

## **FACIAL EMOTION RECOGNITION SYSTEM THROUGH MACHINE LEARNING APPROACH**

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**Abstract-**The emotions, set in simple words are what people feel. Emotional aspects have huge impact on Social intelligence like communication understanding, decision making and helps in understanding behavioral aspect of human. Human faces provide various information about emotions. As per psychological researcher, a person expresses his emotions less by verbal talk and more by non-verbal body posture and gestures. Emotion recognition or Affective Computing (AC) being the AI related area imparts intelligence to computers in recognizing human emotions. Emotion recognition is proved a popular research area topic in few decades. The aim of this paper is to report an illustrative and comprehensive study of most popular emotion recognition methods, which are generally used in emotion recognition problems. We are motivated by the lack of detailed study of all possible technique's implementations in available literature. This paper provides an up-to-date comprehensive survey of techniques available for emotion recognition.

**Keywords-** emotions, images, emotion recognition, facial image, human computer interaction, facial emotion recognition.

### **1. INTRODUCTION**

Emotions entail different components, such as subjective experience, cognitive processes, expressive behavior, psychophysiological changes, and behavior. These various components of emotion are categorized in a different way depending on the academic discipline. In psychology and philosophy, emotion includes a subjective, conscious experience characterized by psychophysiological expressions, biological reactions, and mental states. The research on emotion has increased significantly greater than the past two decades. There are many fields contributing that include psychology, neuroscience, endocrinology, medicine, history, sociology, and computer science.

There are abundant theories that attempt to explicate the origin, experience, and function of emotions and have fostered more intense research on this topic. Current areas of research in the concept of emotion include the development of materials that motivate and elicit emotion [1]. Charles Darwin's (1872/1965) book "The Expression of the Emotions in Man and Animals" has been highly important for research on emotions. This book was intended to counteract the claim by Sir Charles Bell (1844), that certain muscles were created so as to give humans the ability to express their feelings. Darwin's basic message was that emotion expressions are evolved and adaptive. For Darwin,



emotional expressions not only originated as part of an emotion process but also had an important communicative function [2]. The cross-cultural studies conducted by Ekman and his collaborators and by Izard strongly suggested universality in interpreting facial expressions of emotion. These findings countered customary ideas of cultural relativism, and suggested that the study of facial expression is relevant to central questions regarding human nature. Then, researcher developed measures of facial emotion recognition, which some emotion researchers used to measure facial activity itself directly, rather than studying the observers' judgments of the emotions they saw in an expression. Whereas formerly facial activity were measured via electromyography, it is far more invasive and less precise than scoring systems measuring the changes in the appearance of the face. The purpose of emotion recognition systems is the appliance of emotion related knowledge in such a way that human computer communication will be enhanced and furthermore the user's experience will become more satisfying. By enabling computers to sense the emotional state of the user and react accordingly, this communication can be renovated to a satisfying one. Refining the communication with computers is not the only application of emotion recognition. There can be specialized systems that can be developed and can be used for even more serious problems like in various medical applications aggression detection, stress detection, autistic disorder, as per

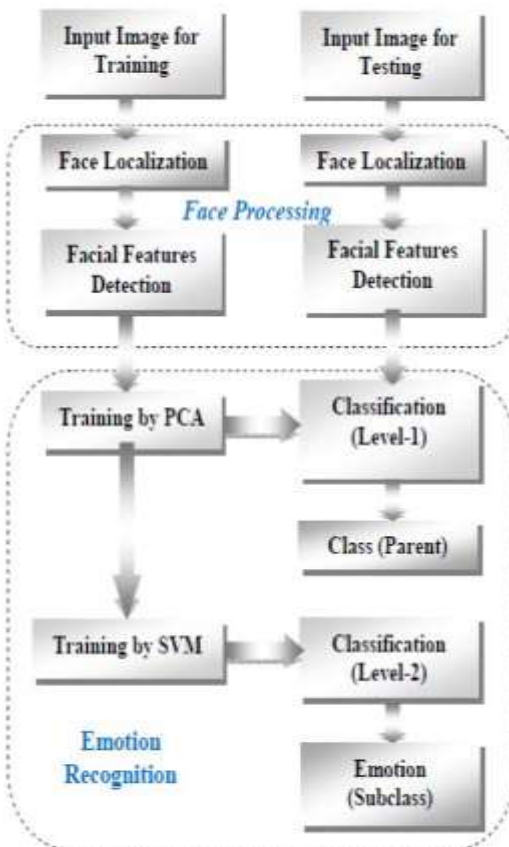
gersyndrome, hepatolenticular degeneration, frustration detection.

## 2. LITERATURE SURVEY

The paper titled "A Novel Approach for Face Expressions Recognition" focus on a new method for face expression recognition. Haar functions is used for face, eyes and mouth detection; edge detection method for extracting the eyes correctly and Bezier curves is applied to approximate the extracted regions. Then, a set of distances for varied face type is extracted and it is serve as training input for a multilayer neural network. The novel factor of this approach consists in applying Bezier curves to efficiently extract the distances between facial parts. The pre classification is done using K-means algorithm. A two layered feed-forward neural network created is then used as a classifying tool for the input images. The consistency of the results is demonstrated by the median value. The performance achieved here is 82%. The method is not able to treat situations when the eyes are closed. Strong illumination variations affect the results

D. Drume, introduced and evaluated multi-level classification framework for the emotion classification. This framework include three phases, face localization, facial feature extraction and training & classification. This paper uses principal component analysis at level-1 and support vector machine at level-2 for the training and classification. Results show that this approach successfully recognize facial emotion with 93% recognition rate. The results suggest that the method introduced is

able to support the more accurate classification of emotion from the images. The Neural network classifying method is used in this work to perform facial expression recognition. The expressions classified include the six facial expressions and the neutral one. A neural network, trained using Zernike moments, was applied to the set of the Yale and JAFFE database images in order to perform face detection. Then detected faces were



### 3. SYSTEM STUDY

**3.1 FEASIBILITY STUDY** The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to

be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

**Three key considerations involved in the feasibility analysis are,**

- ◆ **ECONOMICAL FEASIBILITY**
- ◆ **TECHNICAL FEASIBILITY**
- ◆ **SOCIAL FEASIBILITY**

#### **ECONOMICAL FEASIBILITY**

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

#### **TECHNICAL FEASIBILITY**

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

#### **SOCIAL FEASIBILITY**



The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

## **4. SYSTEM TEST**

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, sub assemblies, 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.

### **4.1 TYPES OF TESTS**

#### **4.2 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.

#### **4.3 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 successful 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.

#### **4.4 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.

### **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.

### **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 used to test areas that cannot be reached from a black box level.

### **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 .you cannot “see” into it. The test provides inputs and responds to outputs without considering how the software works.

### **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.

### **Test strategy and approach**

Field testing will be performed manually and functional tests will be written in detail.

### **Test objectives**

- All field entries must work properly.
- Pages must be activated from the identified link.
- The entry screen, messages and responses must not be delayed.

### **Features to be tested**

- Verify that the entries are of the correct format
- No duplicate entries should be allowed
- All links should take the user to the correct page.

### **Integration Testing**

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects.

The task of the integration test is to check that components or software applications, e.g. components in a software system or –



one step up – software applications at the company level – interact without error.

**Test Results:** All the test cases mentioned above passed successfully. No defects encountered.

### **Acceptance Testing**

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

**Test Results:** All the test cases mentioned above passed successfully. No defects encountered.

## **5.CONCLUSION**

There is increasing integration of computers and computer interfaces in our lives, due to the rise in the need of computers in order to be able to recognize and respond to human communication and behavioral cues of emotions and mental states. The automated analysis of expressions is a challenging endeavor because of the uncertainty inherent in the inference of hidden mental states from behavioral cues. As the facial expression recognition systems are becoming robust and effective in communications, many other innovative applications and uses are yet to be seen. The objective of this research paper is to give brief overview towards the process, various techniques, and application of facial emotion recognition system.

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