COMPONENT BASED DEVELOPMENT OF ONTOLOGY – BASED INTELLIGENT TUTORING SYSTEMS

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Our main research questions are:

- How to ensure further standardization of ITSs;
- How to achieve easier and cheaper development of ITSs;
- How to support reuse of system components across tutoring domains;
- How to develop ITSs, working well for every type learners;
- To classify tutoring strategies for ensuring dynamic selection of suitable tutoring strategy.

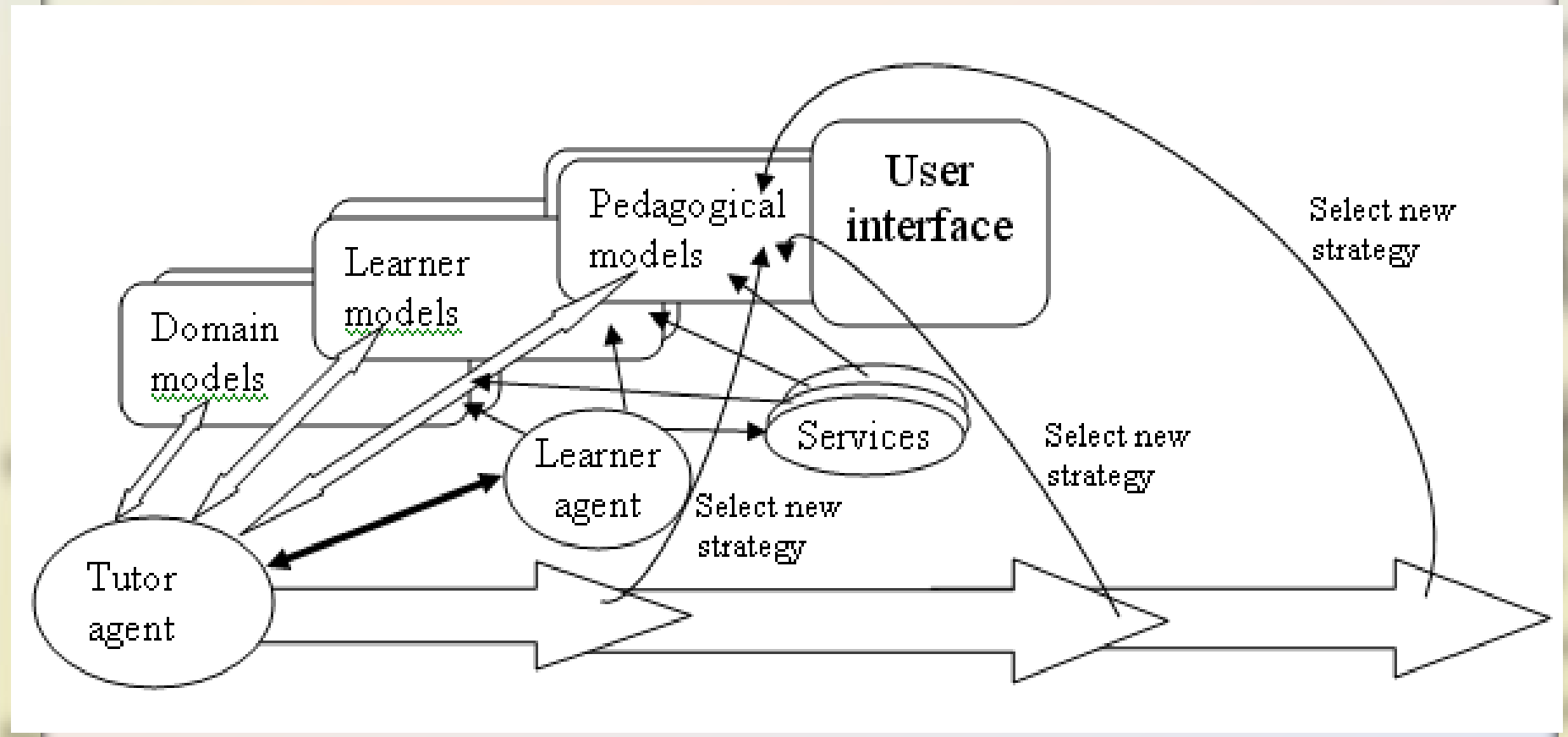
Difficulties related to explicitly represented knowledge :

- Teachers and knowledge experts need to work hardly and have specific competencies for building and explicitly evolving knowledge - based models.
- Working of the knowledge – based system requires usage of reasoning or other intelligent methods that should be implemented in the software components (as agents, inference engines, or rule- based modules).
- Ontology learning and ontology napping techniques are needed, but these techniques are not mature yet.

ONTOLOGIES AND LEARNING ANALYTICS-BASED MODELS IN ITS

- Most of the practical e-learning systems use data and statistics-based models for storing information about learners;
- Modern variants of this type models are Learning Analytics-based;
- LA include data, algorithms and methods to predict the student's behavior, or responses of the student to the system's actions, and data, used to evaluate the students overall progress;
- Ontologies are Better for:
  - static data;
  - Data, directly used by learners;
  - Well – classified knowledge;
  - Understanding learning content;
  - Diving concrete advices;
  - Generating personal learning path.
- LA is better for: prediction; groups-based personalization.

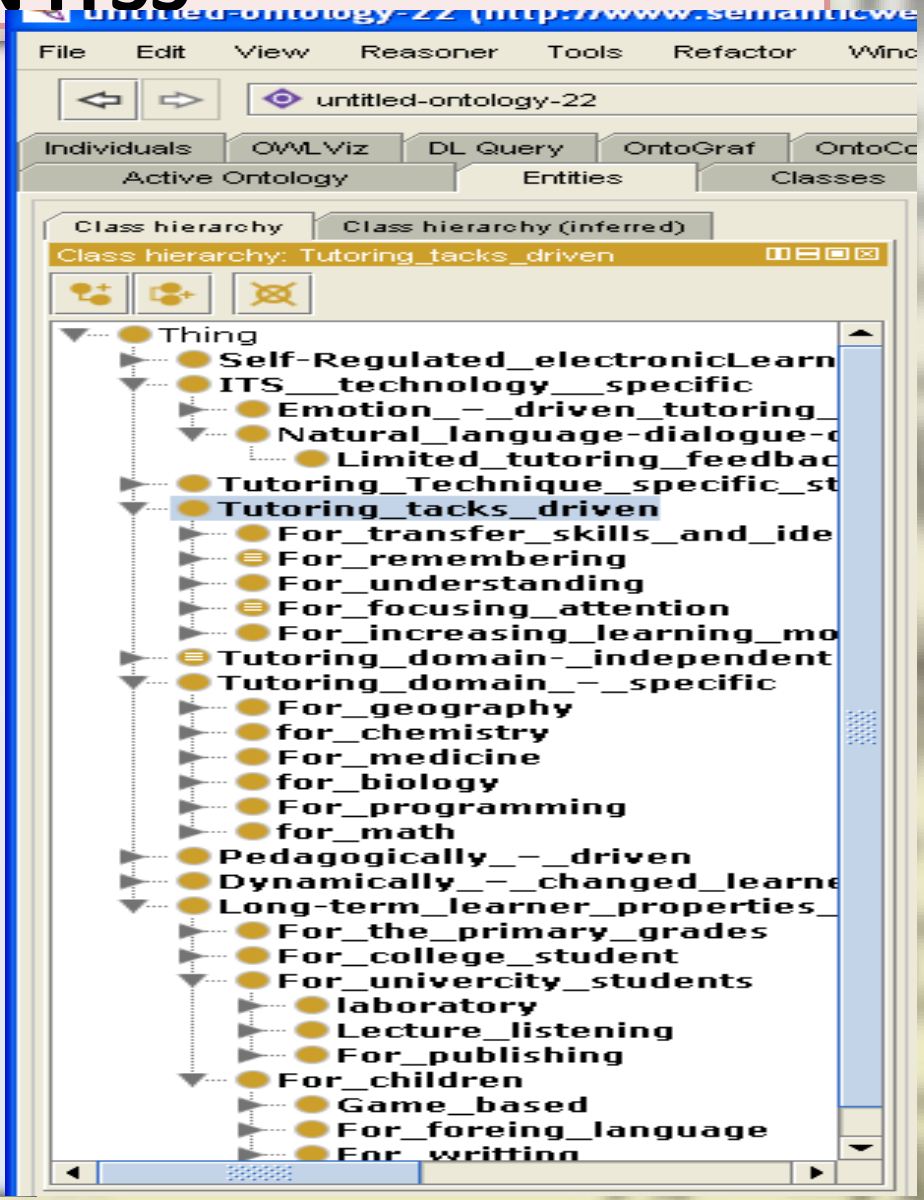
An agent-based functional model for ITS



CLASSIFICATION OF TUTORING STRATEGIES, USED IN ITSS

Ten main groups tutoring strategies:

- **Long-term learner properties – driven;**
- **Dynamically – changed learner properties – driven;**
- **Pedagogically – driven;**
- **Tutoring domain – specific;**
- **Tutoring domain – independent;**
- **ITS's technology – specific;**
- **Tutoring tacks-driven;**
- **Tutoring technique-specific;**
- **Self-Regulated electronic Learning strategies.**



A general methodology for development of ITSs

1. Specify all possible requirements to the system;
2. Define the main tutoring domain;
3. Specify all the related domains and important relations;
4. Collect and classify all the needed initial information about all possible users;
5. Specify and classify all the initial tutoring information that system should store and use (including tutoring approaches, strategies, etc.
6. Find all possible components, related to the points 2-5, and customize them if needed;
7. Develop and test needed agents and services;
8. Perform initial test of the whole system;
9. Ensure tools for communication of the system with external systems;
10. Support constant updates of knowledge models, related to points 2-5;

Trends, perspectives in ITSs and our research

- There is a stable trend of increasing usage of knowledge – based and learning analytics-based technologies for storing and maintaining data and metadata, related to the tutoring process in the next few years.
- knowledge-based technologies, reasoning and intelligent agent-based architectures have greater potential, and these type technologies will be used as elements of every ITS in the near future.
- In our work we propose initial variant of classification of tutoring strategies. We develop ontology, implementing this classification to ensure its