

Developing A System For Visually Impaired Persons

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Abstract

In order to help visually impaired, an emolyzer called emotion analyzer can be used to detect the emotion of the person opposite to them and helps them for an effective interaction with other people. In this proposed method, visually challenged people use spectacles in which a camera is inserted for capturing the video of person who is communicating with them and earphones are used so that the detected emotion by the device, can be communicated to blind people who is using the device. This device can identify some basic emotions like happiness, sadness, a neutral face and an angry face so this makes emolyzer a helpful and an effective tool which can be used by visually impaired. The emolyzer is made using Raspberry Pi and is made portable for ease of use. Here emolyzer is trained using FER-2013 dataset which contains more than 35,000 gray scale images. A free source Open CV python library is used for detection of faces. The detected emotion is finally transformed into speech by installing python libraries like play sound.

Keywords— visually challenged, emotion analyzer, video, capturing, earphones, an effective tool, basic emotions, Raspberrypi, FER-2013, Open CV, Play sound.

I. INTRODUCTION

In this modern era, we can overcome visual impairment by using computer vision technologies. Computer can even be trained so that it can obtain the features of natural human eyes. It can give appropriate results by taking a video or an image as an input and is pretended to work like an artificial human eye. We have already used this computer vision technology to create many face recognition applications so far. Now-a-days face detection system is already in use in modern applications like face authentication to unlock a mobile phone and in security systems. In the same way faciaemotion detection is one of the part of computer vision technology. We are generally using emotion recognition in various applications like police enquires, interviews and shopping applications. In this paper emolyzer is used as anemotion detection tool by visually impaired. Emolyzer can detect the emotion of the person opposite to it. Emolyzer can easily identify all the basic emotions like happiness, neutral face, sadness and an angry face. The emolyzer comes handy using Raspberry Pi so that the visually challenged can just wear it like spectacles in which the Raspberry pi camera is fixed inside Spectacles. The visually challenged people can wear these spectacles and go where ever they want so that the emolyzer inserted inside the spectacles can easily detect the emotion of the person straight opposite to them and conveys it using a voice note. Working of Emolyzer is explained in a detailed manner in the up coming sections. Section3 explains the proposed method and a detailed explanation of modules of Raspberry Pi and section 4 contains the conclusion.

II. LITERATUREREVIEW

An over view of literature which helped in the evolution of this current concept is mentioned in this section Douglas Astler[1], used Computer Vision Technology and developed a model of facial

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expression recognition, In this model they followed three approaches PCA (Principal Component Analysis) In this method PCA will be having a database of faces. So, by comparing the query faces with the faces that existed in the database, PCA will return the emotion that best matches the query face PCA method is very easy to implement but the issue is that it is unable to identify and confirm that the image given to it is a face or not.

LBP (Local Binary Patterns)

In LBP method face is divided into small regions and the LBP-Histogram for each region is calculated and all these histograms are combined to form a multi-dimensional Vector and used a linear search method to compare the query vector with every other vector in data base.

The issue with LBP method is that linear search process is very slow and results are often incorrect Face SDK (Software Development Kit)

In this method recognizing a face in an image is done using Face API. Face SDK saves images as a face template which are compared against input image.

Using Face SDK Real time result can be observed and user can get an accurate result official emotion Omkar Pawar[4] developed a door lock system using facial recognition and the methodology used for face recognition involves local binary pattern histogram using Open CV In LBP Histogram each image is divided into cells and each pixel in cell is compared with eight neighbours and here the facial image is finally obtained by adding all the obtained histograms. The obtained facial image is compared with images in the data base if any images match with the obtained facial image the door will automatically get sopened.

III. PROPOSED METHOD

The emulator is trained using Tensor flow. The Raspberry Pi camera captures Video and sends the images as input. Firstly, the human face is detected in the captured image. Now neural network sare used fore motion recognition. Once the emotion is determined it should be converted into an audio speech. Here the text to speech conversion can be done by using python library namely play sound. The resulted voice note can be heard by the person using earphones. The Raspberry pi is used for this purpose. Here Raspberry Pi is programmed used Python language.

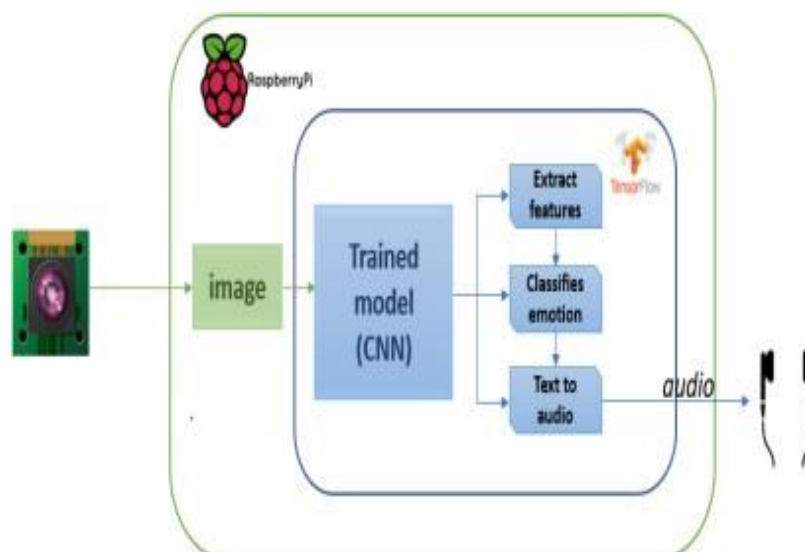


Fig.1.Proposed Method architecture

It is a easy to use and cost effective tool that work ssimilar to CPU. Fig1explains the overall architecture and functioning of the emulator For careful examination of outputs it is to be plugged to a computer screen using an HDMI port. It can be easily programmed using programming languages

like python, c++ and Java Emolyzer can be considered as a real time application for emotion detection using Raspberry Pi and a Raspberry picameramodule. The Raspberry Pi camera can capture the images of the persons standing oppositetov is usually challenged person. Each frame of an image captured is analyzed and a human face will be detected from that image captured. The detected human face is then processed to extract an appropriate emotion.

The steps involved in this method are as follows:

- Data Processing
- Model T raining
- Model Testing
- Converting Textto Voice Message

Data Processing

Data Processing is a method of manipulating data to produce a meaning ful output

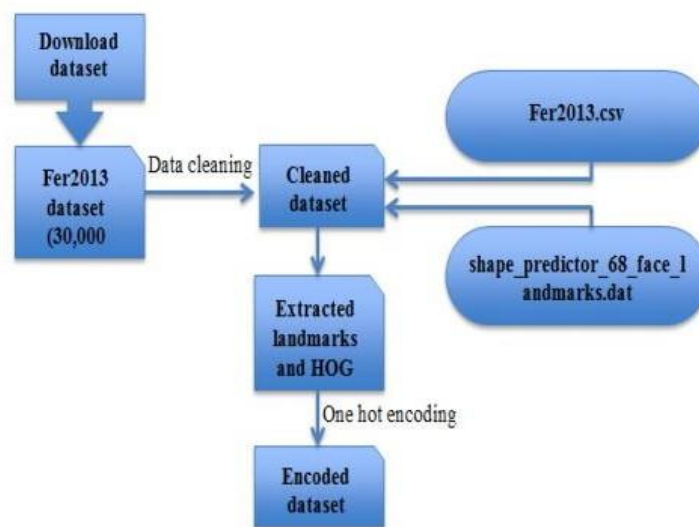


Fig.2. Data Processing

The figure explains the following steps-

The dataset FER 2013 is to be downloaded which is an open sourced dataset. It contains 35,887 grayscale images. It contains 48X48 sized images of facial expressions that covers almost all the basic emotions that human face expresses. Distribution of number offacial images infer 2013 classified according to facial emotion is shown in fig3

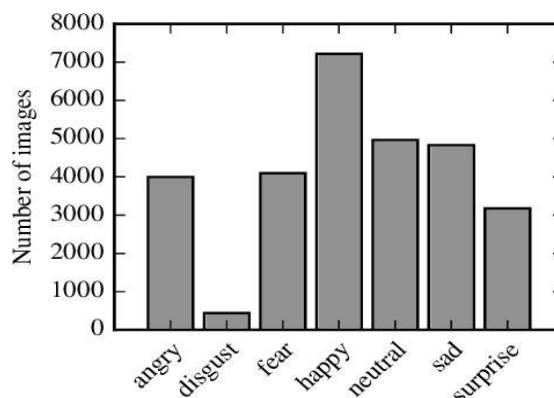


Fig.3. Emotion based classification offer 2013

Now data cleaning is done to obtain a cleaned dataset. Data cleaning is aprocess of removing noise and sk learn Pack age is used to fill the missing values.

1. The fer 2013. Csv file and shape_predictor_68_face_land marks. Dat file is added to cleaned data set.
2. After adding files, it is then converted as Extracted landmarks and HOG (Histogram of Oriented Gradients) which is used to extract features from an image.
3. Here the hoten coding is performed which is nothing but mapping each emotion in a dataset to a particular number as shown in the figure3



Fig.3.Hot Encoding

Model Training

The model training refers to extracting the properties from given examples. After data processing, the model training should be done with the help of Tensor Flow. All necessary modules for tensor flow and dataset modules need to be included. The csv file containing data set is given to Tensor Flow for training which is shown in fig4. Now the result ant trained model can recognize all the basic emotions.

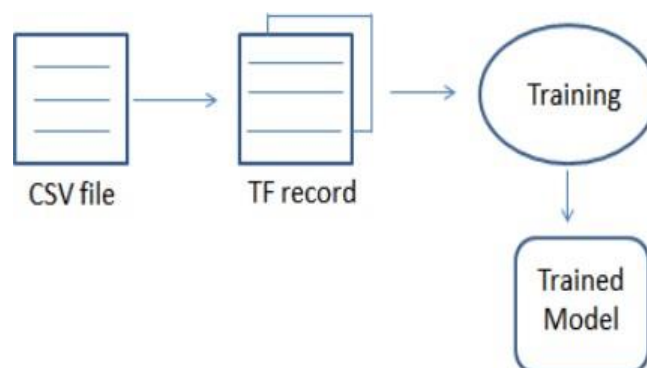


Fig.4.ModelTraining

Model Testing

Generally testing in real time is done using systems camera. On activation of Raspberry Pi Camera

that is fixed inside the Spectacles, the image of the person is captured and is processed by training model. Firstly, detection of human face is done using a pre-trained model. Haarcascade Frontal face Xml file is the pre-trained model used in FER-2013

This model will compare the images captured using Raspberry Pi with existing images in trained data. As a result, the emotion having high accuracy is returned as an output. The results obtained are 67.59% Accurate.

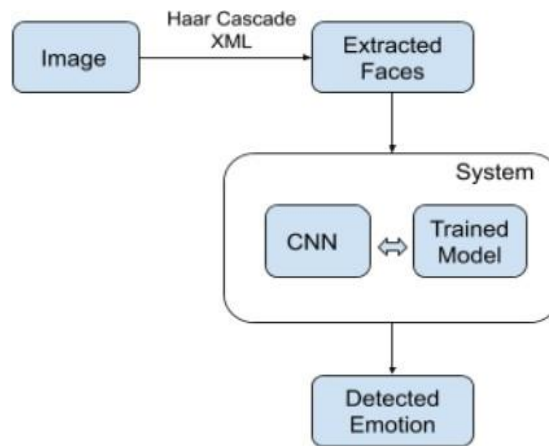


Fig.5.ModelTesting

Converting Text to Voice Message

The final step is converting the detected emotion into voice message which can be done by importing play sound library in python. The resulted audio message is then conveyed to the person using earphones

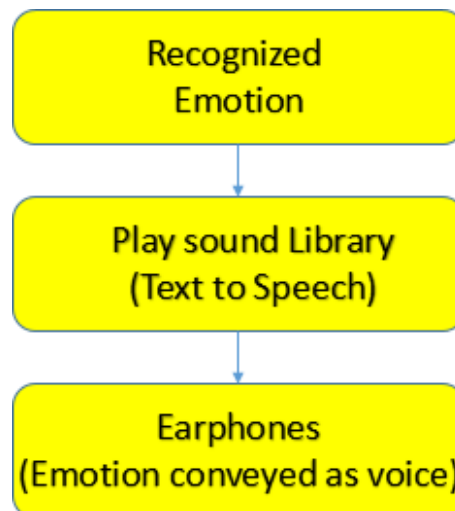


Fig.6.ConvertingTexttoVoiceMessage

IV. DATA AND RESULTS

Mostly all kind of emotions like happiness, neutrality, sadness, anangry face is recognized with maximum accuracy of 67.59% The emotion recognized by the emolyzer for a happy and aneutral, the signal wave of voice for respective speech signal are represented as pictures in following Fig7 and Fig8.

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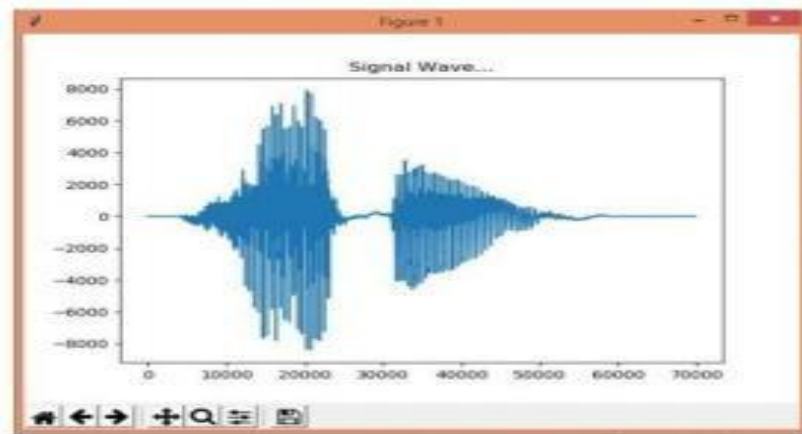
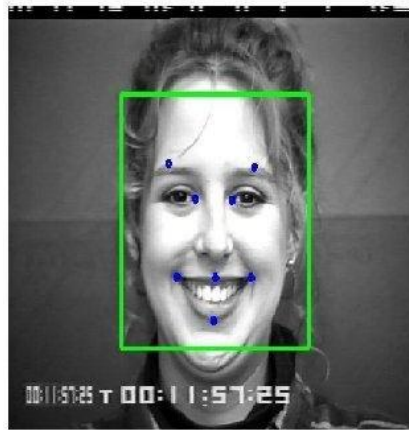


Fig.7.ExperimentResultsforaHappyface

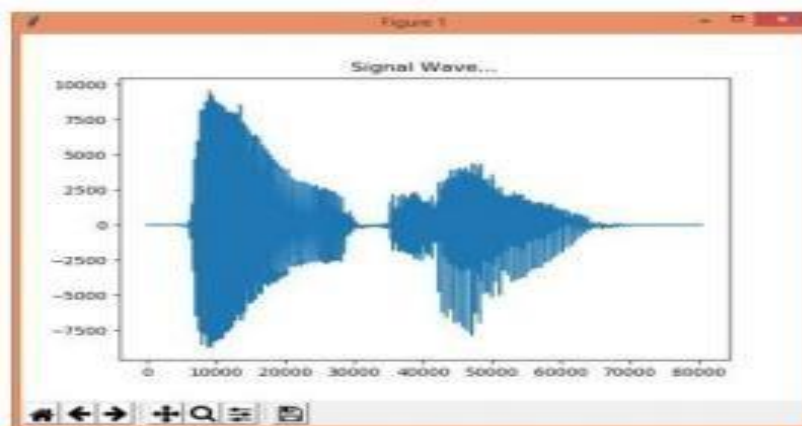
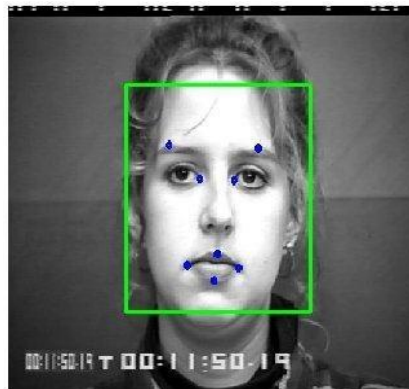


Fig.8.ExperimentResultsforaneutralFace

V. CONCLUSION

Emolyzer includes all the above mentioned functionalities. It can help visually challenged people to analyse the emotion of the people interacting with them. So, the Emolyzer can be used by Visually Impaired persons to enhance their social interactions. Visually impaired can easily use this system Emolyzer by just wearing as spectacles. The results are 67.59% accurate.

Future area of research includes gender identification and object recognition technologies and also dangerous weapons identification technologies can be developed by considering the safety of visually impaired.

VI. REFERENCES

- Mingmin Zhao, Fadel Adib, Din a Katabi Emotion Recognition using wireless signals Panchanathan S, Chakraborty S, Mc Daniel T. Social Interaction Assistant: A Person-Centered Approach to Enrich Social Interactions for Individuals with Visual Impairments, 2016.
- Omkar Pawar, Prathamesh Lonkar, Randhir Singh, Vivek Salunke, Prof. D.M. Ujlambkar, "Door Lock System using Facial Recognition", International Journal