TRIAGE SYSTEM USING FACE RECOGNITION

Aniket Jadhav[1], Diraj Naik[2], Gaurav Lakhotiya[3], Tejas Mahajan[4], Sagar Janokar[5]
[1,2,3,4]Department of Electronics Engineering, Vishwakarma Institute of Technology, Pune.
[5]Professor with the Vishwakarma Institute of Technology

Abstract

Face detection is a very important part of computer vision. Majority of the research and development done in the field of computer vision is done in the computer vision domain is either upon face detection or related to it. Technology has always had its own rate of growth but now the pace at which it is consumed or used by consumers is changed or rather increased due to which new developments have to be made to make the user experience smoother. Face detection is now used for unlocking devices or secure lockers and other safe holds. It still has to go a long way in terms of refinement and development which we mean to achieve or help achieve in this paper. Detecting a face and localization from images is very difficult. The aim is to localize and extract the face region from the background accurately and precisely. This project aims at a noble cause of reducing the number of unknown or unrecognised victims involved in a natural calamity or an accident thereby increasing the claim from the family members. This Triage system hence implemented in an hospital will exponentially bring down the rate of dead unrecognised victims.

Keywords: Face Detection, Face Recognition, Biometrics, Face Identification, Triage.

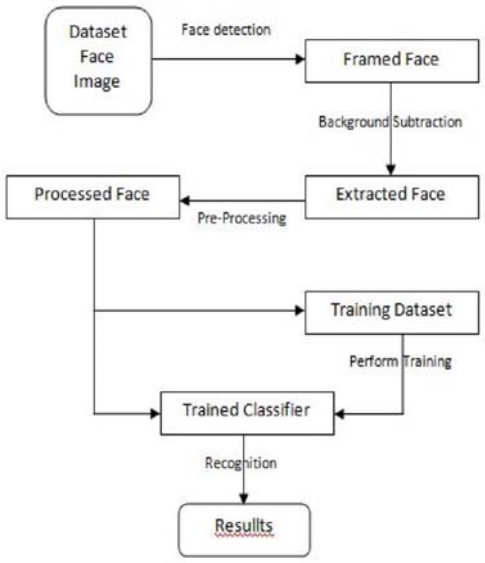
I. INTRODUCTION

Face detection as an application of a wider area of subjects such as neural networks, cognitive science, image processing, pattern recognition, computer vision and neurosciences has been developed and refined a lot over the past decade. We have used haar cascade method for face detection. In this paper we have explained how the xml file required for the detection of face is generated and how it is used. The images which we have used or the faces or conditions to which the images will be captured in have some kind of uniformity regarding the light conditions and the brightness of the environment. This paper explains the whole process of face detection including the xml file generation and how it is used and also how it works along with the results which we have obtained in our project. There are feature based methods available for face recognition which basically uses facial features to construct feature vectors. These vectors are then compared to the sample images and the match is identified or recognized.

The above method relies on face detection and localization of the persons facial features mentioned above and their geometrical likeness. A lot of companies are now commercially developing and refining face recognition methods. The work on face recognition started as early as 1950 in the domain of psychology but in recent years it has been automated and computed on a higher level as the means to implement and develop it have surfaced. Huge databases are now being created and used by developers which can help in training the algorithms hence increasing their accuracy due to which face recognition has become an application of computer vision and pattern recognition such that it is the most active when it comes to research and development.

The Triage nurse in the hospital will take a picture of the victims face and classify him/her in one of the three categories namely Dead on arrival, critically injured and injured. This she will pass on to another nurse who will enter the data in our software. When the person inquiring about the victim calls he will be asked to send a picture of the victim which when showed to the camera, the software will show the details after matching it with the face of the victim taken before hence eliminating the need for names or id proofs and facilitating the process which gets tedious during disasters involving hundreds of people. The overview or flow chart of the system

(steps in which the software works) is shown in figure 1.



In this research paper the problem related to the identity of he victims involved in a natural calamity is solved by detecting and recogising the face of a patient and classifying the face as: dead, critically injured or injured. If a disaster takes place at multiple places in a city then the person inquiring about the victim can find in which hospital and in what condition the victim is admitted in the hospital if all the data collected by the hospitals is stored in a server accessible to all.

II. RELATED WORK

The research papers referred for this project and the previous advancements in this field are shown in this section.

[1] Faizan Ahmed, Aaima Najam, Zeesham Ahmed, Imagebased Face Detection and Recognition: ”State Of The Art”,IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 6, No 1, November 2012.

III. FACE DETECTION

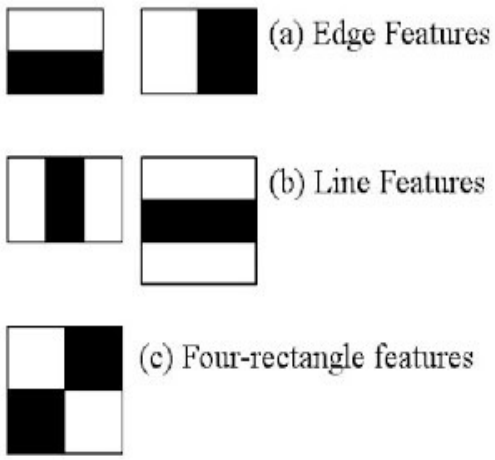
A. *Basic Theory[1]*

For computer vision mostly used library is OPEN CV. Now it needs python, originally is used to be written in c. Faces in the picture is searched by machine learning algorithm. There is no simple test that will let you know if the face has been found or not, if there is something like face. We have different patterns/feature in thousand that is used for match. This algorithm makes identifying the face simple by breaking it into thousands of smaller, bite sized tasks. This procedure is called classifier. For face, you should have 5,000 or more classifiers, which can be used to detect face. Here lies a problem, the algorithm of face detection starts from top left of the image and moves block by blocks. As there are 5000 plus test per small block, there will be hundreds of calculation to do and your system can hang or stop. For this cascades are used by Open CV. Cascades is series of water fall. So like series, detecting faces is breaked into many stages by cascade of OPEN CV. quick and very rough test is done for every block. If it is passed next test is performed. There are more than 40 such test, when passed it will detect face. Main advantage is most of the pictures will return negatives, which will save time as it wont check all 5000 plus features. So now it requires less time as compared to first. Haar cascade classifiers is used for object detection, thousands of positive and negative images are trained in classifier and used to detect object.

B. *Haar Cascade*

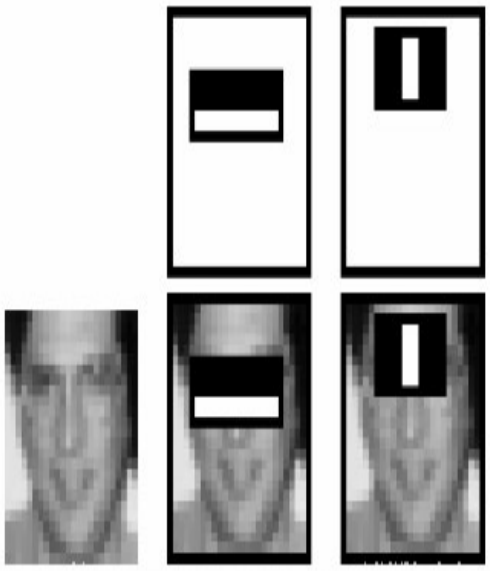
There are thousands of positive (i.e. face images) and negative (i.e. background images) images. Then features are extracted from it. as shown below, haar feature is like convolution kernel. Every feature has its own single value obtained from subtraction of sum of pixels under black and white rectangle. To calculate features, all size and location of every kernel is used. For calculation, sum of every pixels under white and black rectangle is done. Integral images are introduced as is makes calculation easy of sum of pixels.

Most of these features are irrelevant, as given below in two features in top row, the first feature selected seems to focus on the property that the region of the eyes is often darker than the region of the nose and cheeks. The second feature selected relies on the property that the eyes are darker than the bridge of the nose.



The features from which we have calculated, almost majority of them are not relevant.

Suppose when we consider the image below the top row shows us two features that are good. When we select the first feature it appears to concentrate on the function that the region surrounding the nose as well as cheeks is lighter in complexion to the region of the eyes. The next feature or property which is selected is based on the on the rule that the bridge of the nose is lighter in complexion than the region surrounding the eyes. But the same windows applying on any other place like cheeks is not relevant.



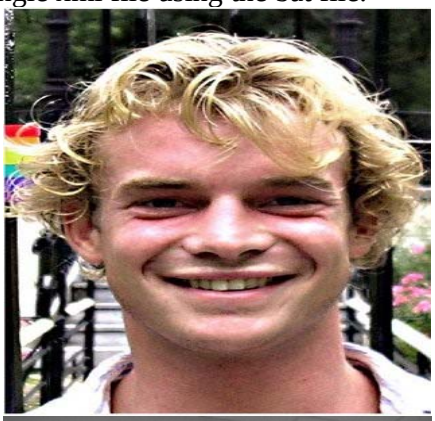
OpenCV (Open Source Computer Vision Library) is a library of programming functions mainly aimed at real time computer vision, developed by Intel and now supported by Willow Garage [Lu et al., 1999][2].

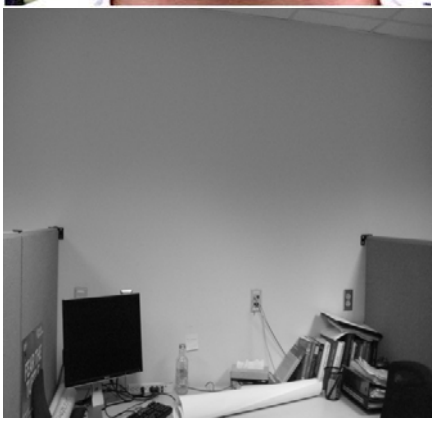
c. Adaboost

In the case mentioned above, Adaboost is a principle that is responsible for selecting the most suitable parameter from the hundreds of parameters that are available. For this purpose,each and every feature is applied on all training images. For every feature, it finds the most suitable threshold which will segregate the faces to positive and negative. But we know that, there will be errors regarding classifications. Hence features with least error rates are chosen which means they are the features that are most suitable to classify the face and non-face images. In this process each image is given an equal weight at the start. After each segregation, weights of wrongly classified images are increased. The same process is carried out again. After this the new error rates are calculated along with the new weights. This process is carried on again and again until the accuracy or error rate which is required is achieved or the number of features that are required are found. Usually in any given image most of the region in the image belongs to the non-face region. So it is advisable to have a simple method to check whether a window is not a face region. If it is not, it is discarded at once and it should not be processed again. Instead the focus should be on the region where there is a possibility of finding a face. We can find more time to check a possible face region.

D. XML File Generation

For this project we have generated a XML file instead of using the predefined XML file of Open CV. XML file consists of two major compoents: Positive images and Negative images in vector format. Positive images consist of the objects that are to be detected. In this case human face forms a positive image. Negative images are the background of the positive images. The negative images are in .bmp or .jpg format. First we create a txt file with all the names of the negative images. Next we use the objectmaker file to crop the part of the human face which we want to detect. After this process is done the objectmaker creates a txt file which consists of the x,y,w,h of the face(X,Y co-ordinate w=width h=height). Once this is done then we use the bat file to create the vector file. After this the vector file is trained and converted into multiple classifier. After this all the classifier are converted into one single xml file using the bat file.





E. SQLite

SQLite is a software library which is used as a database management system. SQLite uses dynamic types for tables.It means you can store any value in any column regardless of the data type. Once the dataset file is initialized it ask for the user id of the person and the condition of the person. once this details are entered it gets saved in a .db file which we have created. After this the webcam starts. Once the face is detected in the frame, it will start capturing the frames with the person face in it. SQLIT is atomic, consistent, isolated, and durable (ACID) even after system crashes and power failures.[2]

IV. FACE RECOGNITION

A. Basic Theory

OpenCV has various machine learning algorithms to look for faces within any given image. For an object which is complicated, we do not have only one simple test which will tell you if in an image it found a face or not. Let alone a single feature, instead there are hundreds of small patterns or features which have to match. The algorithms divide the task of finding the face into various small tasks. Classifiers is the name given to these tasks.

For a face, we might have six thousand or even more classifiers. Out of these thousands of features, all must match in order for a face to be detected. But for face detection, the algorithm starts at the top left of an image. It then navigates down across small blocks of data, looking at each block looking for a face. Since there are six thousand or more tests per block, we might have millions of calculations to do, which will halt your computer.

To overcome this, cascades are used. The cascade of OpenCV disintegrates the detection of faces into various stages. A test is carried out for every block. The algorithm has approximately forty of these cascades and if all stages pass, the face will be detected. It has an advantage that the pictures will return negative during the initial stages. This means the algorithm will not test all the features and thus time will be saved. Face detection can now be done in real time without wasting a lot of time. The cascades are nothing but a bunch of XML files that contain OpenCV data. This data helps us to detect objects. The code is started with the desired cascade and then the task is completed.

FRS is an application that mechanically identifies a person from a digital image or a video outline from a video source. One of the behaviors to do this method is by matching chosen facial features from a facial database and the image.[3]

B. Database

Using this we are capturing the faces of the person of whom we want to recognize. Firstly, we use the xml file to detect the face on the screen. Once detected we are to enter the id. After this it will start capturing certain no. of frames of that person. Once the desired no. of frames have been captured the program will be terminated.

C. YML file Generation

Using haar cascade we detect faces. To generate trainer we follow the following steps: Firstly, get the path of all files in the folder. Then create empty face list and Create empty ID list. Once detected,it'll loop through all the image paths and load IDs and images. Once the image has been loaded it will be converted into grey scale. Now PIL image will be converted into numpy array. Get ID from that image. Extract the face from the training image sample. If face is detected append that in the list as well as the id of it.

V. FUTURE SCOPE

1. General The research of this project has been going on for some time now and it may seem to us due to the advancements made in this field that the ultimate goal of image processing has been achieved. This is true but only to a certain extent. Today the technology recognises faces in various conditions: low light being an important one. All the face recognition systems that are available today fail under the hugely changing conditions in which humans are able to identify people. However the next generation face detection and face recognition system will work in real time. There are still ways in which humans can identify people that these systems can't. The future scope lies exactly here: in bridging this gap.

This technology should also be non intrusive and the users or the people should be freely carry out their work. Wearable technologies will be able to sense and recognise faces in the future. Considering all these wide scale applications, there is a need of detection systems in the future.

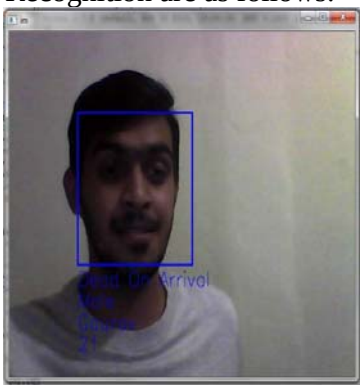
Future research will concentrate on abolishing the restrictions of the detection of only frontal views and single faces, on automatic model creation and on transformation parameter optimization[4].

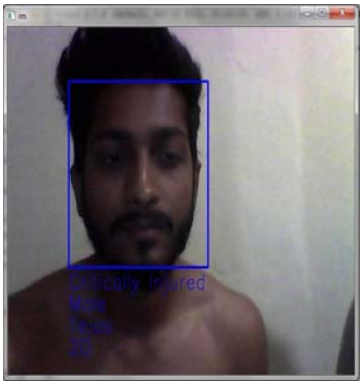
Security: Today more than ever, security is a primary concern at airports and for airline staff office and passengers. Airport protection systems that use face recognition technology have been implemented at many airports around

the world[5]. 2. Project based A helpline can be created so that the person inquiring can send the image to the helpline which has access to data from all the hospitals. A high end camera can be installed in the hallway of the emergency area of the hospital and a patch put on the floor with instruction to stop the stretcher at that point so that the camera can capture the face and the triage nurse can simple press a button regarding the state of the patient and the data will directly be stored in the server eliminating the need for manual entry.

VI. RESULTS

The results of Face Detection and Face Recognition are as follows:





Structure | Data | Constraints | Indexes | Triggers | DDL

Grid view | Form view

	ID	Condition	Gender	Name	Age
1	1	Injured	Male	Diraj	21
2	2	Injured	Male	Amol	21
3	3	Dead On Arrival	Male	Gaurav	21
4	4	Dead On Arrival	Male	Leo	50
5	5	Critically Injured	Male	Tejas	20
6	6	Injured	Male	Rohit	21
7	7	Injured	Male	Shubham	21
8	8	Critically Injured			
9	9	Injured	NULL	NULL	NULL
10	10	Dead On Arrival			
11	11	Injured	Male	Ravi	21
12	12	Injured	Male	Akshay	21
13	13	Injured	NULL	NULL	NULL
14	14	Dead On Arrival	NULL	NULL	NULL

VII. RESULT ANALYSIS

In the above section the results have been shown wherein the faces stored within the database have been classified as Dead and critically injured. The accuracy of the project is 78 percent. The accuracy will depend on the condition of the face of the victim. If the facial features of the victim used in the recognition are damaged then the accuracy reduces significantly.

VIII. CONCLUSION

This project can find it's application in various sectors ranging from security to day to day use sectors. The successful implementation of this project proves the efficiency with which a person can be detected and recognized in a camera frame.

This project when implemented in all the hospitals would increase the identification rate unnamed victims.

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