

## Chapter 04

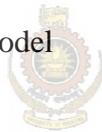
# Using Multiple Regression to identify parameters

### 4.1 Introduction

The project initially started to develop an adaptive model that changes content according to user emotions. But due to the complexity of the problem learnt in the process of conducting literature survey and reviews, the scope was narrowed down to identifying parameters that explain emotions in an eLearning environment, based on user interactions. Defining these parameters included ideas given by teachers and administrators who are stakeholders of e-Learning systems. Also, inputs from research work carried out in the same field were incorporated.

Multiple regression analysis is used as described in Chapter 05, for the analysis of the framework.

This uses a model



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$$Y_i = b_0 + b_1 X_{1i} + b_2 X_{2i} + b_3 X_{3i} + b_4 X_{4i} + b_5 X_{5i} + b_6 X_{6i} + b_7 X_{7i} + b_8 X_{8i} + b_9 X_{9i} + e_i$$

Whether a student has learnt a subject or not is measured by conducting an examination. His or her examination mark is used as a measure of competency in the subject. This is used as the dependent variable  $Y_i$ , and how well the parameters explain it is tested using the model. This approach is used in the web based e-Learning system.

### 4.2 Data captured

Mandatory input devices expected to be available in a student's computer system are the mouse and the keyboard. Hence the data that is captured for the analysis are directly from the mouse and the keyboard. These include keys pressed, mouse moves and clicks, and using them, find out different applications used by the student.

In addition, students exploration patterns through the study material are also monitored. The raw data that is gathered are then converted to a format suitable for processing to derive identifying relevant parameters.

### 4.3 Define parameters

Quantifiable measures that can be developed using the interactions captured are defined as parameters. Inputs from teachers and research done in similar areas were used in determining them.

Parameters defined are as follows.

$X_1$  = Deviation from expected time spent on a content page

$X_2$  = Deviation from expected time spent using application programs defined for the subject

$X_3$  = Relevancy of Applications used

$X_4$  = Time spent on Relevant Applications used

$X_5$  = Content feedback Index

$X_6$  = Emotions feedback index

$X_7$  = Deviation from total subject duration

$X_8$  = Keyword usage index

$X_9$  = Profile rating

Mello et al [7] in Integrating Affect Sensors in an Intelligent Tutoring System and the research done by Kalaydjiev et al [21], Adaptive Hypermedia in eLearning state that emotions are systematically affected by the knowledge and goals of the learner. Therefore when defining parameters, student's expertise and exposure to the subject was considered.

In order to arrive at finding suitable parameters that can be derived from the interaction data that can be captured, the framework used by Brusilovsky et al [2]. In their research, attempts to find the ways to help teachers in providing content for intelligent tutoring systems. Two levels of content, multiple examples, are some of the methods which are adapted in defining parameters for this study, such as emotions and content feedback indices, and time deviations, where we expect students to have

simpler content provided in order to understand concepts easily rather than spending time on the same thing for more than expected time.

#### 4.4 Scope

The scope is limited to capturing interactions data, analyzing and providing a report on the connection between constructive learning and the parameters used above. Introducing additional parameters if required in allowed in the system, which need further designing and implementation work as well.

In addition, the system should consist of administration subsystem which provides the infrastructure of the system.

#### 4.5 Users and their functions

Actors of the system are the student, lecturer, administrator and the existing content providing system. Functions of users in a nutshell are; the administrator administers the system, the lecturer provides content to the system in an ordered manner, and also rates students.

The student learns the subjects in the given course, provides feed back when required and finishes learning a subject after doing the quiz.

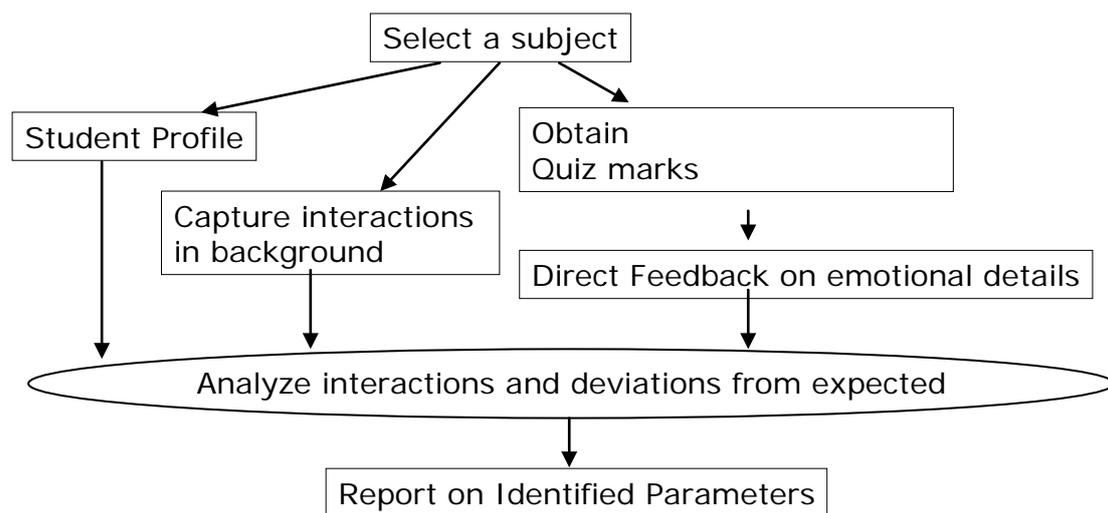


Figure 4.1 Functionality of the system – Analysis and testing perspective

Figure 4.1 explains the functionality of the system in analysis and testing perspective.

To evaluate the system, students are monitored, who use the system in a laboratory environment. In order to do that, the process is carried out as given in Figure 4.1, on a selected subject. Students are monitored and data is captured and analyzed to provide a report.

High level usecase diagram of the system is given in Figure 4.2 below

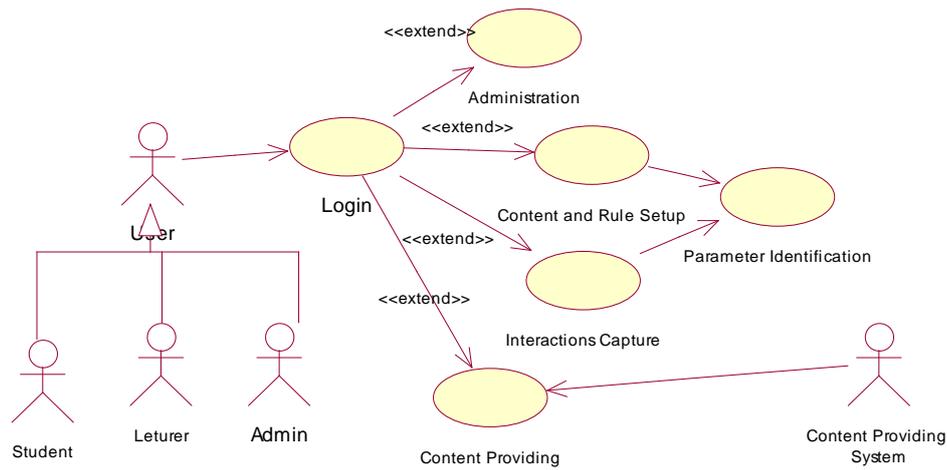


Figure 4.2 High level Usecase diagram

#### 4.6 Assumptions

Since the experiment is carried out at laboratory, the network connection related delays are not taken in to consideration in the time related calculations.