8]The objective of this paper is to assess confront discovery and acknowledgment procedures and provides a complete image based mostly face location and acknowledgment with higher truth, higher reaction rate associated an underlying advance for video observation. Arrangement is planned in light of performed tests on totally different face made databases as so much as subjects, stance, feelings and light.[9]Person identification using face is incredibly exigent and knotty drawback. Recognition of a person from an arbitrary perspective is crucial necessities for security measures and access management. Recognition of a specific face may be useful for countless issues like person laptop interaction, criminal detection, etc. The present system has additional calculation because of higher dimensional and no more effectual still. Rather than feat of face vectors with high speciality it is higher to use face vectors with lower speciality. This enforced face recognition system is easy and comparatively simple to recognize the faces from videos taken from a distance and web cams. The improved PCA rule removes facial expressions and classification is performed by minimum distance classification.[10]In this paper, from a different perspective, we consider enlarging the interclass variance by directly penalizing weight vectors of last fully connected layer, which

represent the center of classes. To the end, we propose Orthogonality loss as an elegant penalty item appends to common classification loss to learn the discriminative representations. The main idea is that in order for weight vectors to be discriminative, it should be as close as possible to be orthogonal to each other in the vector space. More specifically, the optimization objective of Orthogonality loss is the first moment and second moment of cosine similarity of weight vectors. We performed the empirical studies through simulating the long-tail datasets to show the generalization ability of the proposed approach on long-tail distribution datasets. Further, extensive experiments on large-scale face recognition benchmarksinclud"CRIMINAL IDENTIFICATION USING 2D FACE RECOGNITION SYSTEM" ing the Labeled Face in the Wild (LFW), the IARPA Janus Benchmark A (IJB-A), IJB-B, IJB-C, MegaFace Challenge 1 (MF1) and MS-Celeb-1M Low-shot Learning demonstrated that Orthogonality loss outperforms strong baselines, which showcases the extensive suitability and effectiveness of Orthogonality loss.[11]This paper applies the idea of transferred learning for feature extraction to a face recognition application. The feature extraction part of the trained deep learning model from a different domain is transferred for extracting face features. Then, the multilayer perceptron neural network is used for model evaluation. Experimental results on public face databases show that the proposed method is highlyefficient.[12]The proposedsystem addressesthree key challenges of video-basedface recognition systems: end-to-end computational complexity, in the wild recognition and multi-person recognition. We exploit sophisticated deep neural networks for face detection and facial feature extraction, while minimizing the computational overhead from the rest of the modules in the recognition pipeline. A comprehensive evaluation shows that the proposed system can effectively recognize faces under unconstrained conditions, at elevated frames per second rates.[13]This paper proposed a face recognition system that makes searching for criminals easy and quick with less time and hence efficiently helps police and administration. In this paper, a pretrained model i.e FaceNet (FN) is used for face recognition from video. FN modifies the face images into a close-packed Euclidean space where separations extent the face nearness.[14]In this research paper we have tried to survey the existing technologies as well as we propose a new system for criminal Detection & Recognition using Cloud Computing and Machine Learning, which if used by our Crime Agencies would definitely help them to find criminals from CCTV footage. The proposed system can not only help find criminals but if used properly on different sites such as railway stations etc, can also help find missing children and people from the CCTV footage available from the respective site. Existing solutions use traditional face recognition algorithms which can be troublesome in changing Indian environments especially factors like light, weather and especially orientation. Some CCTV are in a bad place and can get tilted resulting in a wild increase in inaccuracy. This research paper pro7poses to use Microsoft Azure Cognitive services and Cloud system for implementation of the proposed system [21]. The next phase this research will try to compare this proposed methodology with traditional techniques like HAAR cascade to judge performance of the proposed System, as it is important to have a high accuracy, for a project of this sensitivity.[15]This research study is based on the analysis of faces, emotions, Ages and genders to identify the suspects. Face recognition, emotion, age and gender identifications are implemented using deep learning based CNN approaches. Suits identification is based on LeNet architecture. In the implementation phase for the classification purpose, Keras deep learning library is used, which is implemented on top of Tensorflow. IMDb is the dataset used for the whole training purpose. Training is performed using in AWS cloud which is more powerful and capable way of train-ing instead of using local machines. Real-time Video and images are taken for the experiment. Results of the training and predictions are discussed below in brief.[16] In this paper, we present machine learning and deep learning based E-police system to enhance public safety and support law enforcement. Main objective of the system is prevention of crimes. E-Police is an application that helps police officers to get informed about the incidents happening around in real-time. In addition, system provides predictions about possible crimes likely to take place in future so that precautions can be taken to prevent those.[16]"CRIMINAL IDENTIFICATION USING 2D FACE RECOGNITION SYSTEM"

SOFTWARE REQUIREMENT SPECIFICATION

1. PROJECT SCOPE

- Todevelop prototype model for criminal identification system from face recognition using python.

- This model will be run using python programming language.

- The application will be a windows based application developed using tkinter.

ASSUMPTIONSAND DEPENDENCIES

This document will provide a general description of project, including user requirements, product perspective, and overview of requirements, general constraints. In addition, it will also provide the specific requirements and functionality needed for this project such as interface, functional requirements and performance requirements.

3.2.1User Classes and Characteristics

Find the different user classes that you anticipate will use this product. User classes can be differentiated based on use frequency or product functions subset used or technical expertise or privilege levels or educational level and experience.

It also describe the pertinent behavior or characteristics of each user class. Few

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requirements may limited only to specific user classes. Differentiate the very most important or useful user classes for this item or product from those who are less significant to satisfy.

3. FUNCTIONAL REQUIREMENTS

Functional user requirements is nothing but very high-level statements about what the system should and also it should describe clearly an overview of system services in detail.

4. EXTERNAL INTERFACE REQUIREMENTS

1. User Interfaces

The user interface or UI for the software should be compatible to be used by any standard operating system. Using this UI user can have access to the system. The UI or user interface can be developed by using many tool or software package like

2.Hardware Interfaces

A hardware interface is needed to run the software. Python IDLE and other necessary libraries is required which is minimal requirement.

3.Software Interfaces

It uses Python as the programming tool. MySQL has been used as back end application tool. Latest version of python anything higher than 3.7 can be used.NON FUNCTIONAL REQUIREMENTS1.Performance RequiremenSystem can work optimal or faster on 8 GB or

2.   Safety Requirements

• The system is designed in modules where errors can be detected.

3.   Security Requirements

• The system is designed in modules where errors can be detected and fixed easily.

4.   Software Quality Attributes

- **Usability:**

    This relates to how easily people can use app/website. A measure of usability could be the time it takes for end users to become familiar with my app/website functions, without training or help.

- **Reliability:**

    This can be defined as the available time or UP time of software.

- **Performance:**

    This is essentially how fast app/website works. A performance requirement for the app/website could be start in less than 20 seconds.

- **Security :**

    Say that app/website saves all the previous code and lets you reuse a saved code.

6. SYSTEM REQUIREMENTS

1.DatabaseRequirements

MySQLDatabase

MySQL is on open source database which is mainly a RDBMS i.e. relational database management system. As a database server, primary function of this software is to storing and retrieving data as requested by other from end software applications like java which may Or may not run either on the same computer or on different computer. This can be across the network either in internet or intranet.

2.   Software Requirements

1. **Operating System:** Microsoft Windows 7 andAbove

2. **Programming Language:** Python

3. **IDE:** Python IDLE

3.　　HARDWARE REQUIREMENTS

1. **Processor:** Intel Core I3 orHigher

2. **RAM:** 8 GB or Higher

3. **Hard Disk:** 100 GB(min)

6. ANALYSIS MODELS: SDLC MODEL TO BE APPLIED

SDLC model to be applied Waterfall Model:

The Waterfall Model is among very first and old model of software development life cycle. It is also called as a linear-sequential life cycle model. This is very simple in nature and easy to understand or use. This is step by step method so next step can only be begin once earlier has been completed. This is mainly used for small scale project. Constant or fixed requirement should be there for this type of model.
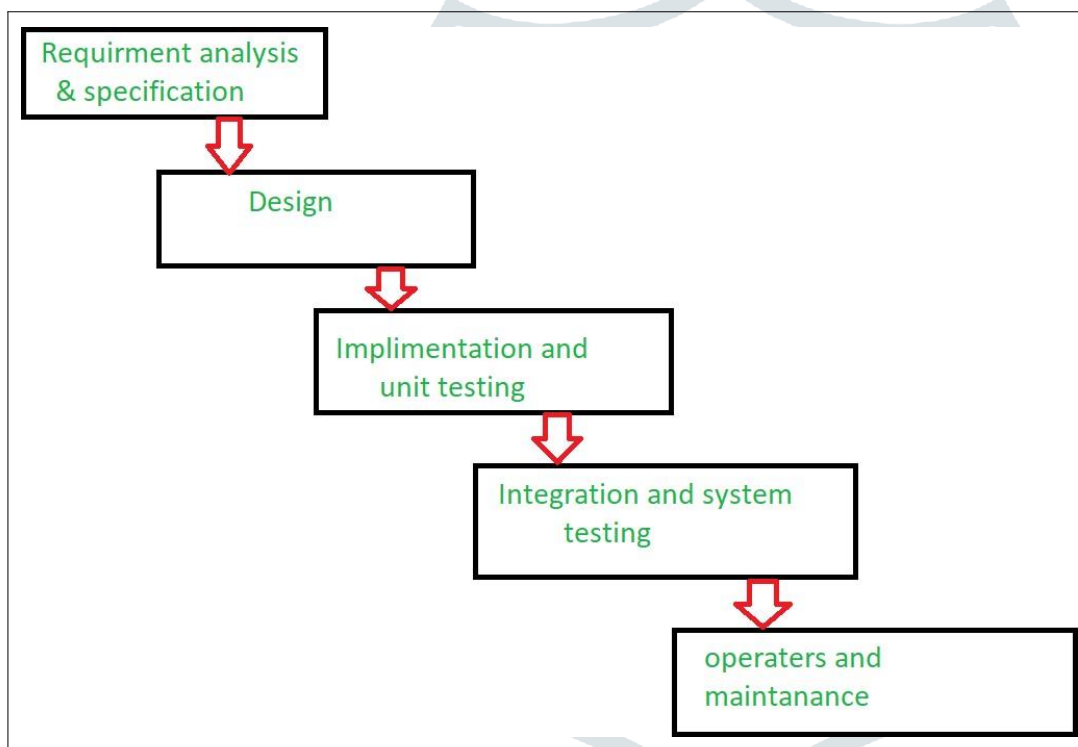
Figure 3.1: Waterfall Model

SYSTEM DESIGN
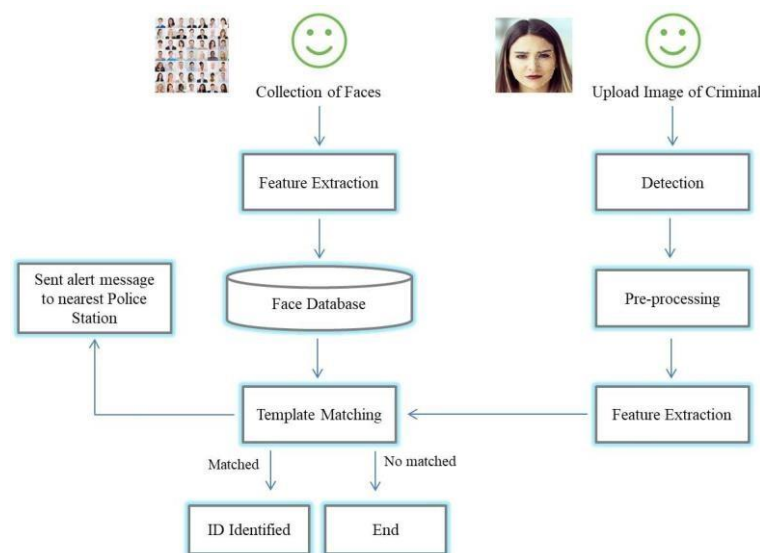
4.1 SYSTEM ARCHITECTURE

Figure 4.1: System Architecture

In this project, System propose a Criminal Detection through Face Recognition. To overcome the drawbacks that were in the existing system we develop a system that will be very useful for any investigation department. Here the program keeps track of images from different sides of faces. Based on this record number the program retrieves the personal record of the suspect (which face from comparing and get result more than 90 percent match then show as criminal is identified.

4.2 MATHEMATICAL MODEL

Let
S be Closed system defined as, S = Ip, Op, Ss, Su, Fi, A
To select the input from the system and perform various actions from the set of actions A so that Su state can be
attained.

S=Ip,Op,Ss,Su,Fi,A
Where,

IP1=Username,Password,Parameters
Set of actions=A=F1,F2,F3,F4
Where
F1= Image Capture
F2= Preprocessing
F3= Segmentation
F4= Face Recognition
S=Set of users
Ss=rest state, capturing image, processing image, detection of criminal, criminal identification

Su- success state is successful analysis
Fi- failure state

Objects:

1) Input1: Ip1 = Username, Password

2) Input2 : Ip2= Imahe

3) Output1 : Op1 = Data Processing

4) Output2 : Op2 = Face Recognition

5) Output3 : Op3 =Criminal Identification

3. DATA FLOW DIAGRAMS

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. ADFD is often used as a preliminary step to create an overview of the system, which can later be elaborated. DFDs can also be used for the visualization of data processing.
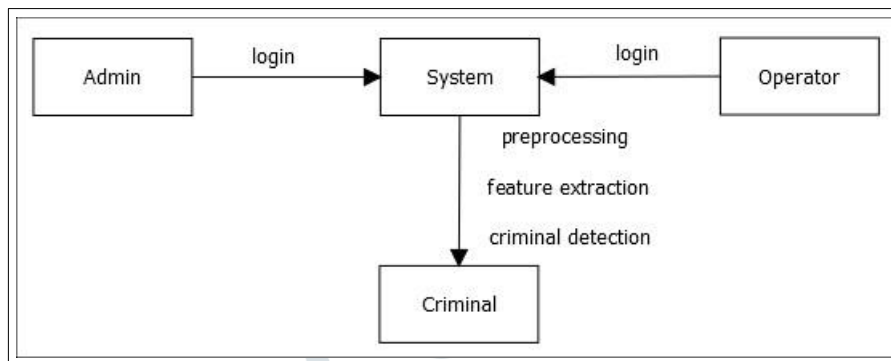
1. **Level 0 Data Flow Diagram**

Figure 4.2:   Level 0 Data Flow Diagram
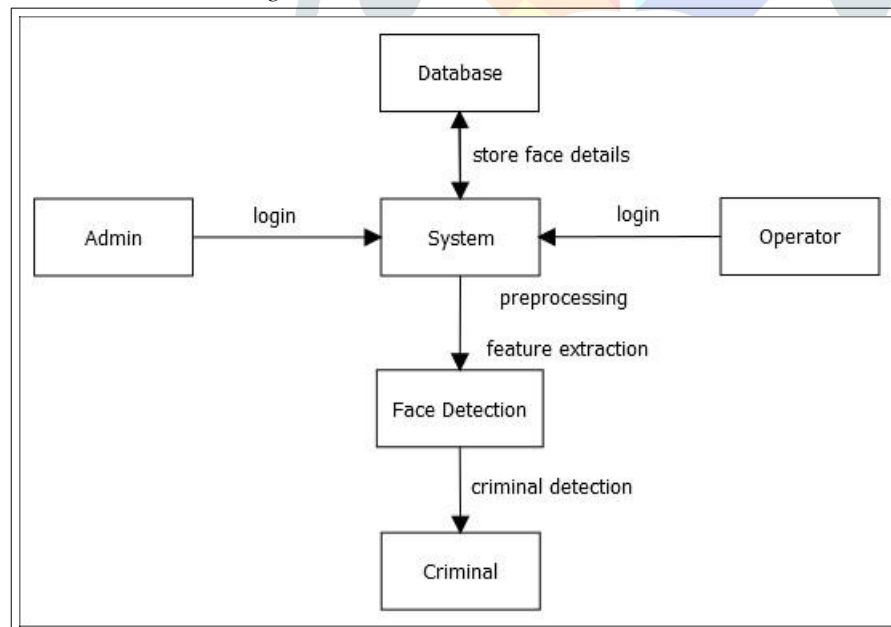
4.3.2Level 1 Data Flow Diagram

Figure 4.3: Level 1 Data Flow Diagram

4.UML DIAGRAMS

1.   Class Diagram

A class diagram in the world of Unified Modeling Language or UML can be defined as a type of static structure diagram which mainly defines the structure of a system. It works by showing the systems classes and their attributes and operations or methods also the relationships among objects.
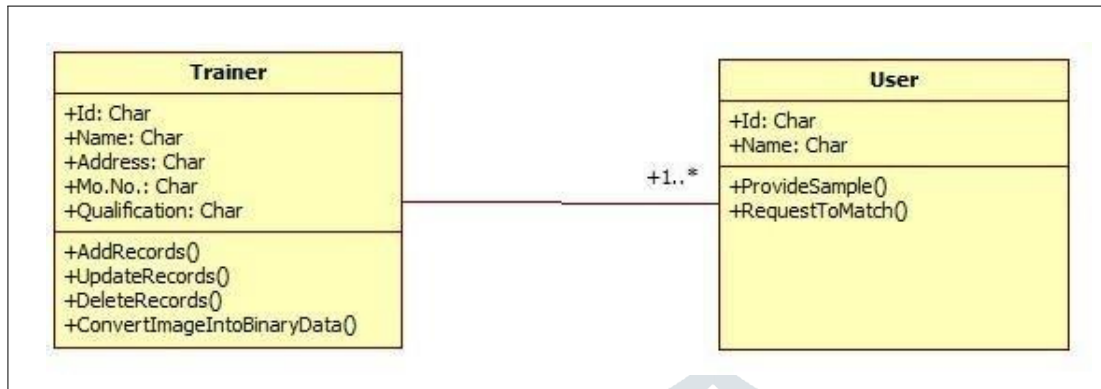

Figure 4.4: Class Diagram

4.4.2Use Case Diagram

Dynamic behavior is most important aspect to capture the model of any system. Dynamic behavior can be defined as the behavior of the system when it is running or operating. Static behavior is not sufficient to model a system rather dynamic behavior is more important than static behavior.
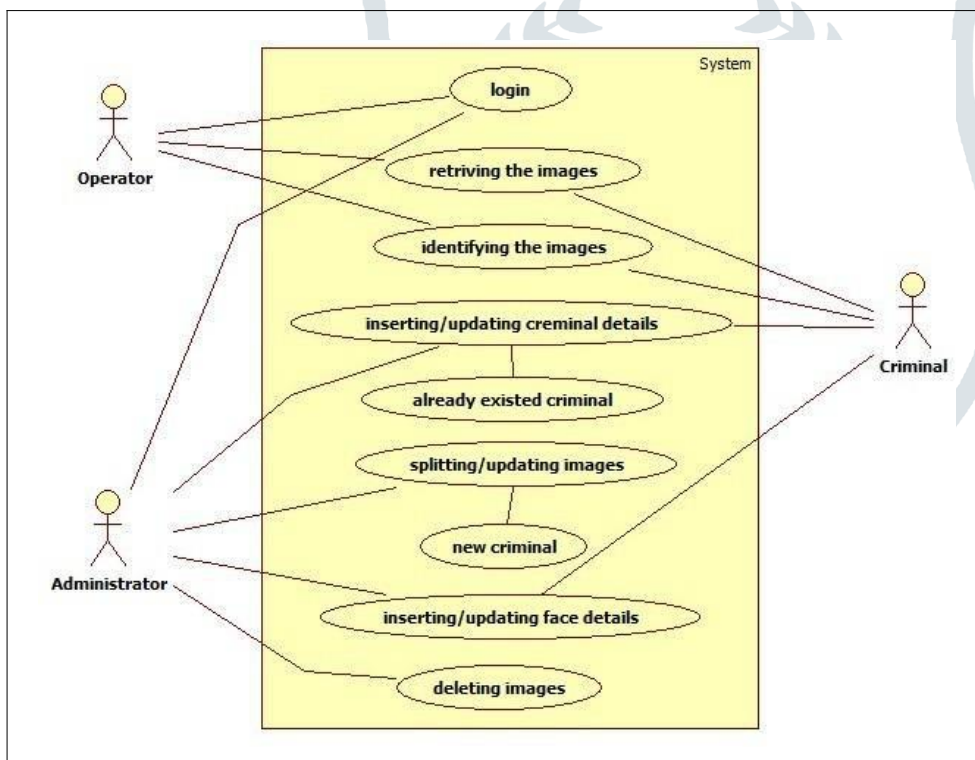

Figure 4.5: Use Case Diagram

4.4.3Sequence Diagram

Sequence diagrams can be used to provide a graphical representation of object interactions or object coordination over the time. These basically displays a actor or user, and the objects and components they interact with in the execution of a use case. The sequence diagrams displays the own of messages from one object to another object, and as such correspond to the methods and events supported by a
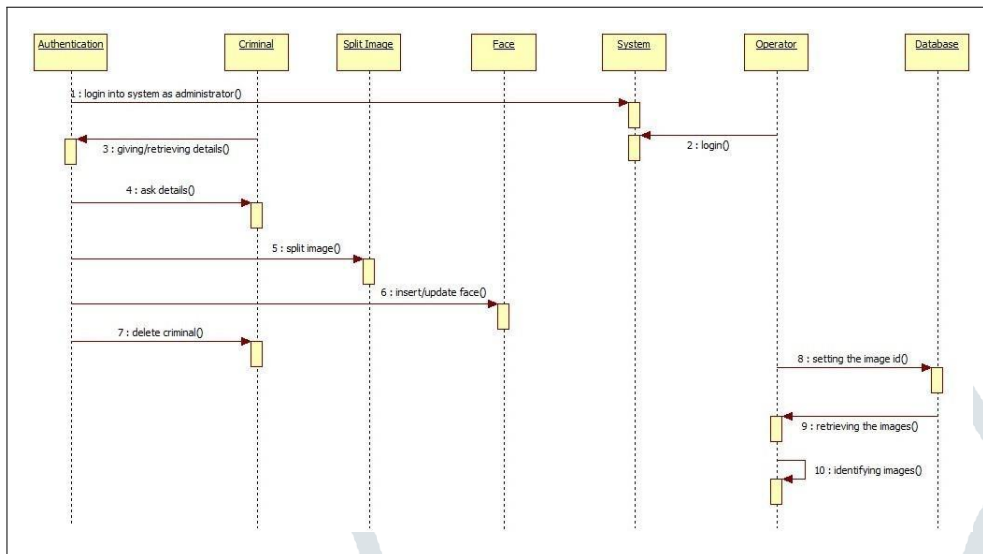
class/object   .

Figure 4.6: Sequence   Diagram

4.4.4Activity Diagram

Activity diagram can be defined as a flowchart to display the flow from one activity to another activity. These activities could be described as an operation of the system. The control flow usually is drawn from one operation of application to another. This can be branched or sequential, or concurrent also. Activity diagrams can deal with all or many type of flow control and used different elements such as
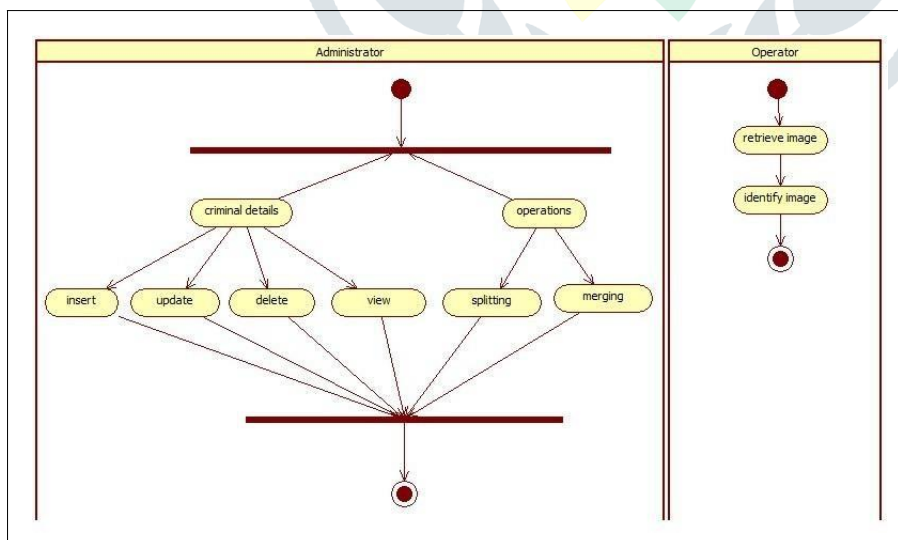
join or fork .

Figure 4.7:   Activity   Diagram

RESULT

Phase	Task	Description
Phase1	Analysis	Analyze the information related to Project Topic
Phase2	System Design	Assign the module and design the process flow Control
Phase3	Implementation	Implement the code for all the modules and integrate all the modules
Phase4	Testing	Test the code and overall process weather the process works properly Test the code and over all process weather the process works properly
Phase5	Maintenance	Modification of a software product after delivery to improve performance or maintainability.

5.0.1Reconciled Estimates

Time Estimate

Costs of the getting knowledge is depends on the resources and efforts needed for the development of the system.

Line of Code (LoC): Estimating LOC for this project is difficult at estimation stages this project is of research or innovative type project. Average estimation of this project is five hundred to six hundred line of code.

MAN MONTH UTILIZATION: Estimation of the man

Function	Estimated KLOC
GUI design	7 1.5-2.0
Logical code	1.8-2.2
Client side validation	1.5-1.8
Training Phase	2.0-2.2
Testing Phase	2.5-2.8
Total	9.0-10.11

Table 5.1: LINE OF CODE Based estimation

Cost of project

C=N*CpC=4*5KC=20K

The cost of the project is approximately 20,000

5.0.2Project Resources

1. Designer: To design system and perform requirement gathering.

2.Developer: To develop system and provide to tester for testing

1. RISK MANAGEMENT

:

Risk Identification

For risks identification, review of scope document, requirements specifications and schedule is done. Answers to questionnaire revd2. PROJECT SCHEDULE

:

1.   *Project task set*

Major Tasks in the Project stages are:

Priority (Highto low)	Risks	Back-up plan
1	Schedule	Overtime
2	Operational	Validation
3	Business	Marketing
4	Technical	-

Task 1: Requirement Gathering
Task 2: Literature Survey

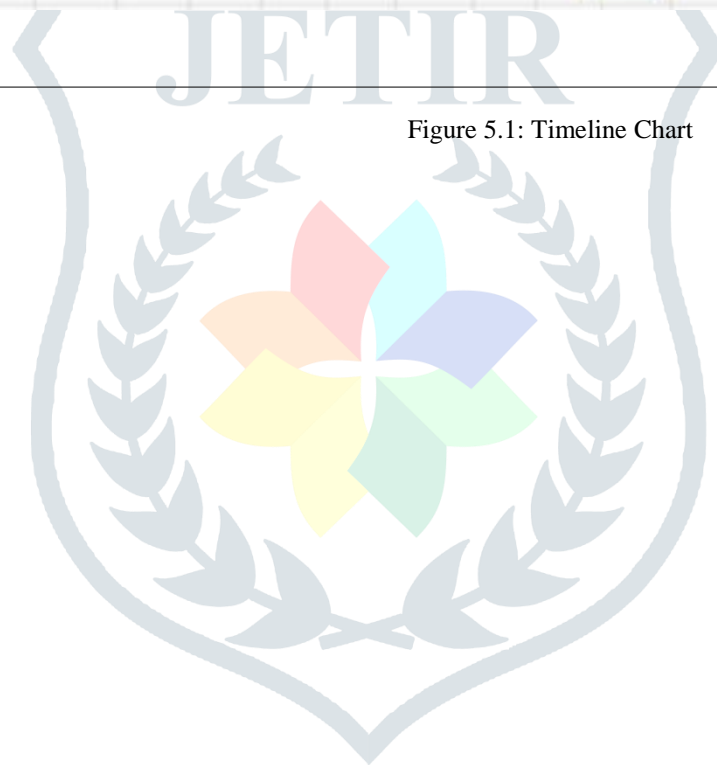Task 3: System Design

Task 4: Functionality Implementation
Task 5: Testing

5.2.2Timeline Chart

Figure 5.1: Timeline Chart

3. TEAM ORGANIZATION

1.   Team Structure

Whatever activities are done related to the project that we all showing all details log to our guide. All the reporting are noted to the guide.

Work Task	Description	Duration
Literature Search	Related work done for conceptual data similarity	6 weeks
System analysis	Critical analysis and comparison of technologies studied and results achieved in research	4 weeks
Design and Planning	Modeling and design and dataset searching or creation	8 weeks
Implementation	Divided into phases	
Phase A	Implementation module 1	2 weeks
Phase B	Implementation module 2	2 weeks
Phase C	Implementation module 3	2 weeks
System Testing	Test system quality, fix errors if any and improve if needed. Test system for different data sets	3 weeks
Final Report	Prepare and upload Initial Report	2 weeks
Initial Report	Prepare and upload Initial Report	2 weeks

Table 5.2: Time line Chart

CONCLUSION

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In this system we are going to implement a criminal identification system which will record criminals according to face recognition. It will save time and effort, especially if it is a social place. Automated criminal identification System has been envisioned for the purpose of reducing the drawbacks in the traditional (manual) system. This system demonstrates the use of image processing techniques at public places. This system can not only merely help in the criminal investigation system, but also improve the goodwill of the government.

1. FUTURE SCOPE

In future we introduce a new face recognition technique to accomplish a system to handle video based images under varietyof pose and illumination conditions. And also we make use of PCA, FLDA technique to obtain virtual frontal face for Dimensionality reduction and Presentation respectively. LLR technique to obtain virtual frontal face and we appoint DCT for illumination normalization. We also intended to introduce a new algorithm which is more efficient

2. APPLICATIONS

Application- Benefits of the project to the society:

- Identification of Criminals

- ATM and bank video surveillanc

- Prevent fraud voters

- Find a thief or terrorist in stored video database from surveillance

"CRIMINAL IDENTIFICATION USING 2D FACE RECOGNITION SYSTEM"

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