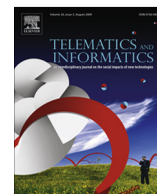




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A global perspective on an emotional learning model proposal

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ABSTRACT

Existing literature argues that emotions have a significant impact on the majority of human activities and functions. The learning process is one of the activities on which emotions have a direct influence. Thus, understanding the manner in which emotions change the students' learning process is not only very important but it can also allow to improve the existing learning models.

Currently, in the majority of situations, the teacher serves as a facilitator between the student and the learning course, and through a constant analysis of the student's behaviour, emotions and achievements, he constantly performs adjustments to the teaching process in order to meet the students' needs and goals. Thus far, in online learning environments there is no easy way for teachers to analyse students' behaviour and emotions. A possible solution to this problem can be the development of mechanisms that enable computers to automatically detect students' emotions and adapt the learning process in order to meet students' real needs.

An emotional learning model was described and a software prototype was developed and tested, in order to find out whether it performs live identification of the students' emotions, by using affective computing techniques, and whether it automatically performs adjustments to their individual learning process. Through a deeper analysis and multidisciplinary discussion of the achieved results it is possible to acknowledge that not only emotions impact students' learning, but also that an application that performs live emotion recognition and which integrates this feature with adjustable online learning environments will trigger improvements in students' learning.

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1. Introduction

As indicated by the existing scientific literature, when analysing the learning process one must take into consideration the impact that emotions will have on its success (Kort et al., 2001; Li et al., 2008; Shen et al., 2009). Research on the set of parameters related to online learning, discloses the significance of learners' emotional state and especially the relationship between emotions and affective learning (Kort et al., 2001).

Despite being a debatable topic (Willingham et al., 2015) Coelho et al. (2014) and Javanbakht et al. (2016) argue that emotion plays an important role in the decision process and knowledge acquisition of an individual. Therefore, emotions might

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influence perception, the learning process, the way people communicate, and the way rational decisions are made. Emotions have two components (Khurana, 2014): the mental component (cognitive) and the physical component (body). They can be classified into categories: primary, secondary and tertiary emotions. Primary emotions occur as a response to some kind of event, which can cause a detectable physical response and trigger emotions such as fear, joy, love, sadness, surprise, anger. From these emotions the other sub-categories can result (Shaver et al., 1987). The studies referring to personality aim at differentiating the people from one another (Santos, 2010). It is acknowledged that personality traits influence people's performance in several life areas (Diseth, 2003; Kumar et al., 2009; Molleman, 2005; Rothmann and Coetzer, 2003). Furthermore, the relationship between personality and learning is largely accepted in existing scientific literature (Busato et al., 1998; Diseth, 2003; Ibrahimoglu et al., 2013). One of the utilised models is the Big Five Model that highlights the existence of the following dimensions: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (OCEAN) (Komarraju et al., 2009, 2011; Kumar et al., 2009).

A learning style is a method that enables an individual to learn in a personal manner having positive results (Morgan and Baker, 2012). Thus, different people learn in different ways. Everyone has a mix of learning styles, but some people may find out that they have a dominant style of learning. Others may discover that they have a different learning style in different circumstances. There are several models developed by several authors that have tried to represent the way people learn (Morgan and Baker, 2012), such as the Learning Style Inventory (LSI) model (Kolb, 2014), the Felder-Silverman Model (Felder and Silverman, 1988) and also VARK (Fleming and Baume, 2006).

Therefore, the issue debated during this project is the existing gap between a student and his online learning environment. In order to address the referred issue, the research team behind this project developed an architecture and an application prototype aimed at assessing students' emotional state. This was accomplished by using affective computing techniques and developing a proper response to induce a positive stimulus, hence improving the student's learning. As presented in (Faria et al., 2015b) the developed "Emotion Test" prototype was implemented in order to be an engaging learning environment with some multimedia interactions and to be considered an auxiliary learning tool to be used alongside traditional classroom learning.

The present work serves as a detailed analysis for both the proposed architecture and also the prototype implemented to test it. In our opinion, the documentation of all the considerations and conclusions achieved by means of this research project will represent an important contribution to science, given that it will allow other researchers to understand the emotion-related questions and the impact which this variable might have, in the long run, for the individual learning process.

2. The Emotion Test Platform

The Emotion Test simulates the entire learning process, from theoretical explanations to exercises and assessment. Throughout the entire process, the student's emotional state, personality traits and learning preferences are taken into account. The architecture proposed for this prototype is composed of four main models (Faria et al., 2015a): the Student Model, the Emotional Model, the Application Model and the Emotive Pedagogical Model.

The Emotional Interaction Mechanisms are the triggers of an emotional interaction when one captures an emotion that needs to be repressed in order to facilitate the learning process. Emotions to be repressed are: anger, sadness, confusion and disgust. The interaction depends on the student's personality and learning style. Finally, the Graph of Concepts in Case of Failure indicates the steps to be taken when a student fails to pass a subject.

2.1. System architecture

The proposed architecture is composed of four major models: the Student Model, the Emotional Model, the Application Model and the Emotive Pedagogical Model.

The architecture is illustrated in Fig. 1.

2.1.1. The Student Model

Two different methodologies can be used to implement the Student Model: knowledge based or behaviour based (Kobsa, 1993; Martins et al., 2008). The student model consists in retrieving the student's information and characteristics, including personal information (name, e-mail, telephone, etc.), demographic data (gender, race, age, etc.), knowledge level, limitations, learning styles, emotional profile, personality traits, etc. This information is used to adapt the learning content, the activities and interactions to the students' necessities.

The student model data are collected in different ways. This technique was chosen in order to facilitate the student's progress in the prototype without having the student answer to endless questionnaires. Instead, the questionnaires were chosen taking into consideration the time which was necessary for the student to finish them. Generic information about the students, such as name and email, was retrieved from the University LDAP database and from a small set of questions presented to the student at the beginning of his interaction with the prototype. Other information like personality traits and learning preferences was determined by means of questionnaires which were incorporated in the prototype. Based on Garcia (2012), Saucier and Srivastava (2015) arguments on the reliability of the Big Five Model as a tool for accurately achieving a characterization of an individual personality, this was the chosen tool for the present research project.

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