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Sentimental Analysis On

Facial Expression

A Report for the evaluation 3 of project 2

Submitted by

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Abstract

The sentimental analysis is a process of extracting human feelings from data . It is an application of natural language processing , computational linguistics, text analysis. Its basic idea is to classify human emotions in different moods such as happy, sad, neutral, etc. It uses the pattern of movement of both the lips and the eye shape that it takes during different feelings of human. It has a huge variety of applications because of its ability to extract insights from data sets and the social media. It will be using machine learning algoriths for the detection of emotions and it will be trained on the huge dataset with varying sample size. It will also use facial recognition to perform a specific analysis of a person after identifying their face. This will provide a separate report for each person on their emotional state. This report then will be used for the expression mining in different modern systems such as online streaming, video interviews, etc. This report will help to empower the existing tools to perform multi task and gives a lot of data to work with.

CHAPTER - 2

Introduction

2.1 Sentimental Feature Extraction

Image processing is the processing of digital image using some acquisition tool like digital camera etc in for extract some useful information. A digital image is made up of a finite number of elements. Each element has a particular value at a specific location. They are called as pixels. The complete process of sentimental analysis is given in figure 2.1.

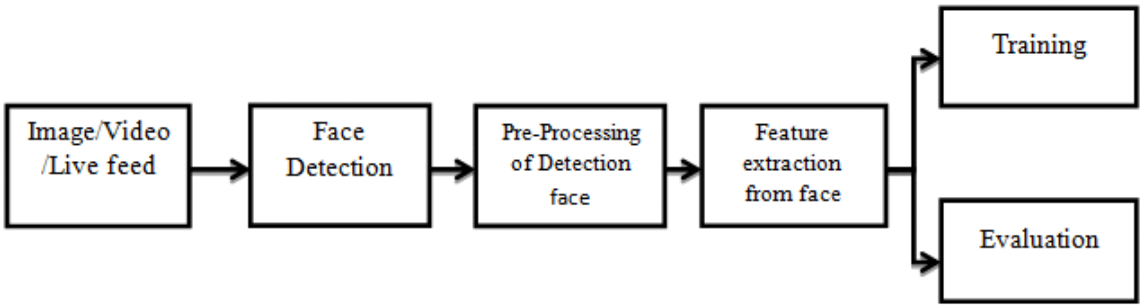

Figure 2.1: Face Recognition Steps

From Figure 2.1 we see that the complete process of face recognition is covered in three stages,

1. Face Detection

2. Feature Extraction

3. Face Recognition

Facial sentiment analysis is being used a lot these days since it provides a natural and efficient way to communicate between humans. Understanding human look has many aspects like from information processing system analysis, lie detectors, emotion recognition, non-verbal communication and even the role of expressions in art. Some other applications related to face and its sentiments are personal identification and access control, teleconferencing, forensic applications, movies, human-computer interaction, automated surveillance etc.

2.2 Phases in facial expression recognition

In expression recognition, we are extracting the features on three different stages as mentioned in the figure: 2.2

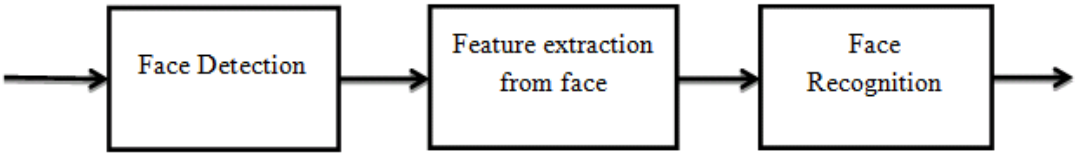

Figure 2.2: Three Main Phase of Face Recognition

In this case machine uses the input as image and detect the face of the person. This face is used for feature extraction and these features are being processed. This processed image used for face recognition based on the images are stored in the data set.

Facial recognition is a category of biometric software that maps an individual's facial feature mathematically and stores the data as a face print extracts features from it. The software uses deep learning algorithms to compare a live capture digital image or previously captured videos to the stored faceprint in order to verify an individual's identity. Facebook uses facial recognition software to tag individuals in any photographs. Each time individual is tagged in a photograph, the software stores mapping information about the person's facial features characteristics. Once enough data has been collected, the software can use the information to identify a specific individual's face in new incoming photograph. To protect privacy of individuals, a feature called photo Review notifies to that individual that these specific Facebook member who has been identified.

Software identifies 80 nodal points on a human face. In this concept, nodal points are endpoints used to measure variables of a person's face, such as the length of face or width of the nose, the depth of the eye sockets and the shape of the checkbones. and similarly many other features.

2.3 Feature Extraction Techniques

Every unique human face shares some properties that are same. These commanalities might be utilized using Hear Features.

A couple of properties basic to human face like:

- The eye area is darker than the upper cheeks.
- The nose connect area is brighter than the eyes.
- Area and size: eyes, mouth, extension of nose.

When the data input to an algorithm is too large to processed and it is expected to be redundant(such as the same measurement in both feets and meters unit, or the repetitiveness of images presented as pixels for quality), then it can be converted into a reduced set of features (also called feature vector). Determining a subset of the initial features is called feature selection. The selected feature are expected to contain relevant information from the input data given, so that the desired work can be performed by using extracted representation instead of the complete initial data taking.

Feature extraction involves reducing the amount of resources required to describe a large ste of data. When performing analysis of complex data one of the major problem stems from the number of variables involved. Analysis with large number of variables generally requires a large amount of memory and computation power also it may cause a classification algorithm to overfit to training samples and generalized poorly to new samples. Feature extraction is a general term for methods of constructing combinations of the variables to get around these problem while still describing the data with sufficient accuracy. Many machine learning practitioners believe that properly optimized feature extraction is the key to effective model construction.

2.4 Face Recognition

In Facial recognition an individual face is compared to the live capture with the stored record for that person. Facial recognition systems are commonly used for security purposes but are increasingly being used in a variety of other applications. In this report we have recognize the faces for three different things. These are recognizing the face of a person based on data available in the data sets on diffetent types of images. It can be jpg, jpeg, png and etc. and recognize that detect the features. Same times we have been implemented on a pre-captured

video or short movies. we have also tried extract the feature from the live camera captured images also.

Facial recognition system is a widely considerd technology identifying recognise or verifying a person from digital images or a video frame from a video source datasets. While initially a type of computer applicatiom , it has seen wider range of uses in recent times on mobile platforms, similar other platforms and in other forms of technology , such as robotics.

It is typically used as access control in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems . Although the accuracy of facial recognitin system as a biometric technology is lower than iris recognition, it is widely adopted due to its way of contactless and non-invasive process.

Current trends also shows it more future scope and too much new work has to be done at all level of it. Every big company to put their hand in it to do more and in this new technology. Large number of research is being going on to get new more. Even government agencies are taking much more interest in it. It is assumed that is a future technology and we can succeed if and only if we can understand as much as possible. Many research papers are being published each year all over the world related to it.

Recently, it has become very popular as a commercial identification and marketing tool in this new technical world. Other applications has advanced human -computer interaction, video surveillance ,automatic indexing of images , and video database, among others but this technology is being expected to be wide range.

CHAPTER -3

EXISTING SYSTEM

There are few models exists in the open market and out of all these no one properly explains the sentiment of the human face based on their expression appearing on the face of human being such as Feature-Based Approaches FAU- Based Facial Expression Recognition in which research made regarding that facial expression recognition can be distinguished in two main directions which are featured based and template based. The feature-based model uses the geometrical informatiom as a feature extraction whereas template -based model uses 2D and 3D head ,facial models as template for expression information extraction whereas features based approach uses features of the face detection and information extraction.

Facial feature detection and tracking is based on active Infrared illumination in order to provide visual information under variable lightening and heat motion. The classification is performed using a Dynamic Bayesian Network(DBN). A method for static and dynamic segmentation and classification of facial expression is proposed for static and DBN organize as a tree like structure but for dynamic approach multi-level approaches are used. The system proposed in automatically detects frontal faces in the video streams and classifies them. Facial expression images are coded using a multi orientation, multi tier solution set of aligned approximately with the face. The similarly space derived from this facial image representation is compared with one derived from semantic ratings of the images by human observers. The classification is performed by comparing the produced similarity spaces.

A Neural Network(NN) is being designed to perform facial expression recognition . The features used can be either the geometric positions of a set of fiducial points on a face or a set of multiscale and multi orientation Gabor wavelet coefficients extracted from the image of face at the fiducial points. The recognition is performed based on two layer perceptron NN. The system developed is robust to face location change and scale variations . Feature extraction and facial expression classification are being performed using neuron groups, which having a input feature map and properly adjusting weights of the neurons for correct classification as per dataset.

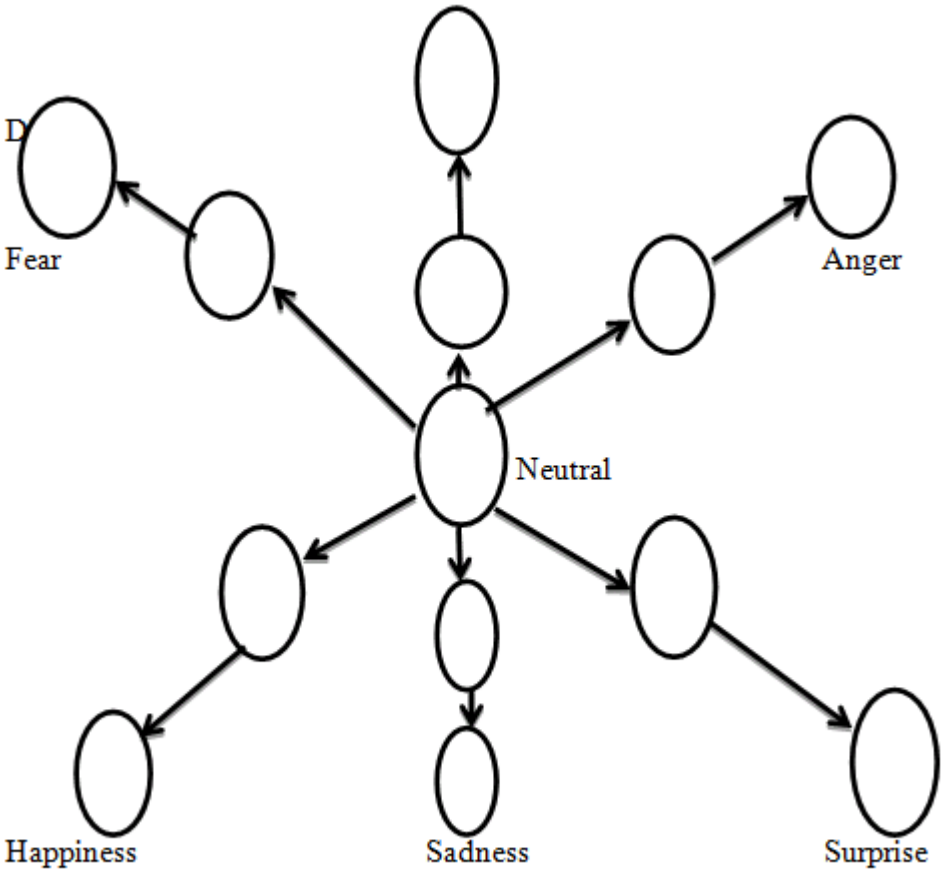

Figure 3.1: Sentiment of the person based on different face Recognition

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PROPOSED SYSTEM

The proposed Face detection and image recognition system has been developed which is itself divided into 3 modules, first one is face detection while the second one sentimental analysis and third one is a simple Graphical User Interface that allows user access to the system's features. The elements of the system are illustrated in Figure 3.1.

We detect real time faces and then we will interpret different facial expressions or sentiments like:

- HAPPY
- SAD

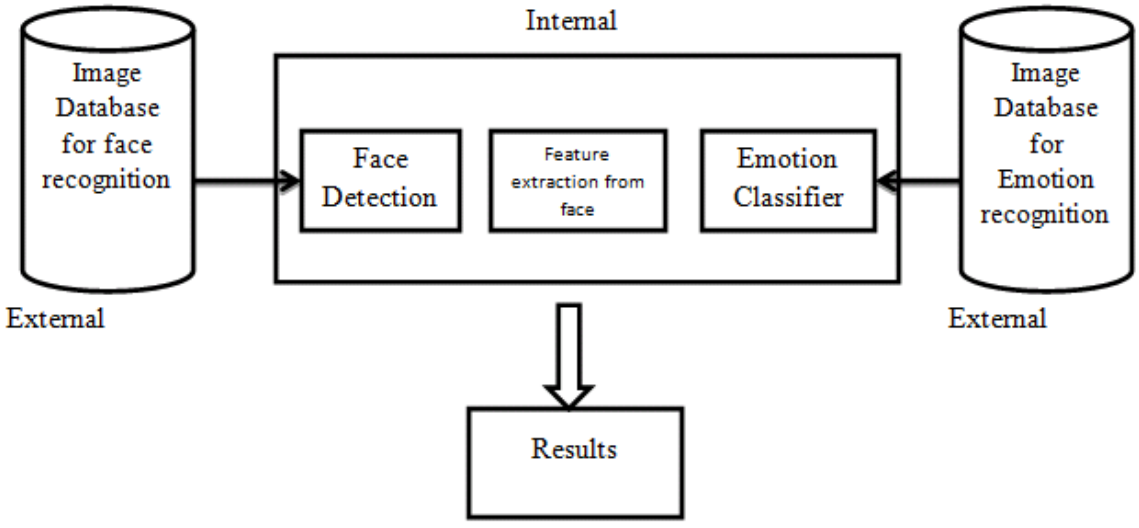

Figure 4.1: External and internal components of the system

All the sentiments are based on different features of face and actions

The key elements of faces like:

- Movement of lips.
- Distance between eyes.
- Different shapes of nose
- Jaw movement.

These various key elements of faces are used for sentiment analysis Machine learning is used for face detection and for classification of different classes of facial expression for the analysis of sentiments.

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IMPLEMENTATION AND WORKING

5.1 Implementation

The implementation of the project is done on the following system design.

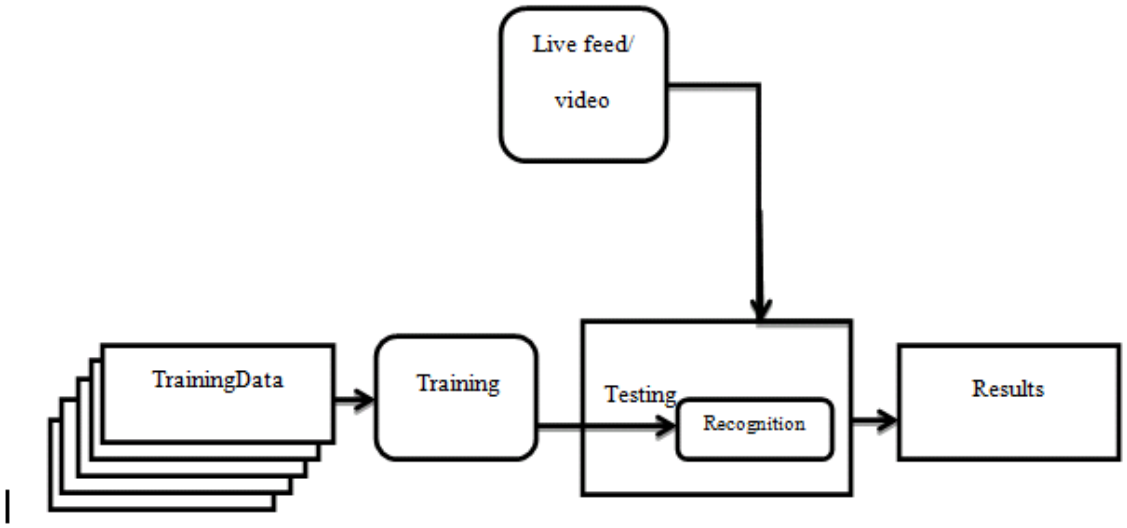


Figure 5.1: System implementation

The implementation in step by step process:

1. First the gathering of the training data of the different emotions such as happy, sad, etc. They should be pre-processed to give accurate results.
2. The training of the collected dataset to be done to create a predictive model that will predict different emotions according to the training.
3. The trained model can be used to recognize the emotions by video file or live feed according to the training it received.

4. The class will be predicted by the model which of it matches with the highest accuracy.

5.2 Working

We first detect the face using OpenCV using the different Haar Cascades which are generally trained classifier. They are an effective way of detection and are available in Xml Form. The various Haar Cascades used here are:

1. Haar Cascade-eye.xml for eye detection.
2. Haarcascade-frontal-face.xml for face detection.
3. Haarcascade-mouth.xml for mouth detection.

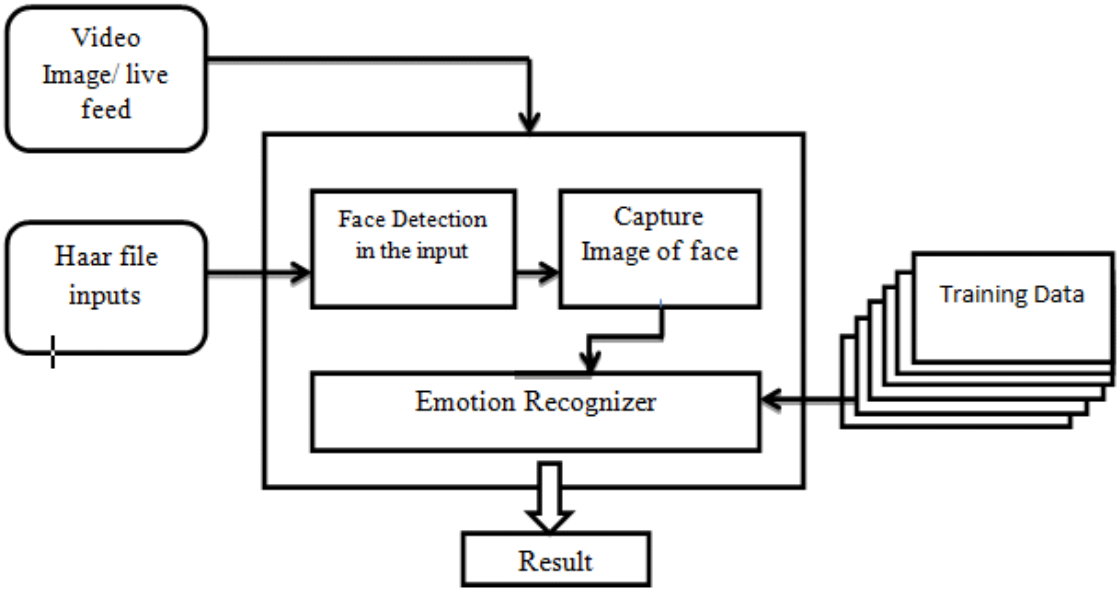


Figure 5.2: Working of the recognizer module

Object Detection using HAAR feature – based cascade classifier is an effective object detection method proposed by Raul Viola and Michal John in their papers.

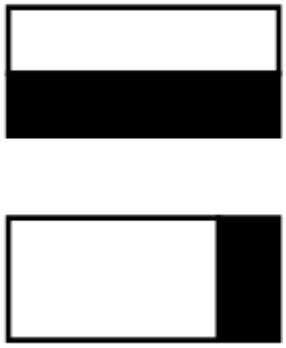
5.3 Face Detection using HAAR Cascade

It is Machine Learning based approach where cascade function is trained from a lot of positive and negative images. It is then used to detect object in other images. We will work with face detection. Initially algorithm needs to a lot of positive images (images of faces) and negative images (images without faces) to train the classifier.

Then we need to extract features from it. For this HAAR feature shown in below images are used.

Each Feature is a single value obtained by subtracting sum of pixels under white rectangles from sum of pixels under black rectangles.

(a) Edge feature



(b) Line feature

(c) Four – rectangle feature

Figure 5.2: face detection using Haar Cascade

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RESULTS

Results

Nowadays, sentimental analysis is a hot topic. As our project's main objective was the the implementation of sentimental analysis on various use cases.

- sentimental analysis is on an image
- sentimental analysis is in movie
- sentimental analysis using live camera

We have come to the conclusion that the system we are using to determine the sentiments of the targeted object is executing successfully but working in different modules. The bottleneck of the process is our hardware that cannot be used to trai8n the large number of imagesbecause of its high demand of processors, slow performance on the processor and not availability of adequate graphics processing unit (GPU).

The identification module can generate data-set and be trained on its own to identify any character with adequate accuracy. The detection module detects the emotion of the characters with adequate accuracy due to its bottleneck. But both of them executes well on their own.

For determining emotion or the present state of the character only expression of face will not provide the accurate result but we have to also include the voice patterns, its pitch and amplitude, the language used and the tone of the speaker with the context. For determining these it needs the ability of speech analysis, natural language processing (NLP) and may other deep learning fields. This also needs high end server hardware for its implementation. This model will be accuracy driven the more it gets train the more accurate it will become


Sad
Happy
Happy
Sad

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CONCLUSION AND FUTURE WORKS

Conclusion

In this project we have done sentimental analysis using facial recognition on human face. Sentimental analysis has varying applications like security, to know about the mindset of an employee, mindset or state of patients and for the investigative purposes. It can be used in different types of examination purposes. We have used haar cascades for classification and feature extraction. It has wide range of canvas for coming days. After implementation, we are able to extract two sentiments features (‘Happy’ and ‘Sad’) from human faces and in future other feature also can be extracted.

The demand for the data of consumer’s sentiments has grown for the brands to market the data and grow their brand; having such access to the data will give the brands the upper hand in the marketing and connecting more effectively to the consumers. This is not only limited to the brand building but it can be used in replacing most of the legacy systems for web video interview where interviewer will have more data at his hand for the assessment. Sentimental analysis has very vast implementations we can’t possibly think of all the use cases that it can used for in the future.

Future Works

Sentimental analysis not only limits its usability to only the enthusiast but it has real world application. The main idea of our project can use or implemented in the following cases:

- Improving accuracy in the recommendation system such as Netflix, YouTube, etc.
- Automating the process of recommendation system by analysing it contents in streaming services, blogs and any place the recommendation is required.

- Better user interface in Virtual reality (VR) and Augmented reality (AR) Products.
- Game simulations based on the current state of the person.
- Sentiments of the patient can be identified based on the medicine given. It helps doctor to observe the effect of medicine on the body of patient.
- Analysis of a character sentiment in a specific act, such as during any presentation or acting in movies.

Sentimental Analysis has many implementations which will make the life of easy for people but it comes at a risk of privacy can have very intense effect on the society as a whole.

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