Advanced Adaptivity in Learning Management Systems by Considering Learning Styles

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Why shall we consider learning styles in LMS?

- Learning Management Systems (LMS) are commonly used in e-education but they provide the same course for all learners

- Learners have different needs and characteristics

- Adaptivity increases the learning progress, leads to better performance, and makes learning easier
Aim of Research

• Develop an advanced adaptive mechanism that
  – enables LMSs to automatically consider students’ learning style
  – allows teachers to adapt the mechanism to their courses (rather than modifying the course to the requirements of the mechanism)
Aim of Research

• In order to reach this goal we aim at:
  – developing an advance student modelling approach, using automatic, dynamic and global student modelling
  – developing a generic framework for providing adaptivity
  – making both work together
General Issues

- The adaptive mechanism is developed in a general way but implemented as part of a larger project.
- This larger project aims at building a personalised mobile learning environment based on different applications/services.
Felder-Silverman learning style model

- Each learner has a preference on each of the dimensions

- **Dimensions:**
  - Active – Reflective
  - Sensing – Intuitive
  - Visual – Verbal
  - Sequential – Global

- **Differences to other learning style models:**
  - Combines major learning style models
  - New way of combining and describing learning styles
  - Describes tendencies
  - Describes learning style in more detail
Automatic Student Modelling

• Detect learners’ characteristics from their behaviour and actions in a course

• Procedure:
  – While students are learning, their behaviour and actions are tracked by the system
  – Information about students behaviour and actions are used as patterns and used as input for the calculation process of learning styles

• Advantages:
  – No additional work for students
  – Information is free from the problem of inaccurate self-conceptions of students
  – analyses data from a specific time span → more accurate & allows tracking changes in learning styles
Dynamic Student Modelling

- Information about students’ behaviour and actions is used for updating the student model frequently

- Procedure:
  - Monitoring students’ behaviour and actions
  - Once enough evidence is available, revise information in the student model

- Advantages:
  - Allows to respond to changes in students’ learning styles
  - Allows to revise information about students’ learning styles based on their current behaviour and actions
Global Student Modelling

• Considering data from all applications and services in the student modelling process

• Procedure:
  – Gathering data from all applications/services
  – Making information in the student model available for all applications/services

• Advantages:
  – More data in order to calculate learning styles more accurately and in less time
  – One application/service can benefit from the data of other applications/services
Advanced Student Modelling

Services
- Adaptive Mechanism
- Q&A Service
- Location-Aware Grouping Service
- Problem-Based Learning Service
- Context-Awareness Service
- Social Network Service
- Multimedia Input Service

Other Sources (e.g., Learning Style Questionnaire)

Automatic, Dynamic and Global Student Modelling Approach

Student Model
A Generic Framework of the Adaptive Mechanism

• Adapt the adaptive mechanism to teachers preferred course structure and used types of learning objects

• Configuration tool:
  – Which types of learning objects should be considered?
  – How shall they be considered in an adaptive course?
A Generic Framework of the Adaptive Mechanism

• Defining a new type of learning object
  – Which learning style can be supported by the new type?
  – How is the type of learning object represented in the learning system?
  – What are suitable adaptation features?
    • Define adaptation feature based on predefined strategies such as:
      – Present A before B
      – Provide a high number of A
    • For which learning style shall the new adaptation feature be applied?
A Generic Framework of the Adaptive Mechanism

• After a new type of learning object has been created
  – Authoring tool is automatically extended so that authors can specify the new type of learning object
  – Expert model is extended in order to be able to store the new type of learning object
Provision of Adaptive Courses
Conclusions

• Adaptive mechanism provides students with advanced adaptivity and is adaptable to teachers’ needs
  – Automatic, dynamic, and global student modelling
  – Generic framework
  – Interaction with students

• Future Work
  – Completing the implementation
  – Evaluating the mechanism with respect to effectiveness and usability