

Conclusion & Further work

9.1 Introduction

The aim of this project was to develop a **framework** that can **identify quantitative parameters** obtained using **interactions** that can be used to identify **emotions** in learning in an e-Learning environment, suitable for Sri Lanka. The results of this study is expected to assist in building more adaptive learning systems that can be used to customize the system according to each user's emotional state during his/her interaction with the system. This chapter discusses the overall achievements of the objectives. In addition, limitations and drawbacks are pointed out in this chapter and finally, possible extensions and improvements also are discussed.

9.2 Conclusion

The study of emotions in eLearning systems, it can be concluded that there are interactions data can be used to identify emotions gathered mainly through the use of specialized equipment such as cameras and other sensing equipment. Evidence about the use of mouse and keyboard interaction data to find emotions was not readily available. Also, it can be concluded from the critical study on the connection between emotions and learning, that there is a very strong positive relationship between learning and emotions of a student.

Another objective of this project was to design and develop the framework described in 9.1 above, which obtains parameter values derived from keyboard and mouse related interactions with the e-learning system and navigational patterns. The system is capable of capturing mouse and keyboard interactions with the system at operating system level and record interactions while learning as well as when the user is not using the e-Learning system. Also, one part of the framework, which is a web based e-Learning system consisting of administration and content providing provides facilities for a student to remotely login to the system and carry out studies. Hence while the student is studying, all his actions are recorded including the application programs he used with time and date stamps.

Using the captured interactions data, the system is capable of calculating parameters. Therefore it can be concluded that the framework developed is capable of obtaining

interactions related parameters to test to identify emotions in an e-Learning environment.

The framework was tested for the set of seven parameters introduced in pages 46 and 47 in Chapter 8. According to the results obtained and presented in pages 59 – 61 in the same chapter, it can be concluded at 90% confidence level, that none of the parameters tested can be used to identify emotions in an e-Learning environment using Multiple regression analysis.

9.3 Problems encountered

Major problems were faced in defining the scope of the project. At the beginning, the intention was to develop a model that identify human emotions and provide e-Learning study material to the student according to emotional state, which is an adaptive model. Due to the time limitation and complexity of the system, the scope was narrowed down and developed the current system, which can be used as the stepping stone of the adaptive model.

The long learning curve to study area of emotions, e-Learning, connection between emotions and education, data that were captured in such research, how they were analyzed, find connections between such analyses to the framework that is developed required a large amount of time.

The complexity of the methods used for analysis, and research work done on these areas required a substantial amount of time and hence to come up with a suitable design for the framework.

Since the system is developed focusing the Sri Lankan e-Learning culture, sophisticated equipment usage such as cameras and voice can not be incorporated. Hence defining parameters for the inputs obtained from these two input devices was a huge challenge.

Technical difficulties were faced when transferring interactions that were captured at client side to server. Since low level hooks were used to capture interactions, a web based system could not be used.

Installing the interactions capturing system in the laboratory became a problem due to viruses in the lab computers.

9.4 Limitations of the system

- Adding a parameter requires changes in design and implementation, hence calculations need to be done in Excel.
- The system needs an extensive amount of test data for analysis but could not collect sufficient amount of data.
- Testing and evaluation is done in a controlled laboratory.

9.5 Improvements and Further work

- Conduct the experiment to obtain more data for a better analysis with the same set of parameters.
- Introduce new parameters and conduct the experiment again to find suitable parameters.
- Interface with the existing moodle system to collect data.
- Improve the client side interactions capturing system to update the server with client interactions.
- Automate analysis engine
- Use of Principal Component Analysis, which is another approach to identifying parameters using correlation, can be used.
- Develop an adaptive system that identifies emotions using the parameters identified and adapts the system accordingly