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Analysis of Facial Expression Recognition Using LBP and Haar-Cascade Classifier

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Abstract: Facial expression recognition is the main factor in human communication that helps us to understand the intension of other emotions. This paper is going to relate human emotions such as anger, happiness, neutral, sad, surprise, disgust. In order to recognize facial expressions from the machines we employed some techniques called local binary pattern (LBP) for face recognition, the algorithm used here is local binary pattern histogram (LBPH), and for detection of face Haar-cascade classifier is used. With this work, the expression of the respective image will be reported, and it will also notify time taken for training an image. A small change in facial expressions signifies lighting, orientation and background. Here the LBP technique is intended only for the purpose of extracting features and Haar-cascade classifier is being utilized for the extracted features from LBP. The dataset is used for the purpose of testing and training of the images.

Keywords: Facial expression recognition, image processing, local binary pattern, Haar-cascade classifier, Feature extraction, Face detection.

1. INTRODUCTION

Facial expressions are important element in human communication that assists us to understand the intensions of the other emotions. We can look into the application of smart-phones; it started the reliability for unlocking the mobile has been moving to reach its milestone. As computers can understand human expressions the customer experience boosts for many companies and adjust it climbs overall happiness and satisfaction. For allowing better customer experience facial expression recognition is a crucial part of sentiment analysis.

Consequently, expression plays a vital role not only in relationship between peoples but also in the way we use computers. As the expression state of a person may influence concentration, task solving, and decision making skills. The perception of affective computing is to make systems able to identify human expressions and impact them to enrich productivity and effectiveness of working with computers. The most important means of human communication is face, it plays a central role in all social interactions. The basic expressions of humans are classified into 7 categories such as happy, anger, sad, surprise, disgust, fear. These external emotions express the internal emotional state of an individual. The “computer vision” is a subfield which probes how computers work to extract facial features from the images and videos.

The idea of designing a machine that had human perception process made many scientists, philosophers and even sculptors fascinated of human-centered automation. The provoking problem of automatic face recognition of human cause has become a research domain involving more and more scientists specializing in different fields such as artificial intelligence, computer vision, psychology, physiology, etc. Human communication plays a vital role in face recognition and social interaction.

In this work we used local binary pattern for feature extraction in face expression recognition. Local binary pattern is a texture operator it is a non-parametric and computationally simple descriptor. It is unvarying to monotonic greyscale. For face authentication and expression recognition local binary pattern technique is introduced. The fundamental qualification of face expression recognition is the detection of precise position of facial feature points which will achieve the automatic analysis of facial expression. And here the classifier used is Haar-cascade, it is going to classify the human face expression.

2. METHODOLOGY

The main goal is to identify human facial expressions with the help of machines, in order to identify the facial expressions we employ some techniques face identification algorithm based on local binary pattern histograms and haar-cascade classifier for face detection. Proposed system follows the steps for working.

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- Collect the images with expressions from the dataset
- Detecting faces in the images and saving them.
- Training the classifier on the faces
- Recognition of expression in new images

2.1 Working of Haar-cascade classifier:

The main goal of Haar-cascade classifiers are an effective way for object detection. It is a machine learning based approach, it has two kinds of images such as positive image and negative image in order to train the classifier.

- **Positive images** - It contains the images which we want our classifier to identify
- **Negative images** - Which do not contain the object we want to detect

2.2 Local binary pattern:

LBP is easy yet very efficient texture operator which labels the pixels of an image by thresholding the neighbourhood of each pixel and considers the result as a binary number. It is visual descriptor it can be used for face recognition tasks. LBP has some parameters to find out the facial expression, it is going to take centre pixel value i_c and neighbourhood pixel value i_n for local binary pattern calculation.

2.3 Working of LBPH:

The main objective of local binary pattern histogram is to recognise the face. There is a difference between face expression recognition and face detection.

- **Face detection**: It will manifest for finding the faces like location and size in an image and probably extract them to be used by the face recognition algorithm.
- **Face expression recognition**: with the facial images pre-processing will be done (extracting, cropping, resizing, and usually converted to greyscale). The face expression recognition algorithm is responsible for finding characteristics which best describe the image.

The face recognition system basically operates in two modes as follows:

- **Verification or authentication of a facial image:**

It basically contrast the input facial image with the facial image related to the user which is requiring the authentication.

- **Identification or facial expression recognition:**

It basically contrast the input facial image with all facial images from a dataset with the goal is to find the user that matches that face expressions.

3. PROPOSED SYSTEM

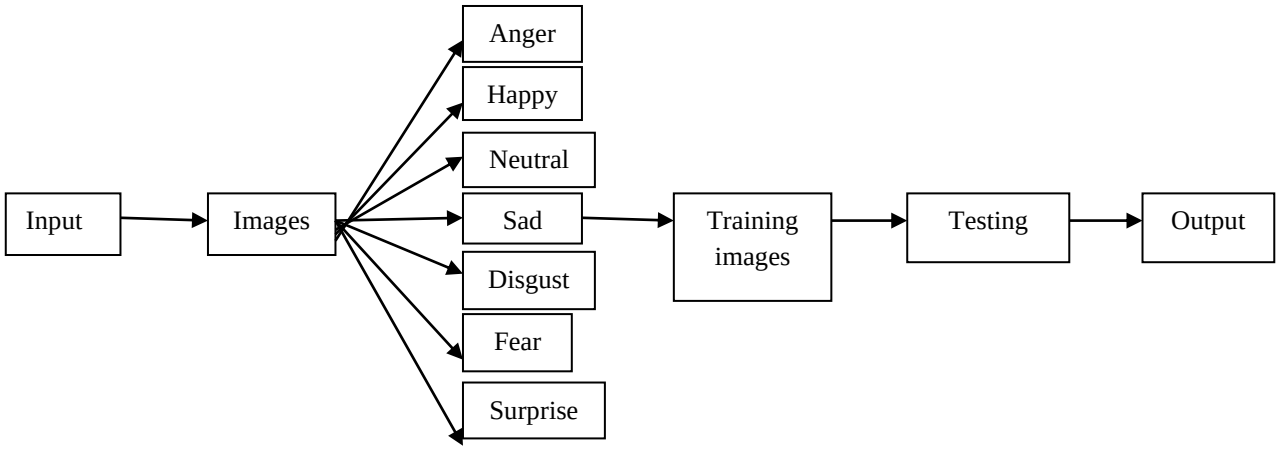

Fig.1: The Block Diagram of Proposed Work

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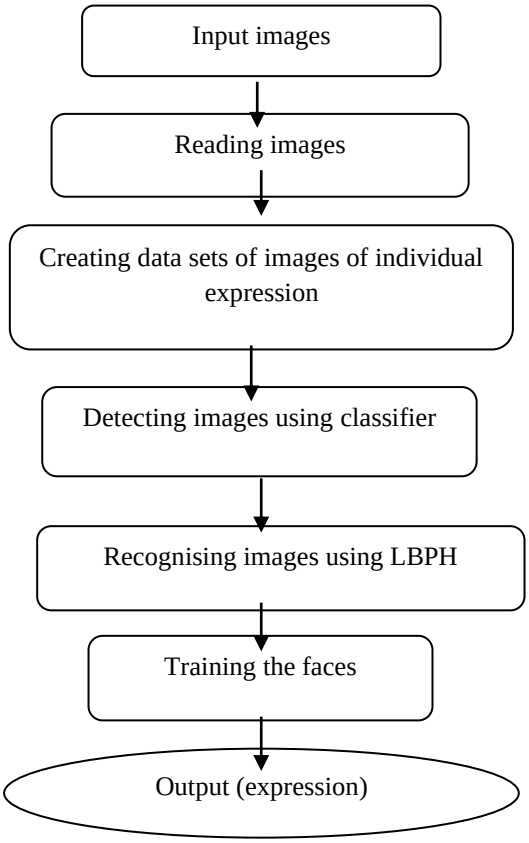
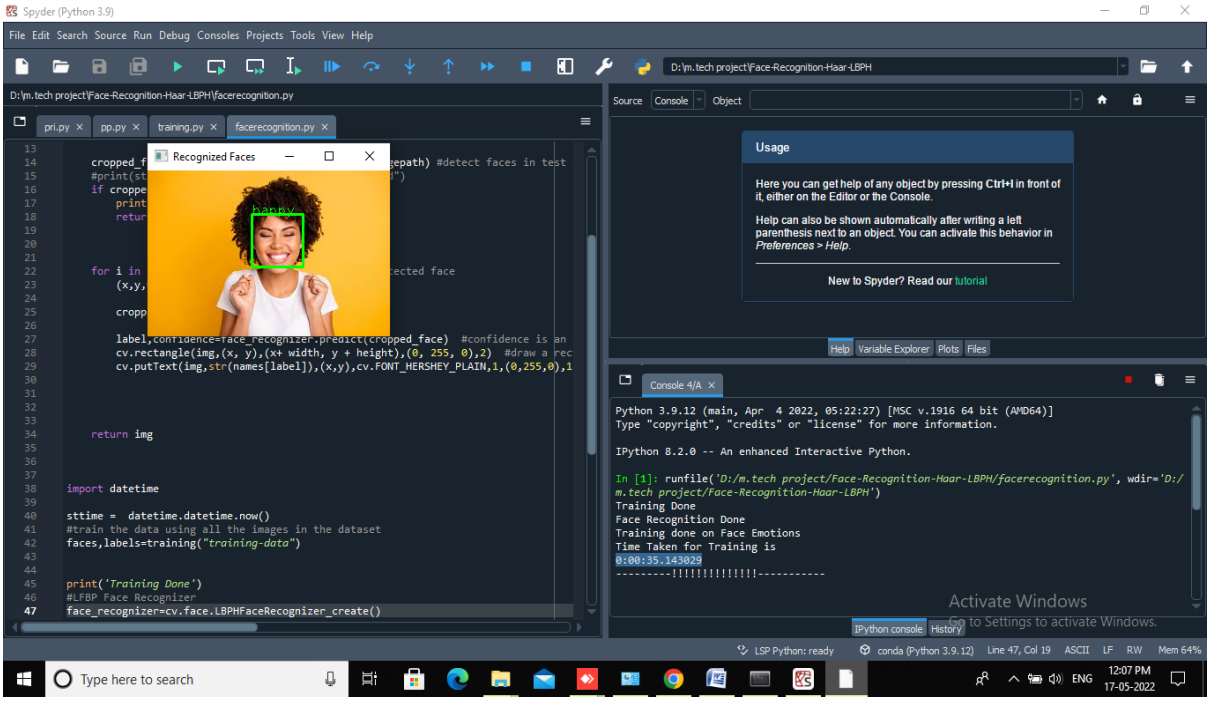


Fig.2: Flow chart of the proposed work

4. RESULT

Experimentation is done with the help of python, which focuses on Haar-cascade classifier and local binary pattern. In this section we will see the image with expression name and time taken for training the image.



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```
Training Done
Face Recognition Done
Training done on Face Emotions
Time Taken for Training is
0:00:36.745481
---------!!!!!!!!!!!!!!----------
```

4.2 Discussion

Calculation of local binary pattern: LBP = $\sum_{n=0}^{i} s(i_n - i_c)2^n$

Calculation of Euclidean distance: $D = \sqrt{\sum_{i=1}^{n}(hist1_i - hist2_i)^2}$

Time taken for training the image: Total time = end time – start time

5. CONCLUSION

The outcome of the paper is to design a simple method for displaying images with expression. The images are classified into 7 categories and the result display the image with expression and also it will display the time taken for training the image. The expressions are identified by using local binary pattern and Haar-cascade classifier technique.

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