STUDY OF PROBLEMS FACED BY FIRST YEAR ENGINEERING STUDENTS USING EMOTIONAL INTELLIGENCE AND FUZZY SET APPROACH

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Abstract: Recent research documents tell that the understanding emotional expressions play an important role in the development and maintenance of social relationships. By accurately interpreting another's emotions, one can obtain valuable information. All people thus certainly a teacher uses student's facial expressions and body posture as valuable sources of feedback. In this paper we are analyzing the problems faced by first year engineering students when they get into the college. This paper have five sections the first one analyzing the students problem, second section describes the role of emotions, third section tells the way of identifying emotions of students, fourth section explains the way fuzzy set approach has been used to finding out facial expressions and body posture and fifth section explains how to respond to the affected students by motivating and encourage them.

Keywords: Body posture, Emotional Intelligence, Facial Expressions, and Fuzzy set.

Introduction: Thousands of students are opting for technical education and joining Engineering colleges every year across the country. Encouragingly, number of students selecting the Engineering course is in uptrend. Among these students, considerable amount of students were educated in their mother tongue as the medium of education till their school level. Especially in Tamilnadu large numbers of Tamil medium educated students are joining engineering institutions. For some students, exposure to English medium at college is a big challenge especially if they are from Tamil medium. Many of them cope up in due course, even though they struggle initially. But quite a number of students cannot manage, especially the Fundamentals of Computer and Engineering Drawing subjects which are entirely new to them.

Other challenge what students face at college is time factor. This is common for all medium of instructions at school – both English and Tamil. In secondary school education, most of the schools start preparing students, their +2 subjects very much in advance like 2nd half of +1 itself. So they have plenty of time to prepare and write the final examinations and scoring good marks. Even otherwise also students are facing final examinations with one year time for preparations – whole of +2 studies. Once they get into engineering colleges, they hardly have 90 days of class work in each semester and face university examinations. Though they are familiar with common course papers like English, Physics, Chemistry and Mathematics from +2 onwards, but they feel tough to prepare. The reason being, the stipulated short time for the evaluation (semester examination), compared to annual examinations they were practicing all along. Many of the students either entering into college directly after school try their level and struggle to perform in college degree program. But unfortunately quite a few of them are getting dejected, losing their hope and finally go for the decision of quit from the course. Some students are depressed to the extent of attempting for suicide.

Role of Emotions: Emotion is completely intertwined with cognition in guiding rational behavior, including memory and decision-making and the human brain is described as a system in which emotion and cognitive functions are inextricably integrated. Emotion has been shown to be more influential than cognitive abilities for personal, career and scholastic success and understanding human emotion is one of the greatest challenges of our time. For instance, impulsivity was twice as powerful a predictor as verbal IQ in future delinquent behavior. Recent findings suggest that too little emotion is not desirable. When basic mechanisms of emotion are missing in the brain, intelligent functioning is hindered.

For human beings, facial expressions occupy an important position in interpersonal and non-verbal communication. They are influenced by changes of internal emotion states and generated by the movements of facial muscles. Over the last two decades, numerous researches have focused on the analysis of these facial motions and the recognition of related emotions. To date, those tasks are still a challenging issue in both psychology and computer vision. Erkman and Friesen proposed to use FACS (facial action code system) as the standard systematic categorizes the facial expression of emotions. They also defined six basic universal emotions: Anger, Disgust, Fear, Happiness, Sadness and Surprise. From then, much progress from academic institutions and commercial companies are obtained on automatic facial expression recognition (FER) systems. Though, the full understanding, which seems to be necessary to improve the interaction between computer and human, is still inadequate for realistic usage.

Way to Identify the Emotions of Student : We have used several methods to recognize student

emotion, including a hardware research platform comprised of validated instruments and hardware technologies to model emotions and software platform that uses machine learning techniques to reason about student affect.

Hardware solutions to recognize student emotion: Hardware technologies includes four sensors (camera, posture sensing devices, skin conductance wristband, and pressure sensitive mouse) and this information is analyzed along with the learning task and participants' interactions to train classifier algorithms.

Software solutions to recognize emotion: In addition to the complex hardware research platform described above, we use software techniques (e.g., machine learning, Bayesian nets) to track emotion. Most prior work on emotion recognition has focused on deliberately expressed emotions within a laboratory setting and not in natural situations such as classroom learning.

Student models have benefited from both supervised and unsupervised machine learning methods (Johns & Woolf, 2006). We can use hierarchical Bayesian networks to represent the structured nature of lessons and hidden variables were used to model relationships among skills that were inferred but not directly observable. These systems automatically created classification or prediction rules from a collection of data.

Facial Expression: We use an in-house camera and software system based on strategies leaned from working with the IBM Blue Eyes Camera that tracks pupils unobtrusively using structured lighting which exploits the red-eye effect to track pupils (Haro et al., 2000). Pupil positions are passed to a method that detects head nods and shakes based on Hidden Markov Models.

Body Posture: We detect student postures using matrices of pressure sensors made by Tekscan. The sensors detect a static set of postures, e.g., sitting upright, leaning back, and activity level.

Fuzzy Set Approach for Facial Expression and Body Posture : Real-world classification problems often involve continuous data that makes the design of reliable classifiers difficult. One way to handle continuous data is by partitioning the data into crisp or discrete intervals. This process of discretization determines how coarsely the data is split into intervals. The crisp discretization is achieved by generating a set of cuts of features within the dynamic ranges of the corresponding features. The positions of cuts are very sensitive to the subsets of the information system, which are used to generate the cuts, as well as to the methodology adopted. The position sensitivity of cuts may make the classification accuracy adversely affected. Fuzzy sets, which are generalization of the classical sets, proposed by Zadeh in 1963, offer solutions for tackling such difficulties associated with continuous data. It suggests the fuzzy discretization of the feature space and solves the problems associated with crisp discretization.

A novel algorithm based on fuzzy sets is proposed for the recognition of body postures and face. Features of the image are extracted using the computational model of the ventral stream of visual cortex. The recognition algorithm translates each quantitative value of the feature into fuzzy sets of linguistic terms using membership functions. The membership functions are formed by the fuzzy partitioning of the feature space into fuzzy equivalence classes, using the feature cluster centers generated by the subtractive clustering technique.

A body posture and face recognition algorithm were used and based on the concepts of lower and upper approximations of fuzzy equivalence classes is used to identify the students emotions from their movement of body posture and facial expressions. The fuzzy membership functions and the corresponding classification rules are generated from the training images and the classification is done by a simple voting process.

Response to the Affected Student

Parameters used in Emotion Research

- **Frustration** - feelings, thoughts, and behaviors associated with not achieving a particular goal.
- **Motivation** - initiation, direction, intensity and persistence in an activity.
- **Self-Confidence** - belief in one's powers, abilities, or capacities.
- **Boredom** - restlessness, or irritability that results from a lack of stimulation.
- **Fatigue** - mental weariness or decreased capacity to function normally because of excessive stimulation.
- Two sets of dependent variables, those that track **student engagement** (or flow) and those that tracks negative emotions **detrimental to learning** (being stuck).

We have used a variety of heuristic policies to respond to student's emotions. For example, the heuristic policies listed below have been applied when the specific emotional state is detected. We have also used machine learning optimization algorithms to search for policies for individual students in different affective and cognitive states, with the goal of achieving high learning and positive attitudes towards the subject, compared to pre-defined heuristic policies.

We used a reinforcement learning agent to help discover optimal ways to react in specific affective states to maximize the long term goal of achieving

high learning, by allowing posterior analysis of the policies that RL comes up with for students in different emotional states. We use off-line unsupervised learning, meaning that we will learn optimal policies from student data from the previous year. We are analyzing the dependency of specific behavioral variables, diagnosing emotions and synchronizing this information with the learning task to train classifier algorithms. We use a small subset of these variables to build a prototype model where we draw on the relations between emotional state engagement and actions. We identify and work with the most powerful predictors (e.g., motivation and frustration). In addition to the non-invasive techniques (wireless sensors and machine learning) and a survey, we may interrupt students in-between problems to ask about their feelings and attitudes for the data-collection phase. We measured how feedback variables interact to promote learning in context (characteristics of the learner, aspects of the task).

Conclusion : The first part of the paper was done thorough analyzes of various reasons of the first year engineering students to cope up the engineering syllabus and the problem faced by them. Second part of the paper we discussed about the emotions of students and their behaviors which were affected due to the various reasons. We experimented in various ways to find out their emotions and outcome of the emotions. Also we described the ways how to respond to the affected students.

Finally we, faculty members, treat these students empathetically and we counsel them, encourage them and even help them in their subjects by giving personal coaching. We can make use of latest technology in helping students initially to cope up and in course of time to excel in their studies.

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