TOWARDS A COLLABORATIVE INTELLIGENT TUTORING SYSTEM CLASSIFICATION SCHEME

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ABSTRACT

This paper presents a novel classification scheme for Collaborative Intelligent Tutoring Systems (CITS), an emergent research field. The three emergent classifications of CITS are unstructured, semi-structured, and fully structured. While all three types of CITS offer opportunities to improve student learning gains, the full extent to which these gains may be achieved is subject to future research.

KEYWORDS

intelligent tutoring systems, collaborative learning, collaborative intelligent tutoring classification scheme

1. INTRODUCTION

The purpose of this paper is to present a novel classification scheme used for Collaborative Intelligent Tutoring Systems (CITS). Intelligent Tutoring Systems mark the forefront of research in applied artificial intelligence to education. The field of Computer Supported Collaborative Learning focuses on how students learn in collaborative settings and how technology can enhance collaborative peer interaction and work (Dillenbourg and Crivelli, 2011; Nkambou et al., 2010). Recently, research efforts have focused on merging the affordances of both industries to capitalize on the benefits of group learning and adaptive support (Nkambou et al., 2010). The relatively new area of research necessitates a method of uniform evaluation that emphasizes main features from both ITS and CSCL literature.

2. CITS CLASSIFICATION

A comparative analysis between selected works within CITS literature resulted in a pioneering classification scheme that blends ITS and CSCL paradigms. The classification scheme is intended to support the analysis of design principles used within CITS. I propose that CITS can be classified and analyzed via the following dimensions: *Modeling* (how learners are modelled and whether the learning domain includes collaborative behavior), *Group Dynamics* (how groups and roles are determined), *Collaboration Cues* (the impetus of the initial collaboration and the timing of ongoing communication), *Pedagogical Guidance* (how the topic of communication is determined and how feedback and activity facilitation is implemented), *Technology* (the system tools for interaction).

This classification scheme encompasses the main operational dimensions of CITS. CITS are a collaborative learning approach that uses technological tools (technology) to provide systematic support to learners (pedagogical guidance) working within groups (group dynamics) either assigned or at-will (collaboration cues) and maintained in computational representations as they work to achieve a learning goal (modelling). The scheme consists of three categories: unstructured, semi-structured, and fully structured. Unstructured CITS leave decisions regarding the collaboration to the user while fully structured CITS guide the entirety of the collaborative process. Semi-structured CITS intermingle user directed collaboration with system guidance.

Table 1. Detailed CITS classification scheme which includes criteria for the five dimensions.

CITS Classification Scheme Unstructured(U), Semi-Structured(S), Fully Structured(F)	U	S	F
Modelling (Target Audience & Objective)			
Provides individual support	✓	✓	✓
Uses individual and/or group models to provide collaborative support		✓	✓
Support concerns domain learning	✓	✓	✓
Support concerns collaborative behavior		✓	✓
Group Dynamics			
Users determine groups	✓	✓	
System or system requirements determine collaborative groups			✓
Users determine roles	✓	✓	
System determines collaborative roles			✓
Collaboration Cues (Impetus & Timing)			
Initial collaboration occurs at-will	✓	✓	
Initial collaboration encouraged for task		✓	
Initial collaboration required for task		✓	✓
Collaborators determine when to communicate	✓	✓	✓
System prompts collaborators to communicate		✓	✓
Pedagogical Guidance			
Users determine activities	✓	✓	✓
System determines activities		✓	✓
Users determine how to collaborate and provide support to others *without* system guidance	✓	✓	
System guides collaboration and collaborators in how to provide support to others		✓	✓
Technology			
Users determine what tools are best for collaboration and communication	✓	✓	
System restricts collaborators to a set of tools for collaboration and communication		✓	✓
Distributed Learning Support			
Collaboration dependent on physical location of users	✓		
Collaboration independent of physical location of users	✓	✓	✓

3. CONCLUSION

The CITS framework shows a plethora of learning designs and capabilities exists that accommodate collaboration and adaptive support for education. The collaboration may be unstructured, semi-structured, or fully structured. The CITS framework provides a uniform tool for analysis of a variety of CITS while emphasizing main features required from both ITS and CSCL research.

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