Facial Emotion Recognition

MINI PROJECT – II

SYNOPSIS

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Acknowledgement

It gives us a great sense of pleasure to present the synopsis of the B.Tech mini project undertaken during B.Tech III Year. This project is going to be an acknowledgement to the inspiration, drive and technical assistance will be contributed to it by many individuals. We owe special debt of gratitude to MD. FARMANUL HAQUE Technical Trainer , for providing us with an encouraging platform to develop this project, whichthus helped us in shaping our abilities towards a constructive goal and for his constant support and guidance to our work.

His sincerity, thoroughness and perseverance has been a constant source of inspiration for us. We believe that he will shower us with all his extensively experienced ideas and insightful comments at different stages of the project & also taught us about the latest industry-oriented technologies. We also do not like miss the opportunity to acknowledge the contribution of all faculty members of the department for their kind guidance and co-operation.

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ABSTRACT

Emotion recognition from facial expression is an exciting field of research with applications like safety, security, personal information and marketing. Researchers want to develop techniques that can interpret, and extract facial expressions so that computers can make better emotional predictions. In recent years, different types of architectures have been used in machine learning to improve facial expression performance. In this paper, machine learning techniques are used to study facial emotion recognition. We present various machine learning techniques to identify the best methodology for the test at hand. Support Vector Machine (SVM), Convolution Neural Network (CNN) and Artificial Neural Network (ANN) along with face detection and preprocessing techniques for the expressions in Japanese Female Facial Expression (JAFFE) dataset and the Extended Cohn-Kanade (CK+) dataset are exploited to achieve best accuracy of 98.47% on CK+ dataset using CNN, and 89.18% accuracy for JAFFE dataset using ANN.

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INTRODUCTION

OBJECTIVE

Artificial intelligence (AI) and psychological human emotion are two different subjects related to automatic emotion recognition. Verbal and nonverbal information such as facial changes voice tone and psychological signals could be pointed out how someone is experienced. According to Mehrabian] visual cues the majority of emotional information is provided and followed by vocal and verbal cues. Because more about other person's emotional state is revealed by facial changes a lot of research has been sparked by this modality. Feature extraction is required for the classification of various emotions from faces. FACS] for facial expressions were created by Ekman and Freisen for the first time. To describe facial movements AU (Action Units) are used by FACS. In comparison to other modalities Validation of sentimentality based on facial interpretation, founded by Philipp et al is the most studied research topic..

MOTIVATION

Validation of the sentiments in AI is the most difficult task due to certain unavoidable obstacles and challenges such as the person's age, gender, background, luminosity, and head pose ... etc. Geometrical features and texture features extraction are commonly used two traditional methods for extracting facial features. All the Support vector machines SVM, convolution neural networks CNN, multilayer perceptron MLP and recurrent neural networks RNN have been successful in predicting facial expressions using machine learning. Researchers are working on developing different machine learning techniques for obtaining high results in this area. This paper discusses recent advances in the field of emotions, specifically using facial expressions from the images. Emotion recognition are implemented on different datasets using advanced machine learning techniques. This research work is planned in the following sections: section II discusses literature review and some available methods, and section III presents the methodology. Section IV is devoted to experimental setup. Sections V and VI are devoted to results and comparison, followed by a conclusion and recommendations for future work.

SOFTWARE AND HARDWARE REQUIREMENTS

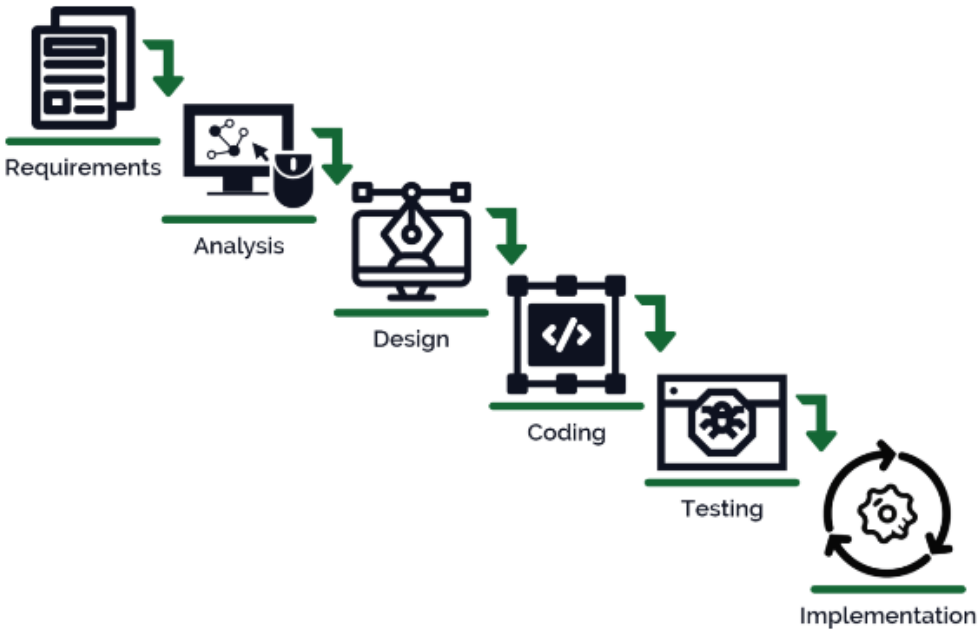
- MIN 512 MB Ram
- Window 10
- AI , ML , PYTHON
- MACHINE LEARNING
- Database
- Visual studio code
- Xaamp
- Intel i3 11^{th} gen., intel ui graphic

PROJECT DESCRIPTION

This system can detect the Live Emotions of the particular user, system compares the information with a training dataset of known emotion to find a match. Different emotion types are detected through the integration of information from facial expressions, body movement and gestures, and speech. The technology is said to contribute in the emergence of the so-called emotional or emotive Internet, Algorithm involve the use of different supervised machine learning algorithms in which a large set of annotated data is fed into the algorithms for the system to learn and predict the appropriate emotion

PROJECT LIFE CYCLE

The waterfall model is a classical model used in system development life cycle to create a system with a linear and sequential approach. It is termed as waterfall because the model develops systematically from one phase to another in downward fashion. The waterfall approach does not define the process to go back to the previous phase to handle changes in requirement. The waterfall approach is the earliest approach that was used for software development



Related works

Automated Recommendation While conducting a search on the web, users are supported by automated recommendation to find and choose the right items that fit their needs, according to people they trust or sharing similar tastes. Automated recommendation is divided into content-based filtering and collaborative filtering [1]. As shown Fig. 1, Content-based methods suggest items similar to those a user has selected in the past. Collaborative filtering recommend objects based on the preferences of other users with tastes similar to those of the current user [2]. To overcome weaknesses of the two previous types of recommendation, we could use a hybrid approach that merge the two previous recommendation techniques to get the best advantage from both of them. Hybrid methods are achieved in different ways such as switching, mixing, weighting or using a cascade approach [3]. 2.2. Text clustering methods Text clustering consist on an unsupervised learning approach that aims to group a given text document set into clusters our groups in a way that documents in a same cluster are more similar between each other [4]. Many techniques are used to accomplish textual content clustering of documents. Here are two main methods : • Word2vec: a neural network based model considering words from a corpus and representing them as vectors with contextual comprehension. Two words are considered similar if the distance between their respectively vectors is lower [5]. Word2vec is a model used to produce word embedding, which is an embedded representation of documents that consists on mapping words or phrases from a vocabulary to corresponding vectors of real numbers. Words that appear together in the text will also be very close in vector space **[6]**

Face Detection:

This pre-processing stage is to identify human faces in the given dataset(images/videos) which is segmented into faces and other non-face regions. The popular algorithms with the highest accuracy for face detection include the following:

Haar classifier: It uses a set of Haar-like features that can be measured by expanding or reducing the size of the pixel group. Without going into detail with low computational complexities, it identifies the most contributing features to face detection. (Often used in the training phase)

Adaptive Skin color: It works on adaptive gamma-corrected images(to avoid illumination) to identify/segment the face and no-face regions using the skin-color model. (Not suitable in a real-time environment due to high computational complexity)

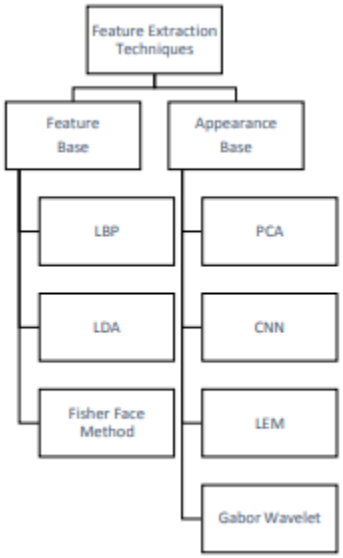
Adaboost Contour Points: It cascades several strong classifiers and uses the model created to compare with new faces. It also uses contour (contour plot of elevation on faces) points to give good accuracy and performance because the features extracted are fewer which leads to low computational complexity.

Algorithm	Reference and Year	Reason for Good Accuracy	Observations
Viola-Jones	[58] 2018	As it was the first real-time face detection algorithm, the accuracy may vary with the number of detected faces in the image database.	Using various Image Processing Techniques performed on images, faces have been detected through skin segmentation in greyscale. The face regions were found by analyzing the greyscale and binary variation in different face regions. Face recognition implementation was successfully enabled through a global classification technique, which classifies the faces from the standard deviation difference between input and average faces.
Haar Classifier	[59] 2019	The accuracy is high because it is good at detecting edges and lines	The computational complexity is less since features contribute the maximum during the training time in the face detection problem.
Adaptive Skin Colour	[60] 2011	The accuracy is good since it is easy to identify skin color, but it fails in different illumination levels.	The illumination problem necessitates a high computational complexity, making it unsuitable for use in a real-time setting. The gamma correction process is used to deal with this.
Adaboost Contour Points	[55] 2011	A robust classifier is used to detect a single face using contour points which result in good accuracy.	A smaller number of features require low computational complexity, which the training model uses, which leads to a low computational cost
Active Appearance Model	[61] 2006	It achieves high accuracy because it is widely used to extract features from human faces under various physical and environmental conditions.	Fitting the model to the original image, on the other hand, is a difficult task in such an active appearance model.
MTCNN	[62] 2019	It consists of a custom CNN which simultaneously works on face detection and alignment in real-time, which leads to good accuracy.	It performs better than most other methods and has the speed advantage, but it does not convince a lower resolution image.

Feature Extraction

For FER, our data is unstructured and thus features aren't clear. Instead of considering every part of the face closely, feature detection reduces the dimension of the input space while keeping the important information about shape, color, and spatial configuration of emotion indicating regions. Deriving an effective facial representation from original face images is a vital step for successful facial expression recognition.

It is usually a process of identifying the eye, nose, mouth, wrinkles, furrows, etc.



Expression Classification

After understanding the inputs and outputs, the software for emotion detection undergoes training to ensure that outputs are correct and appropriate. Usually, there are two approaches:

- **Categorical:** Categorising emotions into classes. (Images as labeled output)
- **Dimensional:**
- No discrete classification but emotions exist on a spectrum (outputs would need to be on a sliding scale). The PAD emotional state (**a psychological model** developed by **Albert Mehrabian** and **James A. Russell** (1974 and after) **to describe and measure emotional states** using three numerical dimensions, Pleasure, Arousal, and Dominance to represent all emotions) while the Circumplex model (all affective states arise from cognitive interpretations of core neural sensations that are the product of two independent neurophysiological systems) of affect uses two

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REFERENCES;

Books:

Machine Learning For Absolute Beginners
Author: Oliver Theobald

Introduction to Machine Learning With Python
Authors: Andreas C. Müller and Sarah Guido

Some sites and channels are there which helps us to make our project

- Java t point
- Code with harry
- Geek for geeks
- Apna college
- Wscube tech

Websites:

1. https://www.javatpoint.com/
2. https://www.geeksforgeeks.org/
3. https://github.com/
4. (677) CodeWithHarry - YouTube
5. (677) Apna College - YouTube

Faculty Guidelines:

MS. MADHU