Smart Face Recognition System

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Abstract: Due to increase in the day to day criminal activities and also slow action of our security forces especially police to nab the culprit leading to a less secure society. In India we have seen many 'CCTV' cameras around us which are less in number and these cameras just record the day to day activity in database. It does not provide any alert system for the people from an unknown person. For an instance the police get an eyewitness who saw a murder or any other crime & he/she knows the face structure of the culprit then the police call a sketch artist to retrieve the image of that person which takes lot more time. Above drawbacks can be overcome by several techniques which are including 'Real Time Face Detection' in which it recognize the face of suspect or criminal in real time and inform to its nearby police headquarters, secondly 'Sketch for Match - 'CBIR' using sketches' contains retrieving of face of the suspect or criminal with the help of an eyewitness in less amount of time and lastly the 'pattern Matching' in which it considers every available evidence and match it with the pattern stored in the database, retrieve the list of suspected people and show it for that crime. It is only done in case of robbery, theft and burglary.

Index Terms- face detection, sketch match, CBIR, ICCTV.

I.   INTRODUCTION

In this fast growing world information plays an important role in our life. As this is the world of imagination, every person imagines that they get instant information of object which they see or which is in their hand at that moment. Also in some countries like India and Sri Lanka there is a requirement of efficient criminal identification software which helps them to identify and nab the culprit in mean time. So it will help the security system to work faster and which helps to secure the society. As we know the rate at which criminal activities are growing and reaction of our police towards sensitive situations. So there is need of a system which satisfies all the security requirements.

In the proposed system which is based on concept of "Smart Face Recognition System" satisfies maximum requirements. The proposed project of "Smart Face Recognition System" uses webcam to detect and recognize the face of person coming in front of it. Then all the information regarding the image or detected face will be displayed. The "Smart Face Recognition System" is a system to be used by our security departments to identify the criminal by observing it by a camera or making its sketch from another person. Many of the image processing measures will be utilized during implementation of the project like image capturing, pre-processing, storing in database, comparison from database etc. on a successful match; a message is send to its nearby police station of captured information. The main objective of this project is to detect and recognize the face of suspected person coming in front of the camera, retrieve the sketches of suspected person and present its information to the user. As there are many images stored in database, so it will take a minute scale of time to find the correct image, so there is need of correct implementation of algorithm for image processing and data handling. After finding correct object image, a sms containing the information about the detected image or person is send to its nearby police station. If image is not present in the database then it will store it for future use.

II.   CURRENT APPROACHES FOR CRIME INVESTIGATION

Before going through from the project while surveying we have considered many things around our society and also the operations done by the security forces attempting various crime cases. In that we have seen that they are still using old techniques to handle tedious tasks in crime investigation. This increases insecurity in society which is not acceptable. While reviewing various things regarding our project either the difficulties or challenges we have noted two main points:

A. PREVIOUS SYSTEM

As we have seen that in today's technical world some Asian countries used to investigate in an old manner. The old word used here because their way of investigation is far behind than that of other countries. For example the CCTV cameras provided in many areas in the city but it does not repay a good result to us. They still used the old techniques to retrieve sketches of suspected person. They did not save the evidences of previous crime scenes due to which it takes more than enough time to nab the criminals.

B. PROPOSED SYSTEM

We are proposing this software in which we enhance the technology of CCTV cameras in which it provides an alert system for the security forces (police departments) in real time through which they can spontaneously take action for that.

We are proposing efficient sketch base software through which we can easily retrieve the picture of suspected person from the eyewitness. As saving data regarding the evidences available at the crime spot in the database and use it for the future conditions.

III. METHODS AND PROCEDURES

The Smart Face Recognition System provides real time information about the images or video placed in front of camera. The product functions are more or less the same as describe in product perspective. The functions of the system include the system providing different type of services based on type of module. This system mainly uses Eigen-face detection algorithm.

In this algorithm we manage 3 different things to extract the pixels of the face so as to calculate and store it in database. First it identifies the pixels in a particular face region, plot it apparently using graphics and manage the neighbouring pixels so as to configure the pixels accurately.

To extract from a particular region two algorithms are used precisely i.e. Harr-cascade classification and edge detection algorithm. In edge detection case we increase the brightness and contrast of the image due to which lines going to generate which are mainly the edges of various face features. In case of Harr-cascade classification a particular image is place it eh coordinate axis with plot (x, y) and it is rotated to about 45 degree so that regions of face can be detect easily. This classification is done until the whole face is covered.

- The user should be provided with updated information of the suspected images or culprits.
- The admin is given a provision to check his account information and change the account information any time.
- The user can get the information about the images or videos which are placed in front of camera.
- The admin is provided with interfaces to add/delete the characteristics of the information available in the database.

The system uses internet to interconnect with the surrounding systems for efficient matchup.

IV. USER INTERFACES

- System login interface that use for validate the user
- Main view (an interface for searching for details) using the interface user can,
  Upload a digital image
  Validated updated image
  Search for details
- Searched criminal details interface
  Interface that requires showing all the detail that   user has searched.
- Add criminal details interface user for add new details of the criminal
  Add information of criminals
  Validate information
- Criminal detail modification interface
- Administrator interface
  Add users, Edit users, Delete users, View   users, User accounting.

V. DESIGN OF SFRS

A. STEPS FOR FACE RECOGNITION

The section below shows the main steps in using facial recognition to identify an individual in controlled environment. Identification steps are:

Take photo of individual and encode it. Match the encoding against database and display possible matches. Select any matching image and display the full record. While different developers have used different approaches to developing facial recognition technology, the principle is the same as for other biometrics, i.e. the patterns within the object are identified and transformed mathematically into a code. In the case of face, features such as the eyes and tip of the nose are used as anchor points, and the relative location of numerous other facial characteristics to them is determined. The information is then transformed into a digital string. The string can be matched against recoded images in a database to determine if there is a match. As the shot can be taken with a standard camera from a reasonable distance, facial recognition is only biometric that does not require the cooperation or even knowledge of the individual for the process to work. However the implication of this is that the image is subject to external factors, particularly lighting and facial angles.
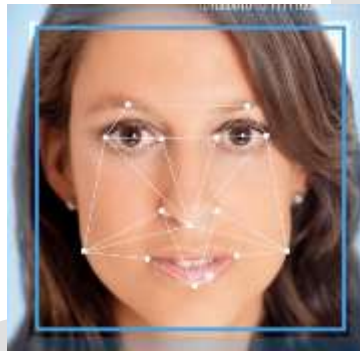

Fig: face analysis

B. FLOW WORK OF FACE RECOGNITION

The user who wants to search for information on a particular criminal will obtain a digital image of the person and upload it to the system using the web based interface. If the input image is in colour, the system will convert it to gray-scale to match the standard image format in the database. Then the image is normalized to match the standard image format and size. Here, the lighting conditions, the angle of the face when taking the photo, facial hair, etc. will be considered. Then the image is converted to a binary image. It is easy to process image. Once the image is converted to the binary image, the face regions are detected. The unique facial features are extracted and analyzed. The value of each facial feature is calculated and assigned to the image. The values will be sending to the database. After these values are put to database, the values that are already stored in the database are matched and compared. If matches are found, the output is displayed to the user through the interface.
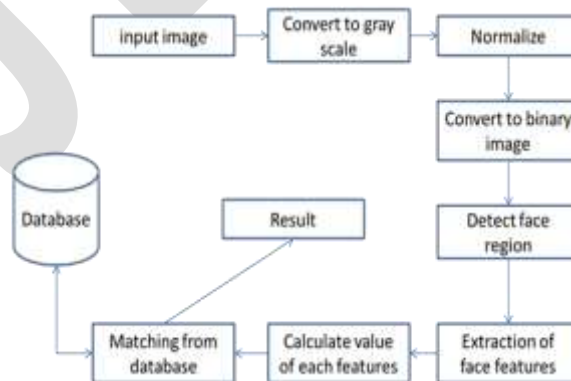

FIG: FLOW DIAGRAM OF FACE DETECTION

C.   STEPS FOR SKETCH MATCH

While implementing this technology we have to consider various aspects regarding an image processing. In that we have to retrieve a desired image from the sketch made by the operator with the help of an eyewitness. This includes following steps to be carried out in a proper manner:

Ask the witness whether the person is male or female. According to its response show the different image constraints to be taken for sketching. The constraints are hair, nose, eyes, head, ears, chicks, wrinkles, lips etc. After selecting some of its constraints and the sketch is made according to the witness, it will then match with the available images in the database and shows the result to the user and the witness. If it is the desired image for them then it will get printed out for surveillance and if not then it will converted to colour image through image segmentation. Mostly it is 90% accurate image for the identification but can be differing from person to person. For comparing we have to keep our database up to date so it will help the user to construct the sketch image.

Context Flow Diagram
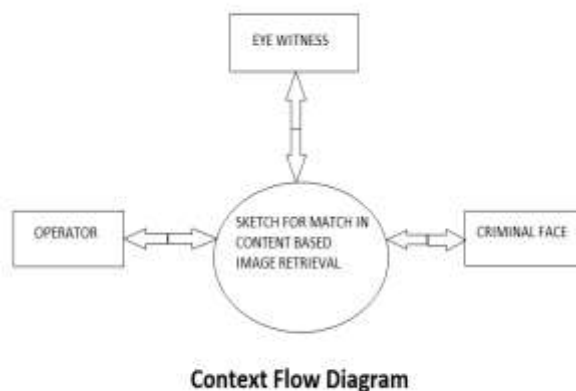
D.   FLOW WORK SKETCH MATCH

The flow of sketch identification is same as that of face recognition for input image but instead of calculating the feature vector of the image through pixel analysis it converts the image into corresponding sketch view and choose the feature vector to be match.
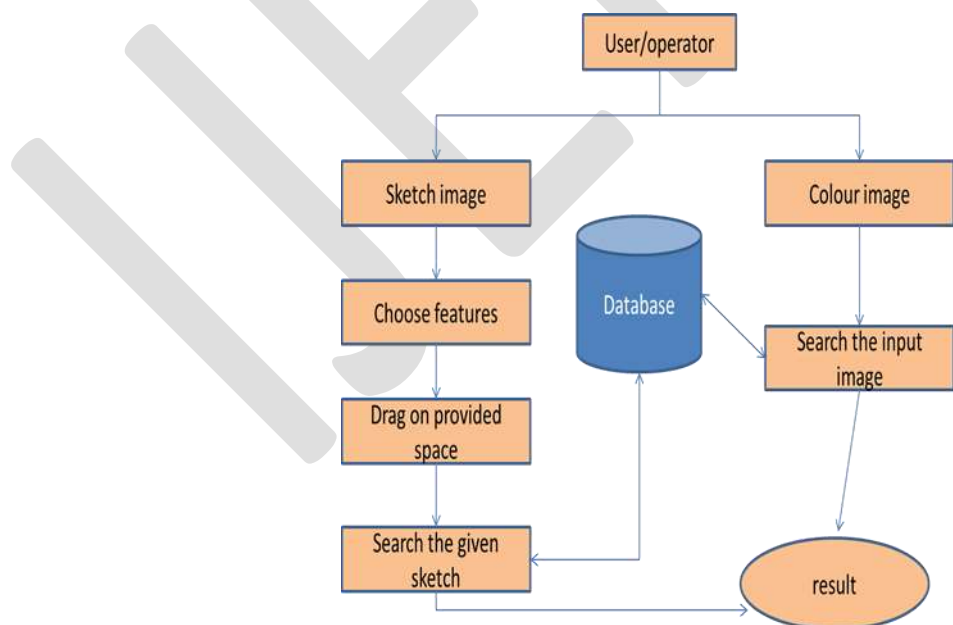

FIG: FLOW DIAGRAM FOR SKETCH MATCH

E.   SYSTEM ARCHITECTURE

1] Login: The user login to the system by entering valid username & password. If username and password is incorrect, then user will not get access to the system.

2] Capture image/video: The user uses the camera to capture the images of the suspected person so as to detect it for comparison with the database.

3] Sketch matching: A technique in which we are using the templates of images to make sketches and retrieve it from the database if available.

4] Interact: Detection and recognition of object which is placed in front of camera is done. All image processing algorithms are applied to identify the image.

5] Perform operation: If image is already present in system, then information related to object is retrieved through database and it will be displayed and message will be send. Otherwise image have to be added into the system.

6] Add images: If the image is new to the system then it must have to be added in a system. Next time when we placed that image in provided space then system will identify the image.

7] Detect and recognize: Another technique which we are using for facial recognition is to recognize the faces in the images and display the result.

VI.   IMPLEMENTATION OF SFRS

There are some hardware and software requirements needs to be fulfilled in accordance with its implementation.
   These requirements are:
Camera: 1 webcam with better resolution (if necessary), **RAM**: 2GB, **Processor**: Intel dual core processor (1.6 GHz), **Hard disk requirement**: 260 GB, **Operating system**: windows platform (XP/7/8), Microsoft .NET Framework 3.0, **Language**: c#, **Front end**: .NET, **Backend**: SQL server.

VII. RESULT ANALYSIS

 If a witness or a forensic report is available on a crime incident identification of criminals is a different case. SFRS is used to suggest possible criminals in situations where a witness or forensic reports are not available in case of face detection. The experimentations are carried out on data obtained from crime records division of Indian police. While recognising the details of criminal will be shown to the user. The end users will be the police officers who require information about criminals when following a certain case. They will need to have the knowledge about using web interface, logging in properly, uploading a digital image and updating new database record. The administrator will need to have advanced knowledge for user account management and usage of web interface as well as about WANs and VPNs. As modules for face recognition and sketch match is different so the end result is divided in two different phase.

   A.   RESULT FOR FACE RECOGNITION

This section provides you the real time detected face and its location. When the camera detects the face of the person it then sends a message regarding the suspected person including its location within few seconds to its nearby police station. It requires specific hardware to send the message. As soon as the user receives the message he/she can alert other people in probable time.

   B.   RESULT FOR SKETCH MATCH

This section provides you an efficient and quick sketch image by the system so as to nab the criminals as soon as possible. The end result will show you the possible faces of required match which is ranked using re-ranking algorithm. It will show you the possible images with respect to its probability. We can also use a colour image to match it with available database. The module contains set of image templates through which we have to create the sketch of the person. Crime information is actual but criminal information should be updated with its occurrences.

VIII.   CONCLUSION

 Thus we have concluded that through this project we can provide our society a secure environment but it needs lot more efforts for that as it is not easy but once it get implemented it will be one of the efficient project to be build for police departments. This project also enhances the efficiency of operations handle by police departments. It can also help us to minimize the terrorist activities and may help to nullify various terrorist attacks happen in the cities. The ability of storing suspect details that were arrested for at least one crime incident but not proved as the responsible criminal by the court, and the efficiency in identifying possible criminals for a crime incident are the characteristics that makes SFRS perfect than other crime investigation tools.

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