Emotion Detection using Facial Expression

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Abstract:
To understand the importance of facial expression and how it is important for emotion detection. Emotion detection from our project has vast study for further future research and development. To build automatically facial expression recognition has an effective emerging for developments. This project extends study and development on emotion detection with facial expressions using Convolution Neural network (CNN). This task is done by detecting the facial actions per every unit of face measurements as a sub part of facial action coding system. This project offers light on utilization of CNN from a live video stream as an input. Using various machine learning libraries like tensor flow and many more. With this development it's advantageous to various domains such as medical engineering, technology, marketing etc.

Key Words: Emotion Detection, CNN, Sad, Surprised, Neutral, Disgust, Angry, Happy.

I. INTRODUCTION
Facial emotions are important aspects in human communication that help us to understand the intentions of others. Facial expressions convey Non-verbal Cues which play an important role to maintain interpersonal relations. According to different surveys verbal component(speech)convey one-third of human and Non-Verbal components(Facial emotions, Gestures) convey two-third of human communication. Facial emotion detection became a well attempted research topic nowa days due to its prospective accomplishments in many domains such as Medical engineering, Vehicles, Robotics and Forensic applicationsetc. Emotion Recognition will help to understand the inner feelings for people by using their facial expression.

II. LITERATURE SURVEY


III. PREVIOUS AND CURRENT WORK, METHODS AND PROCEDURES

Existing System
In the existing system affective computing is the “computing that relates to, arises from, or influence emotions”, or in the other words, any form of computing that has something to do with emotions. The creation of automatic classifier involves collecting information, extracting the features which are important and finally training the data, so it classify and recognize some patterns. To build a model have to extract emotion of happiness and sadness from facial expression and have to feed the model with pictures of people smiling, tagged with "happiness", and with pictures of people frowning, tagged with “sadness”. After that, when it receives a picture of a person smiling or frowning, it identifies the shown emotion as “happiness” or “sadness”. Emotion detection using speech, gathering emotional information from the user of a system is their voice. Any emotion from the speakers speech is represented by the large number of parameters which is contained in the speech and changes in these parameters will result in corresponding changes in emotions which is quite difficult.

Disadvantages of existing system
• Creation of model in real life is difficult.
• Voice recognition software won’t always put your words on the screen completely accurately.
• Programs cannot understand the context of language the way that humans can, leading to errors that are often due to misinterpretation.

IV. PROPOSED SOLUTION
To overcome the existing drawbacks, comparing the traditional machine learning approaches, deep learning based methods have shown better performance in terms of accuracy and speed of processing in image recognition. We have used a modified Convolutional Neural Network (CNN).

CNN is mostly used in image and face recognition. CNN is a kind of artificial neural networks that employs convolutional methodology to extract features from the input data to increase the number of features from live video streaming.

That captures each frames and test them and is trained by CNN model and later classified into different emotions. With computational power of Graphical Processing Units (GPU’S), CNN has achieved remarkable cutting edge results in image recognition.
Advantages of Proposed system
1. Automatically detects the important features without any human supervision.
2. Gives good accuracy.
3. Computationally Efficient.

SYSTEM FUNCTIONAL SPECIFICATION

1.1 Functions Performed
1. Creation of GUI
2. Dataset creation
3. Dataset preprocess
4. Feature extraction
5. Building a Model
6. Classification

1. Creation of GUI: We are creating a desktop application using the python library.

2. Dataset Creation: We have downloaded the dataset from the website Kaggle.

3. Data Preprocess: In this stage we detect face & crop, resize, add noise, and normalizations. It aims to remove background and non-face areas, then crop the face area. Next pre-processing is down-sampling (resize) the resolution to the image to be 32x32, 64x64, 128x128.

4. Feature extraction: We have reduced the redundant data and extracted the implicit features of facial expressions.

5. Building a Model: We have built a CNN model using CNN algorithm.

6. Classification: In the classification step we classify the images and predict the emotion as angry, sad, neutral, surprised, happy.

5. SYSTEM DESIGN

5.1. System Architecture (Block diagram of overall function of system/project)

The above diagram describes the system architecture of the project it contains the following steps
1. Data pre-processor
2. Feature extraction
3. CNN Model
4. Classification

5.2. System Data Flow Diagrams

The above figure shows the level 0 dataflow diagram where it indicates the interaction of the user, system with the user interface to display the appropriate result. The user will give text reviews as input to the user interface then it undergoes various stages of machine learning process and predict the sentiment based on trained data.

5.3. Description of System Operation (high level)

The facial expression recognition system is trained using supervised learning approach. It involves training and testing followed by image acquisition further image acquisition, face detection, image preprocessing, feature are then classified into six classes belonging to six basic expressions. In our project we have included angry, disgusted extraction and classification. From face images, Face detection and feature extraction are carried out. From the images they, happy, sad, neutral, surprised. Image acquisition involves the images involved for facial facial expression recognition are static images or image sequences which takes an input from a live video stream. The images are captured from frames of sequence of video bits. Image pre-processing involves the removal of noise and normalization against variation of pixel position or brightness. It basically involves two steps Color normalization and Histogram normalization. Feature extraction involves the selection of the feature vector a process of a pattern classification problem. Image of face after pre-processing is then used for extracting the important features. The problems related to image classification include the scale, pose, 17 translation and variations in illumination level. Classification happens from the dimensionality of data gained from feature extraction method. They have to take different values for any object or face detected belonging to different class.

5.4. Structured chart and Description of Module Operation

Modules:
1. Data Collection
2. Data Preprocess
3. Emotion Detection

1. Data Collection: In this we have downloaded the data from kaggle website.

2. Data Preprocess: In this data preprocess step we are using
3. Methods: face detection & cropping, resize, adding noise, and normalizations in the given dataset.

4. Emotion Detection: The extracted feature points are processed to obtain the inputs for the neural network. The neural network has been trained so that the emotions happiness, sadness, anger, disgust, surprise and neutral are recognized.

6. SYSTEM VERIFICATION

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, subassemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

6.1. TYPES OF TESTS

6.1.1. Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. It is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

6.1.2. Integration testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfactory, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6.1.3. Functional test

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals. Functional testing is centered on the following

**Items:** Valid Input: identified classes of valid input must be accepted.

Invalid Input: identified classes of invalid input must be rejected.

**Functions:** Identified functions must be exercised.

**Output:** identified classes of application outputs must be exercised.

**Systems/Procedures:** interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

6.1.4. System Test

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

6.1.5. White Box Testing

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

6.1.6. Black Box Testing

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated as a black box which you cannot “see” in to it. The test provides inputs and responds to outputs without considering how the software works.

6.1.7. Unit Testing:

Unit testing is usually conducted as part of a combined code and unit test phase of the software lifecycle, although it is not uncommon for coding and unit testing to be conducted as two distinct phases.

7. CONCLUSION

From this project we will be able to help many domains as mentioned say it health care, development and research of new technology using AI powered software. The development is totally dependent on CNN algorithm of Machine learning where emotions can be detected using facial expressions in a live video stream. Future with respect to this project might be very vast and interesting because of its own time response Financially, economically it’s a student friendly project as it is only software dependent project. The depth of the project can be increased by adding and building new modules. Overall the project has lot of advanced studies and research on the live video stream emotion detection using facial expressions.

8. FUTURE ENHANCEMENT

Emotion recognition gives an opportunity to significantly improve devices like cars, phones, TV’s, office equipment and even household appliances and systems by implementing new features and interfaces, which would be much more intuitive and capable of auto adaptation to user needs. Large corporate companies use Affective computing, who want to know at all costs whether their products, services and marketing strategy addresses the needs and tastes of customers. Such technology
can be researched and developed. In case of safety systems, for an example to know if the driver of any vehicle is active or not to know the dizziness of the driver. Which is already implemented by most innovative automotive manufactures. The great interest of this kind of research comes also from the Police and Security Forces, who see an opportunity for extraction a much larger amount of information recorded during interrogations and video surveillance. Future applications of such systems may be used in medicine, education or entertainment The polygraph is commonly known as a lie detector. A polygraph machine measures a physiological change in a person as a reaction to a mental thought. Polygraphs have been historically used to detect deceit, but those signals could be interpreted also for other mental states like anger, anxiety, depression etc. Developing emotion recognition systems, based on other signals than polygraph is using, gives an opportunity to transform polygraph into more robust and in the same time, less or even non invasive device. To build new technology for AI powered software to capture images in smart phone and smart cameras by facial expressions. Highly anticipated by the business market are emotion recognition solutions able to capture and analyze response and visual attention of consumers, compatible with ordinary web cams. It would certainly feed to the needs of Market Research, Brand Management, Creative Agencies and New Product Development. Helping make better decisions by incorporating customers emotions into their research. Game consoles allows as to play without any other controllers but our body. TVs are able to switch channels or change volume with single human gesture, and cameras will snap photo only when we smile. Extending those systems with the ability of emotion recognition will let us to play a game on a console in a way like it was written just for us. TV could suggest which channel we are bored. Detection of antisocial motives is currently given special emphasis for increased terrorist activity in our society. Emotional expression of the subject can be used to determine their possible anti-social motives. Emotion modeling has an interesting role in the next generation human machine interactive systems. It can be realized by modeling both input and output parameters of the interactive system.

9. REFERENCES


