Goal Oriented Requirement Analysis for Teleteaching System

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Abstract—Teleteaching systems have proved to be a useful tool in imparting distance education. Various Teleteaching systems have been put to use so far. In this paper, we present a requirement analysis for this widely used system. We propose a goal oriented approach to requirement analysis based on Tropos specification. This approach analyses the system from two different perspectives i.e. organizational and decisional. Further, we have represented the requirement analysis in the formal specification language called the Formal Tropos.

Keywords—Teleteaching system, goal oriented requirement analysis, Formal Tropos

I. INTRODUCTION

With the advent of technology, there has been a growing demand for real time Teleteaching systems in distance education. A real time Teleteaching system should be such that it caters to full two way communications between the teacher and the student. This requirement of two way communication breaks down further into many other requirements (discussed in Section II). The major reason because of which most Teleteaching systems fail or are not up to the level they were meant to be, is that there has been inadequate requirement analysis before the development of the system. This fact imposes a stringent need for the proper requirement analysis of the system. The subject of Teleteaching has engaged researchers all over the world. Many solutions have been proposed for distance learning and collaboration over the Internet. Various methods have been proposed for synchronous learning [4-6], asynchronous learning [7],[8] or asynchronous learning with an on-line facilitator [9], [10]. Various models for collaborative systems that come to cover the communicational needs of collaborative work in a learning system either synchronous [11],[12], or asynchronous [13] have also been proposed. In [14], authors described the requirement for Learning On Demand Systems, which is basically a asynchronous system between a storage device and the student. There is no formal model for requirement specification in this paper.In [15], a detailed requirement analysis procedure has been described for internet based interactive system. Though this paper is related to interactive system, but they did explicitly define the requirement specification for Teleteaching systems.

Although many requirement analysis techniques have been used so far, yet many are not upto the mark as they are not able to specify the system requirements from the goal perspectives. Goal concepts have fundamental significance in requirement analysis, and hence it is desirable to seek some coherent view of the various notions of goal within the field. If the various goal-oriented approaches can be put together, one would hope to have a stronger framework that takes advantage of the contributions from the many streams of requirement analysis research. So a new method of requirement analysis has been used for quite some time called the goal oriented approach to requirement analysis based on Tropos[1] specification. This technique involves two perspectives- organizational modeling, focused on the view point of stakeholders and decisional modeling, from the point of view of decision maker. Therefore we make a requirement analysis from the goal oriented approach for a real time Teleteaching system, in this paper. Further, the system has been presented in the form of the Formal [2],[3] Tropos language.

The paper is structured as follows. Section II discusses the goal oriented approach to requirement analysis for Teleteaching system. Further, the Formal Tropos language specification has been presented in Section III. We give our conclusions in Section IV.

II. REQUIREMENT ANALYSIS

For conducting a requirement analysis of the Teleteaching system, we propose a Virtual University. This Virtual University is responsible to provide a learning environment where the teacher preaches and the student learns. The most basic requirement of a real time Teleteaching system is to provide a full two way communication between the teacher and the student. It is the responsibility of the Virtual University to fulfill this need.

A. Organizational Modeling

As a first step, organizational modeling is based on goal analysis. Fig. 1 shows the Actor diagram of the proposed system. There are three actors in our system-Teacher, Student and Virtual University. The Student depends on the Teacher to learn. In turn the Teacher depends on the Student for evaluating his/her teaching skills. The Teacher and Student depend on the...
Virtual University to provide teaching and learning environment respectively. Moreover, the Teacher depends on the Virtual University to provide teaching tools and the Virtual University depends on the Teacher to improve teaching methodologies.

Fig. 1 shows the second step i.e. the extended rationale diagram for the virtual University actor with facts and attributes. The goal of the Virtual University is to provide teaching environment to the Teacher. This goal further comprises of four more goals i.e. make teacher accessible, make the whiteboard visible, distribute study material, and maintain student record. When the goal ‘provide teaching environment’ is fulfilled, the event ‘teaching environment provided’ occurs. For a real time system, ‘make teacher accessible’ emulates as, Teacher should be visible and audible at all times of the session as well as the Student should be able to question the teacher. A Student can ask questions via a chat box or dynamically with his video and audio being played in the session. When the goal ‘make teacher accessible’ is fulfilled, teacher is accessed. The ‘make whiteboard accessible’ goal can be broken down into giving Teacher the access to Student’s whiteboard and making Teacher’s whiteboard visible to Student. This means the Student can read the Teacher’s whiteboard but the Teacher can read and write, both on the Student’s whiteboard. The ‘maintain student record’ goal can be broken down into name record, id no record, submitted assignment record, and classes attended record. The resource ‘chat box’ has attributes time, id no and name. Similarly for the resource ‘microphone and display’.The goal ‘record submitted assignment’ has attributes ‘date of submission’ and ‘assignment no’.

B. Decisional Modeling

Fig. 3 shows the extended rationale diagram for Teacher actor from decisional perspective. Here dimensions and measures are shown along with goals. The Teacher actor has goal ‘manage teaching’. This comprises of goals - make class schedule, decide way of teaching, decide syllabus and evaluate student’s performance. The goal ‘make class schedule’ further breaks down into goals ‘decide class time’, ‘decide class date’, ‘decide subject’ and ‘decide test schedule’. Similarly for the ‘decide test schedule’ goal. The student’s performance can be evaluated in two ways, either in form of grade or marks. Goal ‘class time’ has dimension time and goal ‘marks’ has measure marks. The goal ‘decide way of teaching’ can be fulfilled in two ways by either teaching in offline mode or online mode.
III. FORMAL TROPOS LANGUAGE
A Formal language called Formal Tropos complements the Actor diagram. It provides a textual notation to the graphical actor diagram by describing dynamic constraints among different elements of specification in first order, liner time temporal logic. The Formal Tropos specification of our proposed system is given below.

**Entity**: study material  
**Attribute constant type**: videolecture, classnotes  
**Dependency constant type**: study material  
**Type**: goal  
**Mode**: achieve  
**Depender**: Student  
**Dependee**: Teacher  
**Attribute constant**: study material  
**Fullfillment**  
**condition for depender**  
Student should be notified about the time of online class

**Dependency**: provide study material online  
**Type**: goal  
**Mode**: achieve  
**Depender**: Student  
**Dependee**: Virtual University  
**Attribute constant**: study material  
**Fullfillment**  
**condition for depender**  
Student should be able to download file from specified web page at all times

![Fig.4. The Formal Tropos Specification](image)

IV. CONCLUSION AND FUTURE WORK
In this paper we have done a goal oriented requirement analysis for our proposed interactive Teleteaching system. This analysis will help us to design the system according to user’s need and satisfaction. In future we wish to map these requirement specifications onto our conceptual design of the system. Further we will design the architecture of the proposed system based on that conceptual design.

REFERENCES


