

PhD Research Proposal

The Development of Adaptive Hypermedia System Based on Multiple Student Characteristics

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Background (about CAI)

- Empirical studies showed that individual one-on-one tutoring is the most effective mode of teaching and learning.
- Individual tutoring is impossible for all students, so that CAI, CAL, CBT, etc. have been developed.
- In CAI the same teaching material is presented to every student in the same way.

Background (about ITS)

- This drawback has prompted a new generation of educational system known as ITS (Intelligent Tutoring System).
- An important feature of ITS is ability to adapt instruction dynamically to the student's needs.
- ITS has been not so popular in schools because of high development cost, hardware dependency, installation and delivery problem.

Background (about WBI)

- The advances of the Internet have boosted the development of WBI (web-based instruction).
- Benefits of the WBI are classroom & platform independence, and possibly communication forum and student administration.
- WBI is just integration of the traditional CAI and web technology, so WBI only provide the same hypertext pages to all students.
- It is assumed that students accessing WBI are homogenous. In fact, they are not.

Background

(about Adaptive Hypermedia-1)

- Every student certainly has different knowledge, background, learning styles, goals, preferences, experience, etc.
- The course material needs to be flexible, so that different student may get different material and order of presentation depending on his/her own characteristics.
- Adaptive Hypermedia System (AHS) try to solve the problem by altering the presentation to suit an individual student.

Background

(about Adaptive Hypermedia-2)

- AHS combine ideas from hypermedia system and ITS to adapt the system to particular user.
- AEH (Adaptive Educational Hypermedia) is one of AHS applications in education.
- The key component of AEH is a Student Model (SM) that represents relevant student characteristics.
- Student Model maintains up-to-date information about each student.

Background

(about Adaptive Hypermedia-3)

- Identified problems of current AEH are:
 1. capable of considering a small number of student characteristics.
 2. fixed and not easily expandable or adaptable to other subject matter.
- This research is trying to solve those two problems by developing a generic AHS based on multiple student characteristics.

Research Questions

1. What are the student characteristics that influence the learning process?
2. How can AEH acquire the student characteristics to build and update the Student Model?
3. How can the SM and other Models (DM, AM, Interface) be designed?
4. How can the AEH based on multiple student characteristics be implemented?
5. What is the performance of the AEH?

Research Goals

1. Identify the student characteristics that influence the learning process.
2. Explore the techniques of SM and the methods of acquiring information to build and update the SM.
3. Design the SM and other Models (DM, AM, Interface).
4. Implement the AEH based on multiple student characteristics.
5. Evaluate the performance of the AEH.

Contributions of Study (1)

1. The proposed AEH will take into account multiple student characteristics, so that the adaptation will be more accurate and individualistic.
2. The adaptation and student models will be implemented as domain-independent components, so that it is possible to author other subject matter easily.

Contributions of Study (2)

3. The proposed AEH will be developed in the domain of electronic theory targeted for university level students.
4. Compared to existing web-based learning systems, the proposed AEH has capability to adapt presentation to the individual needs.

Literature Review (1)

1. Adaptive Educational Hypermedia (AEH)
 - Computer uses in education
 - Intelligent tutoring system
 - Hypermedia and Hypertext
 - Web based learning environment
 - Adaptive hypermedia
 - Current problem of AEH

Literature Review (2)

2. Learning Theory

- Foundation theories
- Learning/teaching model
- Student characteristics
- Learning styles

Literature Review (3)

3. Student Modelling

- Stereotypes
- Overlays
- Perturbation
- Model-tracing
- CBM (constraint based model)

Methodology: Research Design

- The nature of this study is developmental research. The major steps include analysis, design, implementation, and evaluation.
- A systematic and comprehensive approach will be used to develop AEH in the domain of electronics theory based on multiple student characteristics.

Methodology: Research Procedure (1)

1. Analysis
 - a. Feasibility study
 - Identifying the method and techniques to design the models in AEH.
 - Choosing technologies to implement AEH.
 - Choosing the domain content and targeted students.
 - Considering the complexity and time allocated to the development of AEH.

Methodology: Research Procedure (1-cont)

Analysis (continued)

b. User analysis

- Identifying student characteristics
- Determining how the data can be obtained and be inputted to the system

c. Requirement analysis

- Specifying the AEH objectives and behaviour
- Defining functional requirement of the SM and the AEH.

Methodology: Research Procedure (2)

2. Design

- a. Conceptual design
- b. User model design
- c. Navigation design
- d. Presentation design
- e. Adaptation design

Methodology: Research Procedure (3)

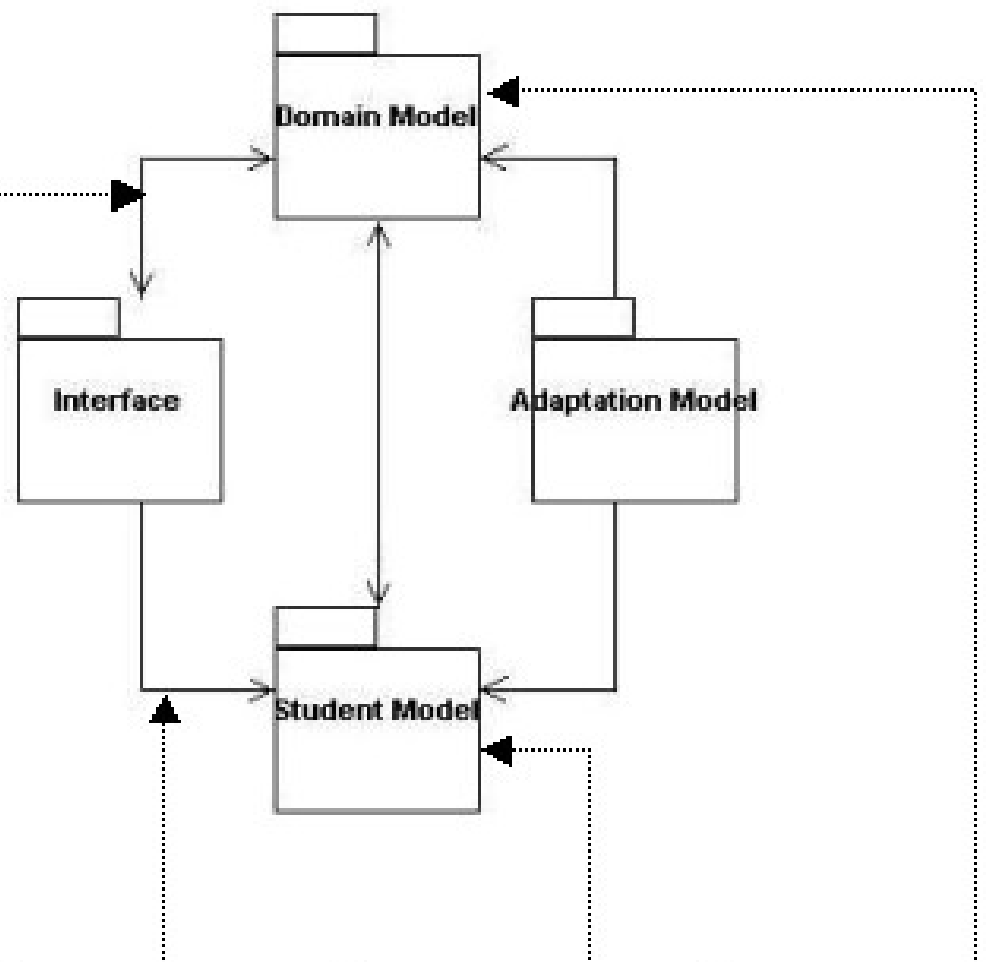
3. Implementation

- a. Provide domain content
- b. Implement hyperspace structure
- c. Implement user model
- d. Implement adaptive mechanism
- e. Implement user interface

System Architecture

Technology used to implement the system are:

XML/XSL,
MySQL,
PHP, Java,
JavaScript



- Presenting adaptive presentation
- Presenting test
- Receiving student responses

Acquiring data from student

- knowledge
- learning styles
- background
- presentation preferences

SM stores student character:

- default
- individual

Techniques:

- stereotypes,
- overlay, perturbation

DM consists of material:

- topics
- pages

topic relationship:

- requirement
- links

Methodology: Research Procedure (4)

4. Evaluation
 - a. Validation
 - b. Verification
 - c. Expert review
 - d. Student evaluation

Conclusion

The final product of this research will be an adaptive hypermedia system of electronics theory with two uniqueness compared to the other existing systems.

1. Multiple student characteristics will be considered, so that the adaptation will be more accurate.
2. It is a generic system, so that teacher without any programming knowledge can author other subject matter using this system.