FACIAL EMOTION RECOGNITION

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Emotion identification using deep learning techniques is a hot topic in the field of artificial intelligence. This paper attempts to present this area and its core technologies.

Facial emotion recognition is the process of detecting human emotions from facial expressions [1]. The human brain recognizes emotions automatically, and software has now been developed that can recognize emotions as well. This technology is becoming more accurate all the time, and will eventually be able to read emotions as well as our brains do.

Artificial intelligence (AI) can detect emotions by learning what each facial expression means and apply that knowledge to the new information that it gets. Emotional AI is a technology that is capable of reading, imitating, interpreting, and responding to human facial expressions and emotions.

Creating an algorithm means we need to understand our inputs and outputs – so what exactly the human emotions are. There are two basic approaches that inform how solutions can be designed.

Categorical – argues that emotions fall into sets of classes [2]. The idea is simple: human emotions can be represented as a finite set. Paul Ekman and a group of scientists developed the system, called Facial Action Coding System (FACS), and have continually been updating it. The emotions are happiness, sadness, surprise, fear, anger, disgust, and contempt.

Dimensional – assumes there exists a spectrum of emotions, that can't be defined concretely [1]. The Circumplex model of affects defines two dimensions, pleasure and arousal, while the PAD emotional state model uses three [3].

The easiest way to determine emotion from a face image is based on the classification of key points (facial landmarks), the coordinates of which can be obtained using various algorithms Point Distribution Model, Active Appearance Model, Constrained Local Model [4]. From 5 to 68 points are usually marked and they are connected with the position of the eyebrows, eyes, lips, nose, jaw. This allows us to partially capture facial expressions. Normalized coordinates of points can be directly submitted to the classifier (Random Forest) and get a basic solution. Naturally, the position of a person must be centered.

However, this approach has already been considered obsolete, as it is known that deep convolution networks are the best choice for the analysis of visual data.

Research using deep learning techniques could make better representations and create innovative models to learn these representations from large-scale unlabeled data. Some of the deep learning techniques like Deep Boltzmann Machine (DBM), Deep Belief Networks (DBN), Convolutional Neural Networks (CNN) and Stacked Auto Encoders (SAE) can be used in practical applications such as pattern recognition, audio analysis, computer vision, natural language processing, automatic speech recognition, bioinformatics, vehicle, pedestrian and landmark identification for driver assistance, image recognition, customer relationship management, life sciences, speech recognition and translation [1].

Deep learning techniques offer several advantages such as easy training, usage of shared weights, etc. But there are some limitations with the deep learning techniques:

Firstly, interpretation of the deep learning model is difficult because it has many layers with many nodes. Secondly, it's difficult to explain why the model has made this or that choice. Thirdly, the deep learning technique can get too much training data and be overtrained.

Thus the purpose of our research is to overcome the limitations of the deep learning techniques and make it possible to create models for the real time environment.

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