

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH  
TECHNOLOGY****DESIGN OF E-LEARNING SYSTEM FOR AFFECTIVE LEARNER MODEL USING  
REGRESSION TECHNIQUE A PROPOSED SYSTEM FOR LEARNER MODEL  
FOR SENTIMENTAL ANALYSIS****Prachi P. More\*, Kavita M. Kelkar**

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**ABSTRACT**

This paper speaks about the proposed system for designation of the E-Learning system of the affective learner with the help of Regression Technique. Affective Computing is a upcoming and fast growing field in computer science in past few years. The paper is a proposed system for the design of E-Learning system so that the Emotions can be detected or predicted with the help of regression technique. The various Invasion Techniques are also discussed. Not to affect the privacy of the Learner being the main motto of this research and proposed system.

**KEYWORDS:** Sentimental analysis, e-learning, affect state, affective computing, emotion theory.**INTRODUCTION**

The upcoming, new technical results show us how emotions play an important role for decision making, machine learning and many others. According to Rosalind Picard in 1998, if we want the computers to be genuinely intelligent and to interact naturally with us, we must give computers the ability to recognize, understand, and even to have and express emotions.[1] Affective Computing is trying to assign computer the human –like capabilities of observation, interpretation and generation of affect gestures. The foundation of affective computing will be the ability to recognize emotions, to infer an emotional state from observation of emotional expressions and through reasoning about an emotion-generating situation.

For recognizing ordinary human emotions computer needs human senses like audio and video, gathering facial expressions and vocal intonations. Additionally, it can sense inputs that may not have analogs in human senses – reading infrared temperature, measuring electro-thermal conductivity, and so forth. Once emotional expressions are sensed and recognized, the system can use its knowledge about emotion generation and situation to infer the underlying emotional state that most probably gave rise to the expressions. Emergent emotions are those which are attributed to systems based on their observable emotional behavior, especially when the system at hand doesn't have any explicit internal mechanism or representation to emotions. A computer with emotional intelligence will be one that is skilled at understanding and expressing its own emotions, recognizing emotion in others, regulating affect, and using moods and emotions to motivate adaptive behaviors. Recognition of emotion in others includes reasoning about what emotion is likely to be generated in a situation, ultimately understanding what is important to other person, what are his goals, preferences and biases. Regulating one's own emotional reactions is a characteristic of a civilized adult. Ability to utilize emotions, both with self and in others, for higher cognitive goals like learning, creativity, and attention is a powerful skill. In building affective computers the tools of pattern recognition and analysis are used for recognizing and synthesizing facial expressions, recognizing and synthesizing vocal inflection, recognizing physiological patterns corresponding to affective states, and modeling emotional behavior. Research in the area is very new, but the results so far have proved promising results. Emotion synthesis, the process of generating emotional states and communicating them, can utilize models employing both cognitive and non-cognitive mechanisms. Cognitively generated emotions have been the easiest to implement with AI based systems, since they are rule-based and lend to implementation in a computer. Emotional computers will not be the next giant step in computing, but building emotional capabilities into many, if not all, computing

devices surrounding us will improve the understanding and communication between us and them. Wearable computers are the first natural application field, having direct access to their users [2].

**LITERATURE SURVEY**

Affective Computing takes the help of the input from the user, as understood till now. The input produced as said, can also be a fake emotion. Though it is logically impossible for a human being to control his emotions, for example, the person who is already frustrated cannot pretend to be happy to fool the computer. Therefore emotional computing aka affective computing comes in picture where the results are almost 70% appropriate [2]. This method of collecting data from the user is termed as invasion technique, where the privacy is at the risk of the user.

Sometimes it can also occur, that the user is informed about the analysis of the subject’s emotions due to which, on the testing part the user may react in a different way than as expected. The brain/ mind unconsciously know the fact that he is being supervised due to which the real emotions capture becomes a bit difficult to the experimenter.

The various invasion techniques are emotions using facial expressions using camera, Emotions via voice with the help of speech of the learner, Body language and posture with the help of sensors on the body or the chair, Brain Imaging using EEG and Emotions with the help of Text using phrases or sentences.[11]

**Facial Expressions**

With the help of Camera for monitoring the facial expressions of the learner, it is possible to judge the emotions using Detection and tracking, Feature Extraction, Classification and thus showing the output as the expression detected. Below shows the good explanation using various algorithms for various stages of the Face emotion detection system.

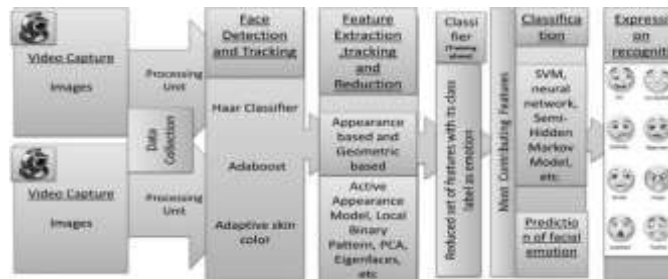


Figure 1. System architecture of real-time FER system[6]

**Voice**

Consider a example, of you sitting in a cafeteria where you are waiting for someone. While waiting, you hear a phone ringing behind you at another table. Now you could listen the one-sided conversation. At this moment you are able to judge the gender of that person talking on the phone. Within some minutes you are also able to estimate that the person is happy or sad with the way he talks or whether he is angry by the tone, some key words of the particular emotion. And thus you just judge a person’s emotion without the help of your eyes, but with the help of that person’s voice. So is this concept too. The Voice Emotion Recognition is therefore a technique where you can classify the emotion of the person. The below Figure 2 shows Voice Emotion Recognition Technique.

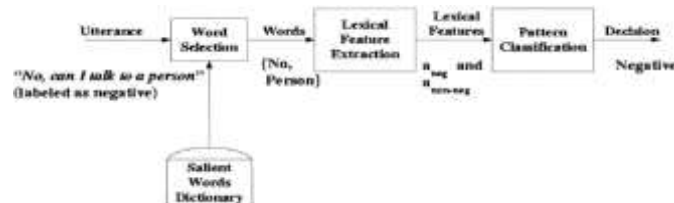


Figure 2. Block diagram for the classification using lexical information [7]

### Body Posture and Language

Here in this technique, the body is being connected to the system, to detect the body language or the postures of the Learner. It is very well explained and experimented in [8].

### Brain Imaging

The input taken from the brain can be the most accurate emotion of the person. This can be calculated using a EEG System, a device like a cap around the head area to detect and catch the brain waves. With the help of this, we can identify the emotion of the person.

### Text

The text is used to detect emotion with the help of the following known and explained as Key Spotting Technique.

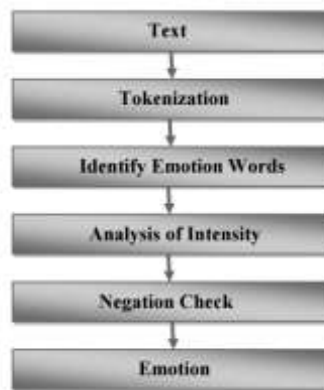


Figure 3: Key Spotting Technique [9]

As Paul Ekman have already researched and classified emotions in six various emotions as sad, happy, disgust, excitement, angry and frustrated.

### Proposed System

A E-Learning System is being proposed where the emotion of the learner can be concluded. As classified by Ekman , the various emotions, a thorough study is made on the various emotions and categorization of the same. The various emotions we will consider in the system will be confusion, frustration, confident, boredom and excitement.

### Confusion

*Confusion* is defined as “uncertainty about what is happening, intended, or required”[3]. Confusion behavior of the learner shall be determined with the help of various factors mentioned further.

### Frustration

*Frustration* is defined as “the feeling of being upset or annoyed as a result of being unable to change or achieve something.”[3]. A Learner shall be termed as a Frustrated candidate if the candidate behaves in various patterns as per the factors mentioned further.

### Excitement

*Excitement* is defined as “A feeling of great enthusiasm and eagerness.”[3]

### Confident

*Confidence* is defined as “The feeling or belief that one can have faith in or rely on someone or something”[3].

### Boredom

*Boredom* is defined as “feeling weary and impatient because one is unoccupied or lacks interest in one's current activity” [3].



These five emotions must be recognized as the output of the E-Learning System. Though there is a very fine line between confusion and frustration as well as confidence and excitement. The true trick is proper categorization of these emotions with the results. A learner can show the various emotions. Such as, if the learner answers various answers then the learner is confused. If the learner is randomly clicking on various answers then may be the learner is frustrated and wants to end the test as soon as possible and leave the premises. If the learner constantly has a look over time, it can result that the learner is not interested i.e. bored. And such other possibilities will be seen later.

### Hypothesis

As for the system of E-Learner we are considering only the emotions of excitement, confusion, frustration, confident and boredom, we will focus our system only on the above mentioned emotional state in learner. As per the study till now, there stays a very fine line in some of the emotions as confident v/s excitement, frustration v/s confusion. The study of this emotion state is given below.

Confusion v/s Frustration must be categorized as on the number of clicks. If the learner is answering number of answers that definitely means that the learner is confused about the topic as he is unable to judge the answer. Likewise, if the learner is knowingly or unknowingly answering a question as a wrong answer then at that moment of time, he can be categorized as a frustrated learner as he is just willing to stop the test and wants to end the examination. The E-Learning System also has a Hint Button on every question of the test page. This click on the hint Button can also be used for analysis of the emotion. For example, if a learner is unsure about the answer, he can click on hint button. Once he clicks on the hint button, we categorize him as a confused learner as he is definitely willing to study and go through the concept again and study for his knowledge. While if the person is frustrated, he is already giving wrong answers and he may also click on the Hint Button so that he may pretend that he is also like an interested candidate and this can be still categorized in frustrated emotion of the learner. Confusion can also be determined if the learner is giving multiple answers and still if the answer is not a right answer.

Let us see another emotion i.e. Confident v/s Excitement. These two emotions too, have a fine line to differentiate. We shall categorize confident if the learner is promptly answering all the questions correctly in the stipulated allotted time. We shall categorize the behavior of the learner as excited, if the learner has a look at the amount of questions to be answered and also reads the content of the question. Further study is being carried on, for these two emotions categorization of the behavior of the learner.

Various Factors are to be considered to identify the accurate behavior of the learner. Some of them pointed out till now are as follows:

1. Time required on learning each contents.
2. Time required for solving exercises.
3. Number of incorrect answers in each test related to contents.
4. Number of incorrect answers in each tests.
5. Number of changes to the test answers.
6. Number of questions left blank in each test.
7. Number of solved test questions.
8. How much time the learner utilizes to reviewed the topic.
9. Order in which the answer to questions in test (sequential/ random).
10. Mouse clicking on the interface pages.
11. How often the learner looks for help.(Hint)

### System Design

The E-Learning System is being designed using PHP. Also for the database MySQL is being used. Various other scripting languages are additionally used for user interface purposes like JQuery etc as per requirement. The E-Learning System is a Tutorial site where, for the trail purpose we have taken, Data Structures as the topic. Various Concepts like arrays, pointers, linked list, Stacks, Queues are being conceptually explained here. Following to the concept, we have created link to the test page, where the user, if ready, can test the new learnt knowledge. The Test Pages have a timer of 15 mins countdown and after 15 mins, the test is automatically submitted. The answers selected by the learner are stored in the database using MySQL. All the Questions and the answers, which are in 4 MCQ, have a Hint button, to help the user to recollect the read content. The System will store all the data achieved from the activities of the learner on the test page.

### Analysis Technique

One of the proposed techniques for the analysis of data collected is discussed below. All the data that is being collected that is, for example, the number of times the hint button was clicked, the number of times the learner answered and the other factors being considered, they can be categorized as mentioned earlier. This Categorization can be done in one of the technique known as Regression.

Regression technique which is widely used for prediction and other applications related to prediction, this is one of the reason to select this technique for our system. Regression analysis is used to understand which among the independent variables are related to the dependent variable, and to explore the forms of these relationships. In restricted circumstances, regression analysis can be used to infer causal relationships between the independent and dependent variables. However this can lead to illusions or false relationships, so caution is advisable. [5] Regression analysis also allows us to compare the effects of variables measured on different scales, such as the effect of price changes and the number of promotional activities. These benefits help market researchers / data analysts / data scientists to eliminate and evaluate the best set of variables to be used for building predictive models. [10]

### Linear Regression Technique

Linear Regression establishes a relationship between dependent variable (Y) and one or more independent variables (X) using a best fit straight line (also known as regression line). It is represented by an equation

$$Y = a + b * X + e,$$

Where, a is intercept, b is slope of the line and e is error term. This equation can be used to predict the value of target variable based on given predictor variable(s). [10]

Thus we have proposed a system which shows the calculations of the emotions estimation/prediction with the help of Regression technique.

### CONCLUSION

The E-Learning System shows a Non-Invasion Technique where the user is not affected with the privacy of his own. Regression can be applied on the data collected. This Paper is a proposed system, though we are at the initial part of Implementation, the research for the same is still in work. On Successful Implementation of this System, it can be a useful application at learning level, where the concepts can be clear as per the output of the emotion recognition. Sentimental Analysis is a boon to computer science field, while research is still rapidly increasing day-by-day, this is an attempt to the same.

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