Indian Institute of Information Technology, (IIIT) Ranchi

"Facial Expression Recognition System using Convolution Neural Network"

PROJECT PROPOSAL
[EC-475]

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1. Introduction

A Facial expression is the visible manifestation of the affective state, cognitive activity, intention, personality and psychopathology of a person and plays a communicative role in interpersonal relations. Automatic recognition of facial expressions can be an important component of natural human-machine interfaces; it may also be used in behavioral science and in clinical practice.

An automatic Facial Expression Recognition system needs to perform detection and location of faces in a cluttered scene, facial feature extraction, and facial expression classification.

We aim to propose an approach that can achieve the desired goal of face detection and identification effectively.

Facial expression recognition system will be implemented using Convolution Neural Network (CNN). CNN model of the project is based on LeNet Architecture.

Kaggle facial expression dataset with seven facial expression labels as happy, sad, surprise, fear, anger, disgust, and neutral will be detected by this project.

In machine learning, a convolutional neural network (CNN, or ConvNet) is a type of feedforward artificial neural network in which the connectivity pattern between its neurons is inspired by the organization of the animal visual cortex. Individual cortical neurons respond to stimuli in a restricted region of space known as the receptive field. The receptive fields of different neurons partially overlap such that they tile the visual field. The response of an individual neuron to stimuli within its receptive field can be approximated mathematically by a convolution operation.
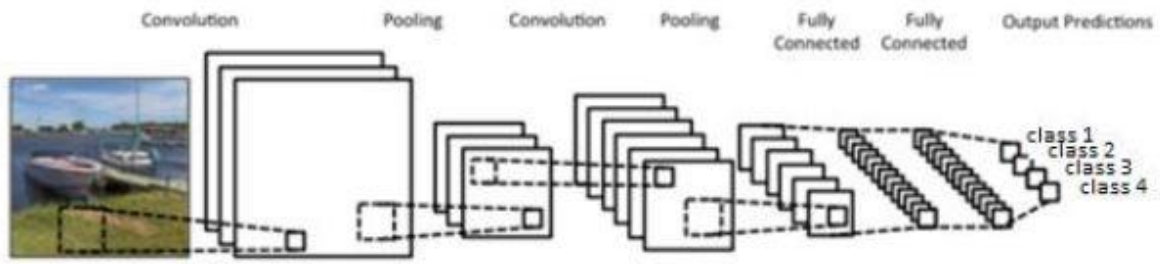
Basic Convolution Network Representation

Convolutional networks were inspired by biological processes and are variations of multilayer perceptron designed to use minimal amounts of preprocessing. They have wide applications in image and video recognition, recommender systems and natural language processing. The convolutional neural network is based on its shared weights architecture and translation invariance characteristics. LeNet is one of the very first convolutional neural networks which helped propel the field of Deep Learning.

2. Problem Identification

Human emotions and intentions are expressed through facial expressions and deriving an efficient and effective feature is the fundamental component of facial expression system. Facial expressions convey non-verbal cues, which play an important role in interpersonal relations. Automatic recognition of facial expressions can be an important component of natural human-machine interfaces; it may also be used in behavioral science and in clinical practice. An automatic Facial Expression Recognition system needs to solve the following problems: detection and location of faces in a cluttered scene, facial feature extraction, and facial expression classification.

3. Objective

To implement Convolutional Neural Networks for classification of facial expressions.

4. Scope

In this project facial expression recognition system will be implemented using convolution neural network. As per the Kaggle dataset, Facial images are classified into seven facial expression categories namely Anger, Disgust, Fear, Happy, Sad, Surprise and 'Neutral'. This dataset will be used to train and test the classifier.

5. Procedures/Methodology

The facial expression recognition system will be implemented using convolutional neural network.

During training, the system will receive a training data comprising grayscale images of faces with their respective expression label and learns a set of weights for the network.

The normalized images are used to train the Convolutional Network. To ensure that the training performance will not affected by the order of presentation of the examples, validation dataset will be used to choose the final best set of weights out of a set of trainings performed with samples presented in different orders.

The output of the training step will be a set of weights that achieve the best result with the training data. During test, the system will

receive a grayscale image of a face from test dataset, and output the predicted expression by using the final network weights learned during training.

Its output will be a single number that represents one of the seven basic expressions.

6. Feasibility Study

It will automatically determine if the system can be built correctly and precisely on time with available resources meeting all the constraints.

Facial Expression Recognition System is technically feasible since user only require web camera to use the system. Similarly, it is operationally feasible because this system is easy to use.

7. Software and Hardware Requirements

Software Requirements
1. Opencv 2.0
2. Python 2.7
Hardware Requirements
1. Web camera

8. Expected Outcomes

On getting a better accuracy we can use it in different fields for the purpose of security and for detection.

9. References

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