



STUDY ON FACIAL EMOTIONS OF HUMAN USING IMAGE PROCESSING TECHNIQUES

Computer Science

**Kejal Chintan
Vadza***

Asst.Prof. *Corresponding Author

**Dr. Amit Kumar
Shastri**

Professor

ABSTRACT

Communication plays an important role in day to day life of human being and expression helps in identifying human inner feelings, idea, thoughts, opinion, etc. expression is a strong mean of non verbal communication which plays an important role in analysis of emotions – “State of mind where feelings of joy, sorrow, fear, hate, love, etc experienced. Human can easily recognize hidden emotions through expression without any extra efforts but making machine to understand these emotions is a real challenge for human today. Emotion can be performed by using text, speech, facial expression, gesture and bio-signals. Here our main aim is to focus on emotion recognition from facial expression using images. But there are some challenges with facial expression.

KEYWORDS

AI, image processing, CNN, image recognition, emotion recognition

INTRODUCTION:

As we know facial expression is nonverbal communication which primary used for conveying social information between human but they also occur in most other mammals and some other animal species. [Fridlund and Russell & Fernandez Dols]. Human can easily recognize common emotions like anger, sadness, happiness, disgust, fear and surprise universally set by Paul Ekman and Friesen but to transfer these skills into machine is quite difficult. Programming emotion is tedious task rather you can train machine to recognize emotion, which leads us to era of AI.

With the help of Artificial Intelligence human and machine interaction become easy now.

Our project is followed by image recognition area which is sub branch of Computer vision. Computer vision relies on pattern recognition and deep learning to recognize what's in a picture or video. Again image recognition is dependent on Deep Learning technology which is an advanced type of Machine Learning, and the modern wonder of Artificial Intelligence.

Image recognition using Deep learning techniques works with low error rates for computer vision recognition and classification. Our main aim is to develop an efficient, simple and easy to use Human Computer Interface (HCI).

How Actually Image Recognition Works?

It uses set of algorithms or technology which analysis image, find the hidden facts and features behind them and apply this learned knowledge for different task such as understanding which objects are present and where in an image, classifying images into different categories automatically, etc. These technologies force various conventional computer vision methods, machine learning and deep learning algorithms to achieve required results for solving such problems.

1. Collecting data: it is one of the first and most important steps in image recognition. The more and accurate data we have, the better our models perform. Data can be gathered by different means like from web, third-party sources or buy datasets from re-sellers etc. Some open-source labeled dataset repositories are also available like, image-net.org, Google's Open Images, cocodataset.org, Mldata.org or through GitHub
2. Annotating data in Image recognition: Annotation means labeling the data for further references. It is done by assigning keywords on the specific area of text, image, video etc. Once you have the data, you need to label it.

There are 2 things you need to focus here:

- 1) Technique used to label the data and
- 2) Who labels the data?

There are different types of annotation done on images like: Bounding box annotation, Polygon annotation, Semantic annotation, Key point annotation and Redaction

Tools used for Annotation:

- LabelIMG -github.com/tzutalin/labelImg
- Comma Colouring
- Annotorious - annotorious.github.io
- VGG Image Annotator(VIA)

3. Processing data in Image recognition

Data preprocessing performed on raw data, after processing, finally transforms the data into a format that will be more easily and effectively practiced. In order to achieve higher recognition rates, we need effective preprocessing algorithms and techniques. These techniques are required on color and grey-level images containing text and/or graphics.

Following are some of the techniques like Image Enhancement Technique, Thresholding Technique, Page Segmentation Technique, Character Segmentation, Morphological Preprocessing and many more are there according to the need of a given system.

APPLICATIONS OF IMAGE RECOGNITION:

Image recognition applications are creating growth opportunities in many fields.

Major applications of image recognition are:

- Face, Object, optical character, Gesture and Code recognition
- Industrial automation
- Self driving cars
- Visual geolocation
- Identity verification through iris code
- Image analysis in medical
- Driver assistance.
- Tracking objects
- Object detection in real time
- Ball tracking in sports
- Image recognition for smart phones
- Detecting wanted criminals from public crowds
- Emotion detection
- Security and surveillance
- Processing satellite imagery for agricultural purposes to distinguish different properties of different crops on a huge farming field and many more...

Ex: Facebook uses image recognition excessively and this has created issue of privacy and security also. But my research specifically deals with human faces which fall under face recognition section, where faces are categorized on many criteria.

Significance Of Image Recognition And Emotion Recognition:

As we discussed image recognition takes an image as input and as a output it gives a class label to which image belong amongst many classes. For ex. Labeling book on desk from class group {pen, book, coffee mug, lamp}. Then comes image localizing. It means giving

bounding box to specific object in image. Here Object Book will come with square box with label "book" on it.

Finally object detection which means taking image as input and localizing all objects in image using multiple bounding boxes. Labeling not only book object with square bounding box but all other objects in image i.e. pen, coffee mug and lamp also with their respective class label.

In short object detection aim is to detect all instances of objects from a known class in digital images and videos. It is widely used for computer vision tasks like face recognition, face detection, video object. Face detection is applied in many other areas of computer vision and have many applications for future research. One of them is Emotion Detection and Recognition.

Face detection is the first step of face recognition system as it automatically detects a face from a complex background. Face recognition System utilized in various fields like secure information systems, cognitive sciences, multimedia systems and enforcement applications. Various Challenges in face recognition are pose variation, occlusion, image orientation, illuminating condition, facial emotion and gender individuality which we will see in next section.

Many companies are using Sentiment Analysis is to guess customer mood towards their product or brand in the digital online-world. However users are also interacting with the products or brand in retail stores, showrooms, etc. and solutions to measure user's reaction automatically under such situation is a challenging task. An Emotion Detection from facial expressions using AI can be a feasible alternative to automatically measure customer's interest with their content or products or brands.

CHALLENGES:

- 1) Recognition of emotion is a real challenge due to some reason like changes in head pose. Had pose are likely to change with wrinkles, hair on face, face injury and using extra accessories like caps, bands etc.
- 2) Use of accessories or occlusion in images like face covered with hair, mustache, bread, face cover with scarf, sunglasses, etc
- 3) Complexion various due to various region and culture. Again if background color is same as person complexion then it may create issue.
- 4) Light illumination in picture has another impact on identifying emotions.
- 5) Poses and abnormality in face.

GOAL:

Main aim is to design system that can identify emotion of human. To achieve accuracy in prediction assembled model of CNN and RNN is used.

POSSIBLE AREAS OF RESEARCH:

- Capturing spontaneous expressions on images and video is one of the biggest challenges.
- Identifying low intensity expression
- Audio video emotion recognition
- Identifying emotions in infra red images
- Emotion recognition in 3d face model and physiological data are also some of the challenging and promising research area due to immense demand of facial emotion recognition.
- capturing emotion information for less common expressions
- experiments not only fix dataset but cross over data sets with variety of information

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