An Approach for Detecting Learning Styles in Learning Management Systems

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Motivation and Aim

- Learning Management Systems (LMS) are commonly used but they provide only little and in the most cases no adaptivity
- Learners have different needs
- Incorporating these needs increase the learning progress, leads to better performance, and makes learning easier
- Requirement for adaptivity: needs have to be known first
  - Comprehensive questionnaires
  - Identification from the behavior of students during a course

Aim:

Developed an approach that identifies learning styles according to the behavior of students in LMS

→ Identify patterns of behavior

→ Implemented a tool that

extracts data from LMS database and

calculates the learning styles

Felder-Silverman Learning Style Model

- Richard M. Felder and Linda K. Silverman, 1988
- Each learner has a preference on each of the four dimensions
- Dimensions:
  - Active – Reflective
    learning by doing – learning by thinking things through
    learning by discussing & group work – work alone
  - Sensing – Intuitive
    concrete material – abstract material
    more practical – more innovative and creative
    patient / not patient with details
    standard procedures – challenges
  - Visual – Verbal

    learning from pictures – learning from words
  - Sequential – Global
    learn in linear steps – learn in large leaps
    good in using partial knowledge – need „big picture"
    interested in details – interested in the overview
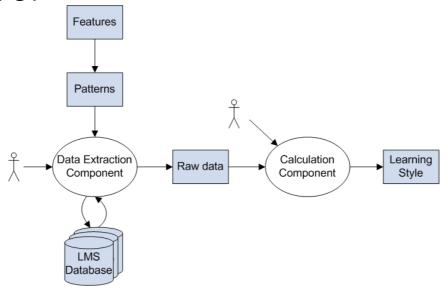
Patterns of Behavior

- Felder and Silverman describe how learners with specific preferences act in learning situations
- Based on commonly used features in LMS such as content objects, forum, chat, self-assessment (SA), exercises, and examples

Active/Reflective	Sensing/Intuitive	Visual/Verbal	Sequential/Global
Visits_forum (act)	Correct_facts/concepts (sen)	Visits_forum (ver)	Correct_detail/overview (seq)
Postings_forum (act)	Revisions_marked tests (sen)	Postings_forum (ver)	Performance_marked tests (seq)
Visits_chat (act)	Revisions_SA tests (sen)	Visits_chat (ver)	Performance_SA tests (seq)
Postings_chat (act)	Duration_marked tests (sen)	Postings_chat (ver)	Visits_outline (glo)
Visits_exercise (act)	Duration_SA tests (sen)	Time_graphics (vis)	Time_outline (glo)
Time_exercises (act)	Visits_exercises (int)	Correct_graphics (vis)	Skips_learning objects (glo)
Time_examples (ref)	Time_exercises (int)		Visits_overview page (glo)
Time_content objects (ref)	Visits_SA tests (sen)		Time_overview page (glo)
	Visits_examples (sen)		
	Time_examples (sen)		

- **Tool can be applied for LMS in general**
  - Each LMS has a different database schema
  - Maybe not all features are used or data for patterns can be tracked
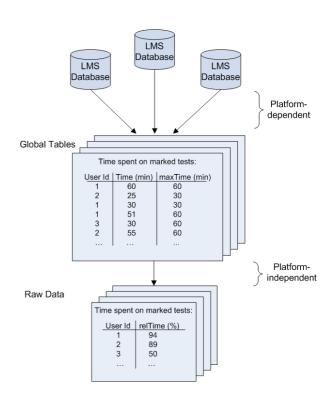- **Architecture:**

■ **Global schema**

- Top-down approach: required information (patterns) act as basis
- Each table includes data representing one pattern
- Extraction should be as simple as possible
  → use event-based way in which data are stored in LMS
- Cumulation of data is done automatically

Calculation Component

- **Calculate ordered data from raw data**

  e.g. User 1: 94 % time spend → high → sensing → +1

  - determine thresholds based on values from literature
  - 3-item scale (+1, 0, -1)
  - provide recommendation and teachers can change thresholds

- **Calculate learning styles from ordered data**
  - Based on approach of questionnaire (ILS)
  - Summing up the values relevant for the dimension
  - Result is converted to 3-item scale (e.g. sensing – balanced – intuitive)

Conclusion and Future Work

- **Developed an approach and implemented a tool for identifying learning style based on the behavior of students in LMS**
  - Identified general patterns of behavior
  - Developed a tool that extracted required data from LMS database and calculated learning styles

- **Future work**
  - Evaluate the tool
    (comparing results of the tool with results of ILS)
  - Improve calculation approach (AI approach)