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Adaptive Educational Hypermedia based on Multiple Student Characteristics

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What is Adaptive Educational Hypermedia (AEH)?

- It is a combination of two technologies: hypermedia and intelligent tutoring sys (ITS).
  - Hypermedia contains information supported by different media and connected by links.
  - ITS utilises a user model to adapt various visible aspect to particular user.
- It is used to enhance learning activity in web-based distance learning environment.

Why is AEH important?

- To overcome some problems of web-based instruction (WBI), such as:
  - providing the same information to all students
  - assuming that all students have a homogenous ability and preference.
- Students need to get different learning material and order of presentation depending upon their own characteristics.
- To minimize the "lost in space" problem when using conventional hypermedia.

What is multiple student characteristics?

- Every student has different characteristics.
- Learning process is complex and influenced by these, including
  - prior knowledge
  - learning styles
  - background/experience
  - preference, etc.
- It is important to accommodate these characteristics into the Student Model in order to generate accurate adaptation.

What about existing AEH systems?

- There are many AEH systems currently available on the Internet.
- Problems of current AEH systems are:
  - capable of considering only a small number of student characteristics.
  - fixed and not easily expandable or adaptable to other subject matter.

The AEH research project

- Work on prototyping the system has just commenced.
- This research is trying to solve the two main problems by developing a generic AHS based on multiple student characteristics.

Contributions of the research

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.

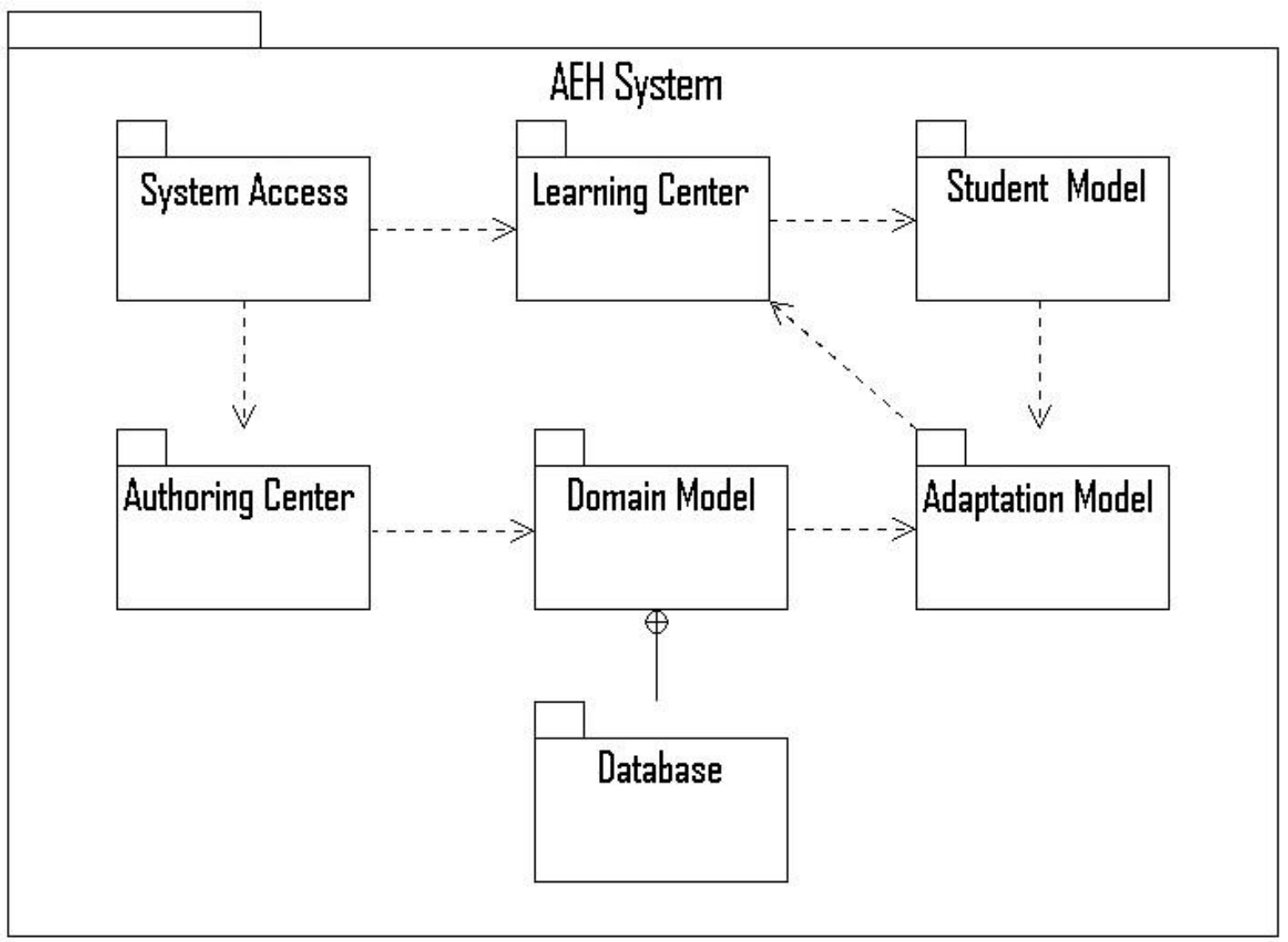
Contributions of the research (continued)

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

Basic components of the AEH system

- Basic components of the system are: Student Model (SM), Domain Model (DM), Adaptation Model (AM), and Interface.
  - SM contains student profiles.
  - DM contains domain knowledge.
  - AM contains adaptation rules.
  - Interface connects the system and users (student and teacher).

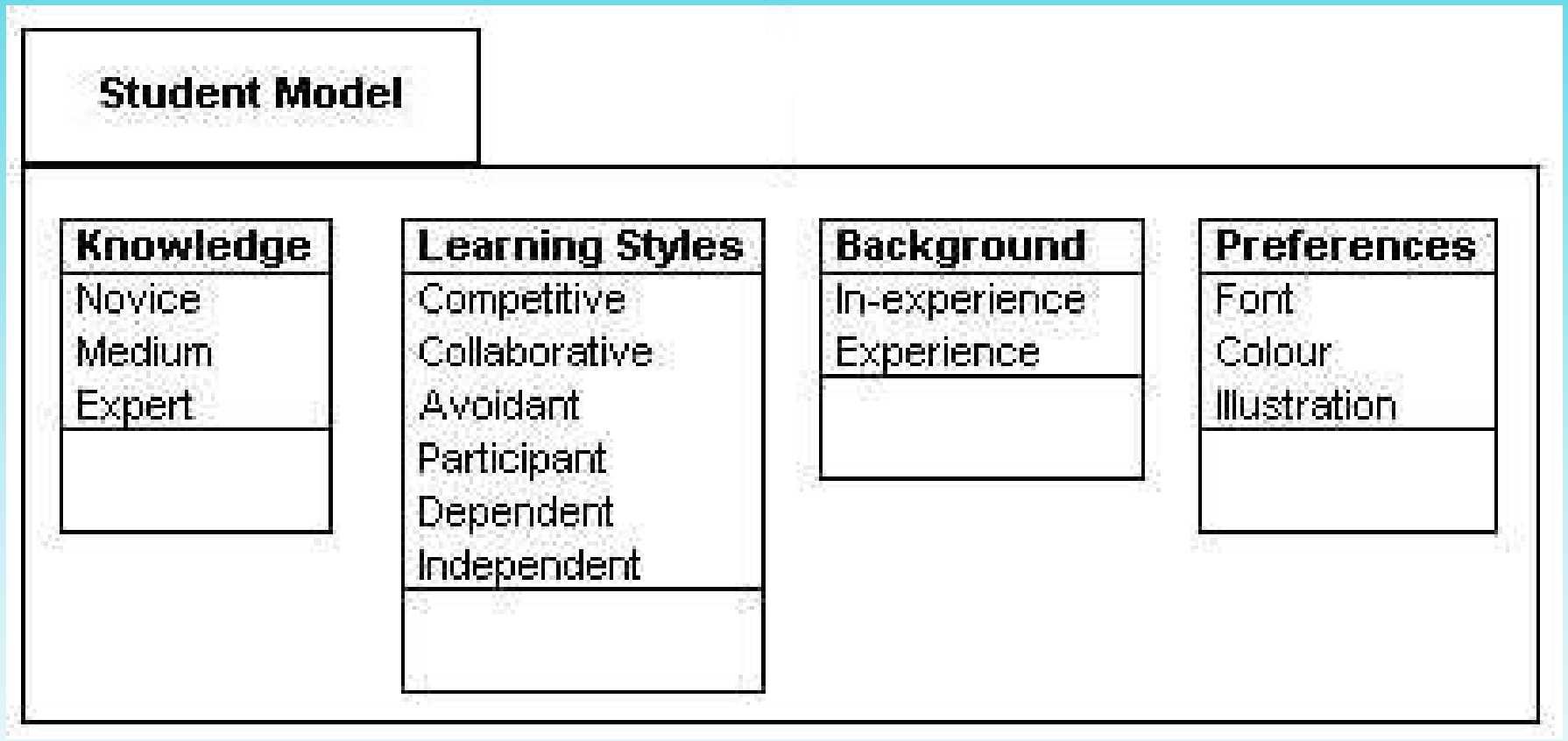
System Architecture



The Student Model

- The main component of the system is the Student Model (SM).
- It stores and maintains up-to-date information about each student's knowledge, learning styles, background, and preferences.
- The student information are obtained by questionnaires and tests.

Conceptual model of the Student Model



Techniques to build the SM

- Stereotype: *fixed and default*
  Students are assigned to a specific group or stereotype
- Overlays
  Student performance is considered to be a subset of expert knowledge
- Perturbation
  An extension of the overlay model that includes possible misconceptions

Obtaining student characteristics

- System initialises default values
- System provides test to measure knowledge
- System presents questionnaires:
  - Learning styles inventory (GRSLSS) includes *competitive, collaborative, avoidant, participant, dependent, and independent*
  - Questions about background/experience
  - Questions about presentation preferences
- Students edit their own profiles

Techniques to provide adaptation

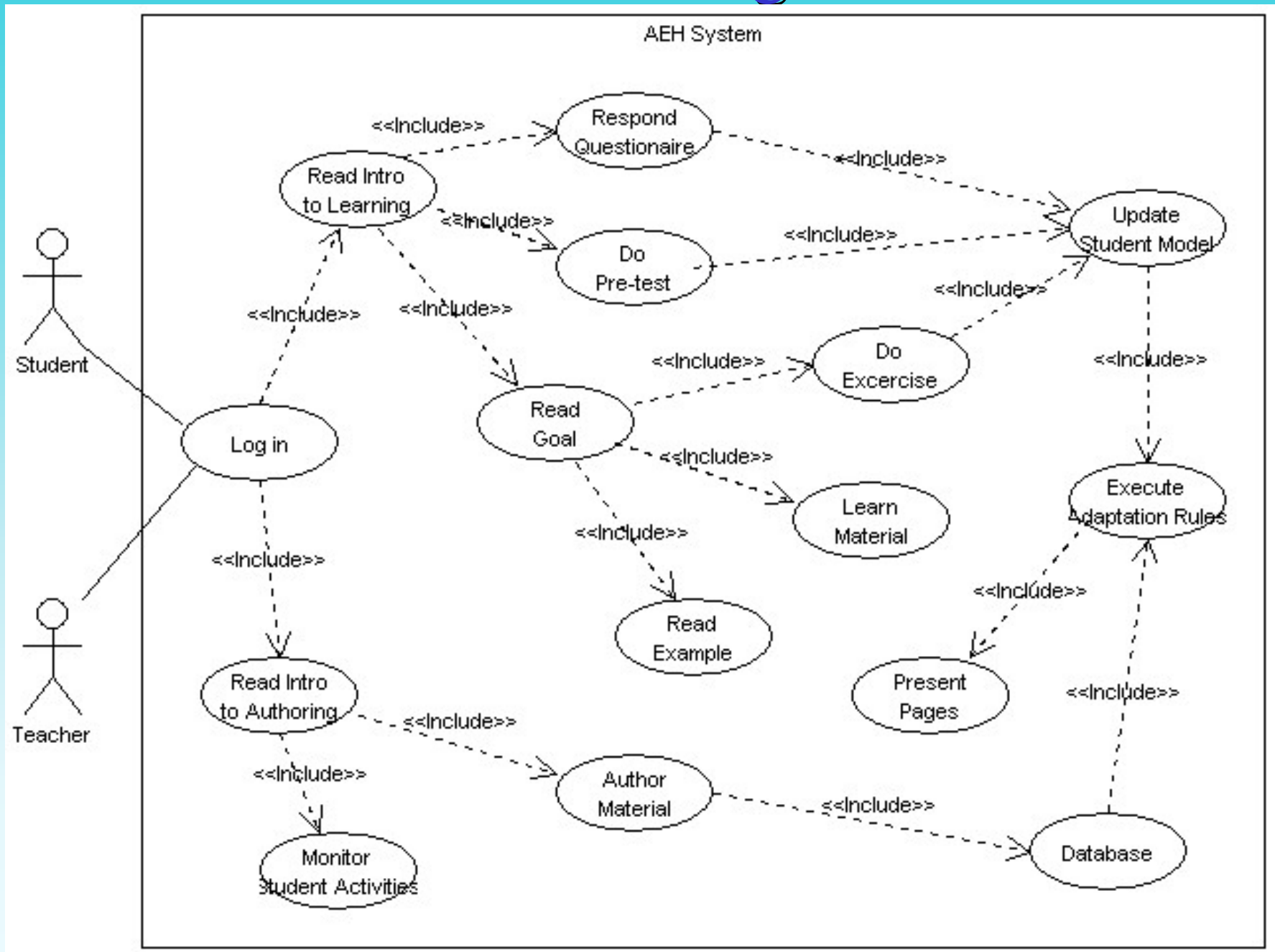
- Content adaptation

  Technique used to adapt the content of a web page based on the SM including: page variant, stretch-text

- Link adaptation

  Technique used to modify the links accessible to the user at a particular time including: direct guidance, removing/disabling/hiding

Use Case Diagram



Conclusion

The final product of this project is an AEH system of electronics theory which is unique in that it

- Considers multiple student characteristics, so that the adaptation will be more accurate.
- Is a generic system, so that a teacher without any programming knowledge can author other subject matter that can be "plugged in" to the system.