

Adaptive Learning through Interest Based Negotiation

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Abstract: In most of current learning systems, learning content is either decided by learners or by the learning systems. This paper proposes a negotiation mechanism, where the system and the learner can exchange ideas and negotiate the learning content via argumentations. Through the negotiation, learning content that satisfies both the learner's interest and the system's pedagogical requirement is more likely to be achieved, because both parties participate in the decision.

Keywords: Interest based negotiation, adaptive learning, e-learning systems, knowledge representation and reasoning.

Introduction

This paper proposes an interest based negotiation mechanism for learning content selection, through argumentations between the learner and the system. It has advantages especially for e-learning systems to negotiate learning content, and for children's edutainment systems to balance children's learning and play.

1. Interest Base Negotiation and Adaptive Learning

In the traditional Position Based Negotiation (PBN), the involved parties are firmly committed to their positions that finally only one party could reach the position. Interest Based Negotiation (IBN)[1] seeks to discuss and satisfy the reasons behind the positions, and try to reach mutually acceptable agreements or find alternative solutions. IBN is a win-win solution, it suits better in learning content negotiation. IBN automation has gained increasing attention recently. For example, Rahwan et al [2] equipped intelligent agents with the ability to conduct IBN. Tao et al provided a computational model to automate IBN[3] and applied IBN in learning activity negotiation[4]. However, IBN automation remains at an initial stage.

Learning content adaptation is important in creating learner centered and personalized learning systems. Chen et al [5] achieved content adaptation by taking into account user profile and device capability. Shi et al [6] use a learner behavioral model to help learner select the best learning path. Moreno-Ger et al [7] use preliminary test and questionnaire to measure prior knowledge and adapt the game. However, few learning systems have provided opportunity for learners to negotiate learning content with systems. None of the report has been based on interest based negotiation.

2. Automated Learning Content Negotiation

The learning system will include a knowledge base and a negotiation engine. Suppose the learning objects are organized in hierarchical structures, higher level learning objects are composed by lower level learning objects. In the knowledge base, each knowledge represents the decomposition relationship among learning objects. The negotiation engine generates the following negotiation argumentations based on the knowledge base (algorithms are based on backward searching strategy and will not be listed here):

Generate Proposal. The system is able to decompose the composite learning object into atomic learning objects and propose to the learner as learning materials.

Accept/Reject Proposal. Learner may also make proposal to request for learning materials. The system will accept/reject the learner's proposal based on the availability of the system and the learner's prerequisite.

Present Justification To explain the reasons why certain proposal is made, the system will present the rules used to generate the proposal.

Recommend Alternatives. The learner may express his/her interest or not interested in some learning materials proposed by the system. The system is able to provide alternative recommendation to the learner based on the learner's interest.

Attack Disagreement. The system may attack the reason that the learner used to make proposal, so as to persuade the learner to give up his/her proposal and accept the system proposal.

3. Conclusions And Future Works

The contribution of this paper is in two folds: Firstly, this paper for the first time proposed an system-learner negotiation mechanism based on interest based negotiation. Through the negotiation, learning content that satisfies both the learner's interest and the system's pedagogical requirement is more likely to be achieved. Secondly, this paper proposed algorithms that fully automated the interest based negotiation process.

A prototype system has been implemented. Our next step is to integrate this mechanism in an educational system and evaluate the learning progress with real learners. Future works include the modeling of domain knowledge and applications in more areas, and adoption of other knowledge models like cognitive maps, or Bayesian networks.

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