ENEA

FAD

Intelligent Agents in Distance Learning Systems (Modelling)

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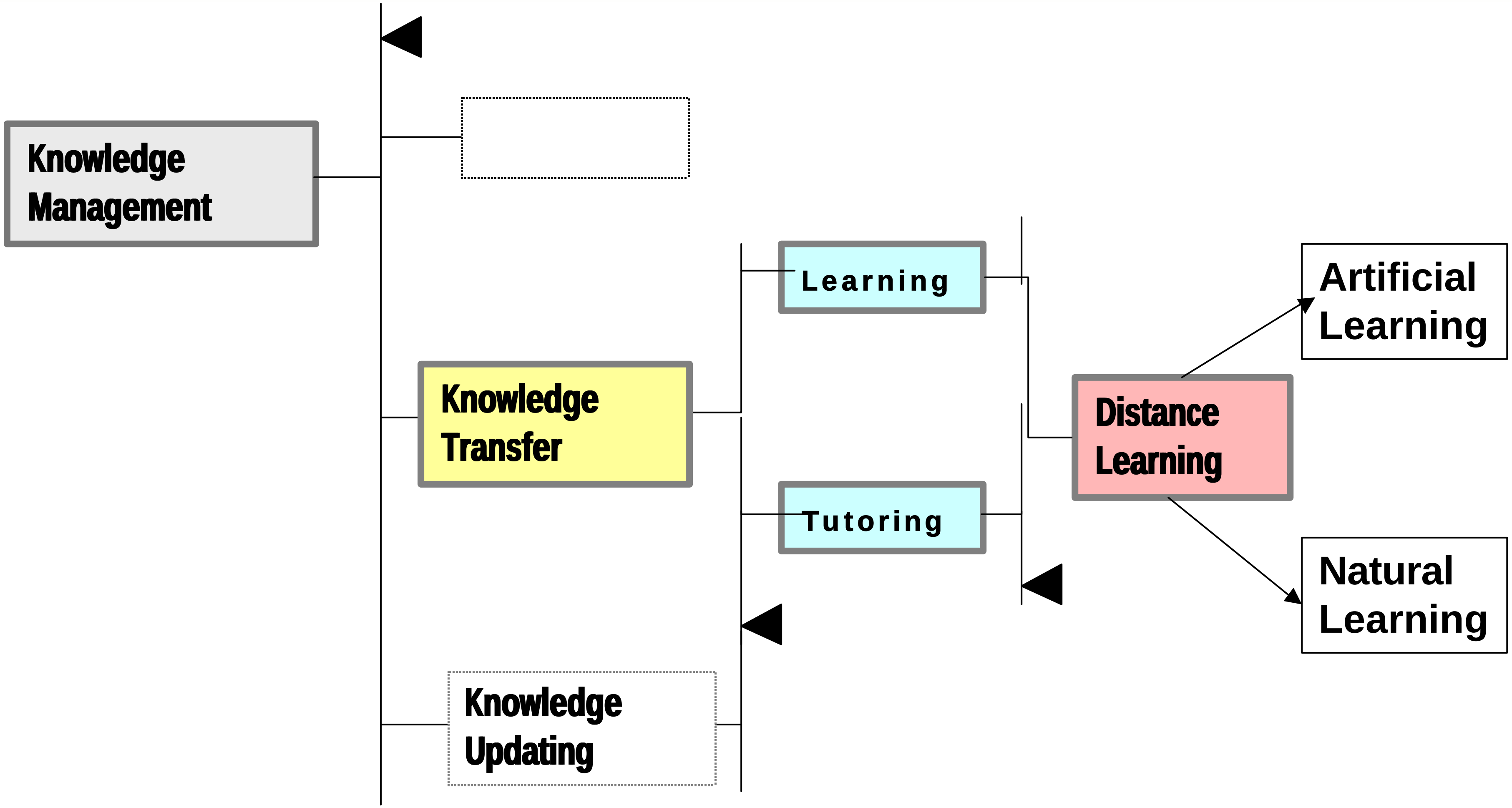
Distance-Learning Conceptual Context



Points of View on FAD

Theoretical: ontology building, modeling,…

Implementative: software technologies and systems development

Experimental/evaluative: quality of data and

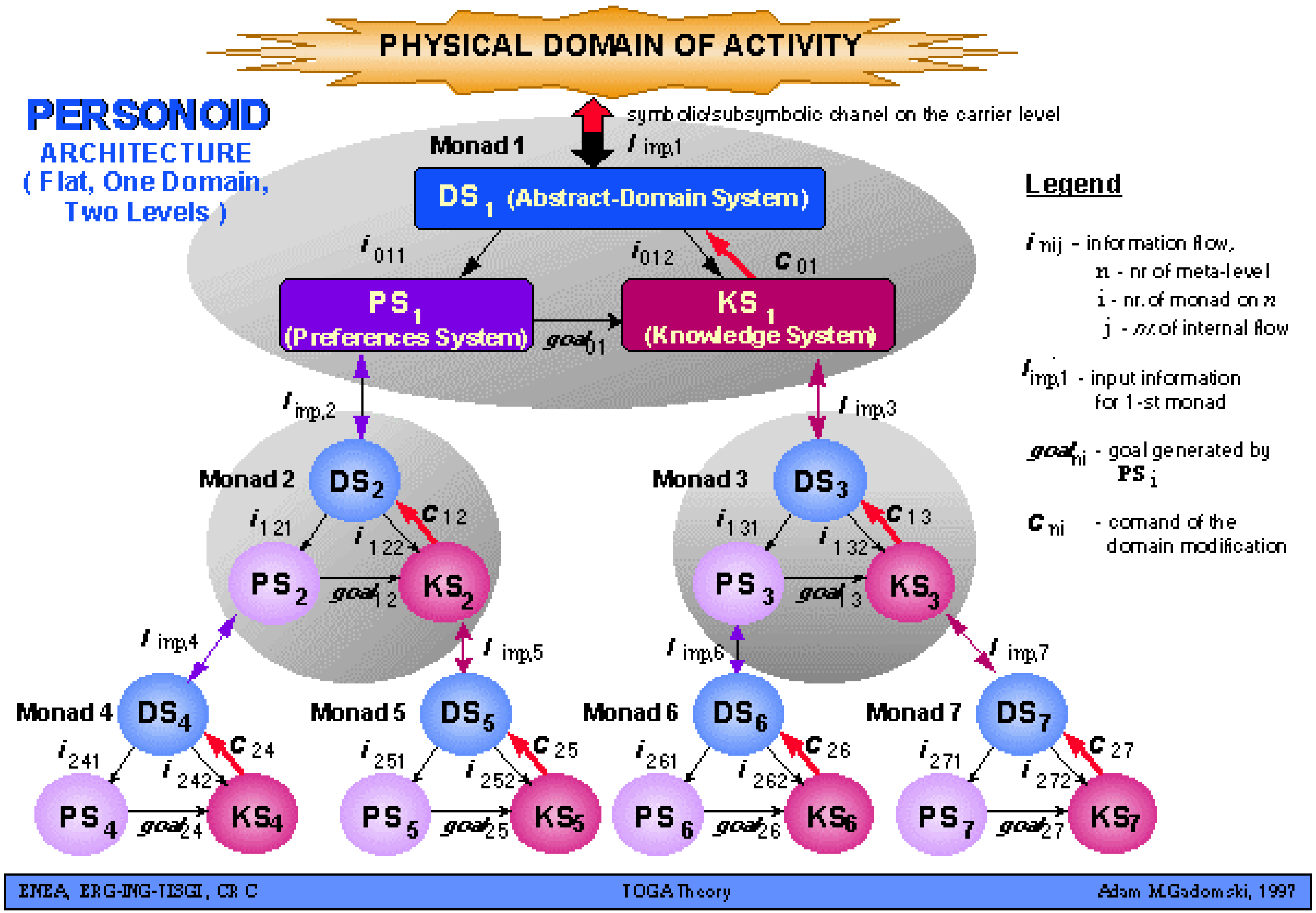
experts knowledge

User-oriented:

- **Tutor/Teacher**
- **Student/learner**

Conceptualization frame:
Organization of Intelligent Agents

Architecture of the IPK Agent



http://erg4146.casaccia.enea.it

FAD Agent: Intelligent Tutor Assistant

Intelligent Tutor Assistant (ITA) is a key element in the cognitive management of the data and communication between main actors of the FAD system.

According to the IPK architecture any agent **task** requires an adequate:

- **knowledge** for its execution; how to do it,

  It is in the form of calculational quantitative or qualitative: models,

  procedures, methods (in OOP) and cause/consequence relations

- **preferences** which order of possible states of the agent and its domain of

  intervention. They can be ordered by:

  ++ relative preference relations of the type: **A is better then B**

  ++ importance/utility functions, and

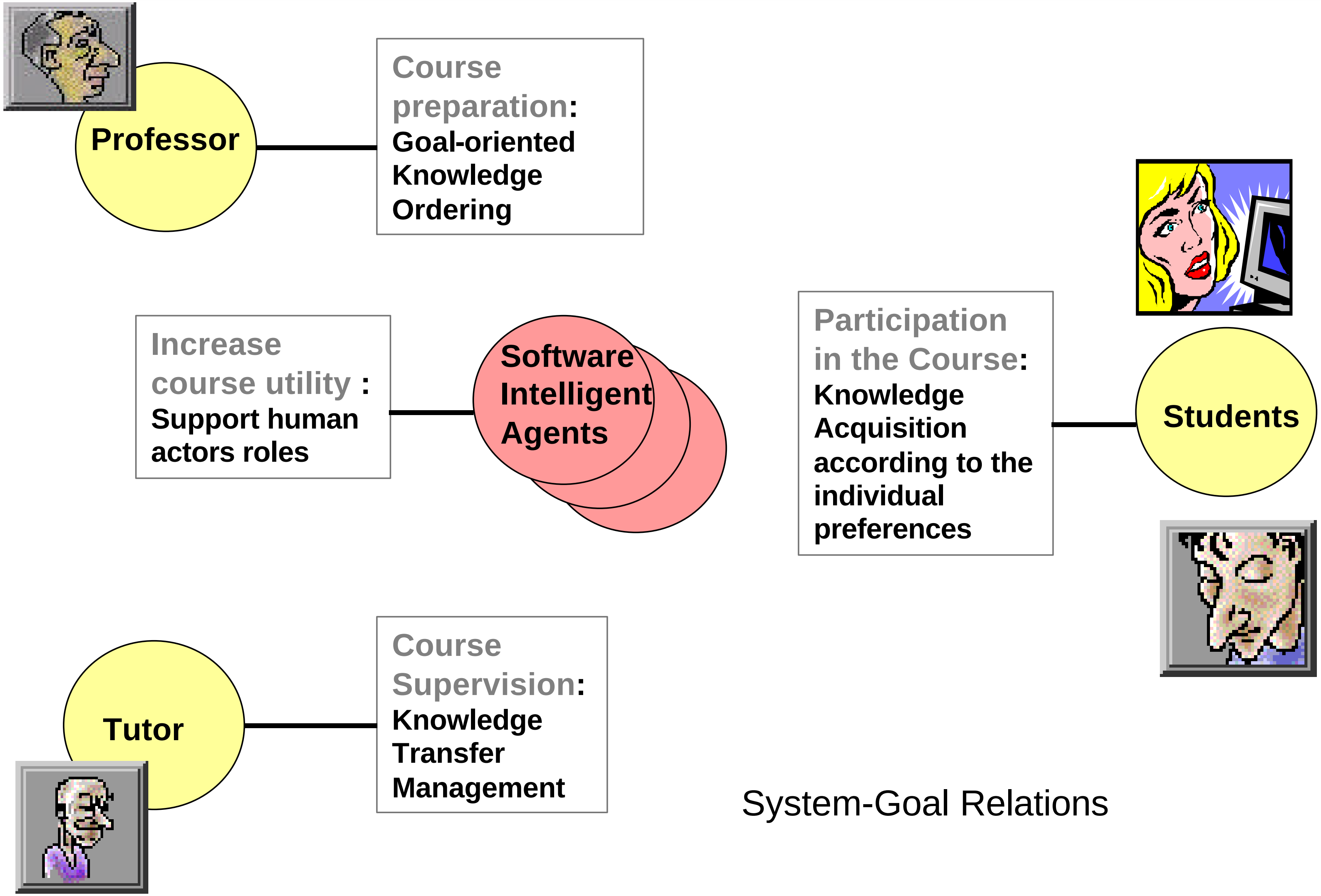
  ++ pre-prepared schedule of partial intervention-goals.

- **information,** it represent current state of the domain of agent.

  It is quantitative or qualitative and refers to the recognized objects and

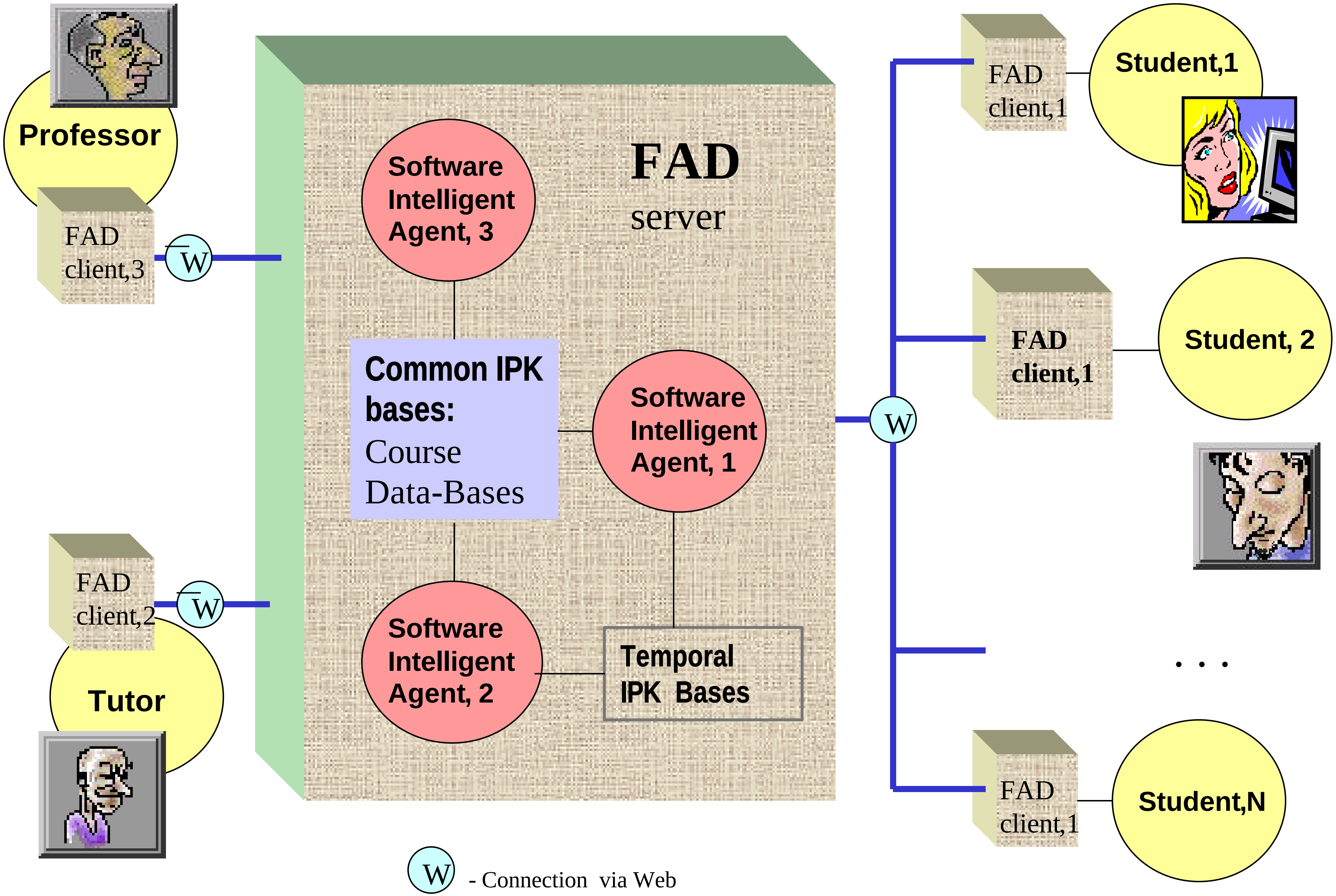
  relations between them. Information is processed by agent knowledge.

Top-Goals of Intelligent Agents in FAD

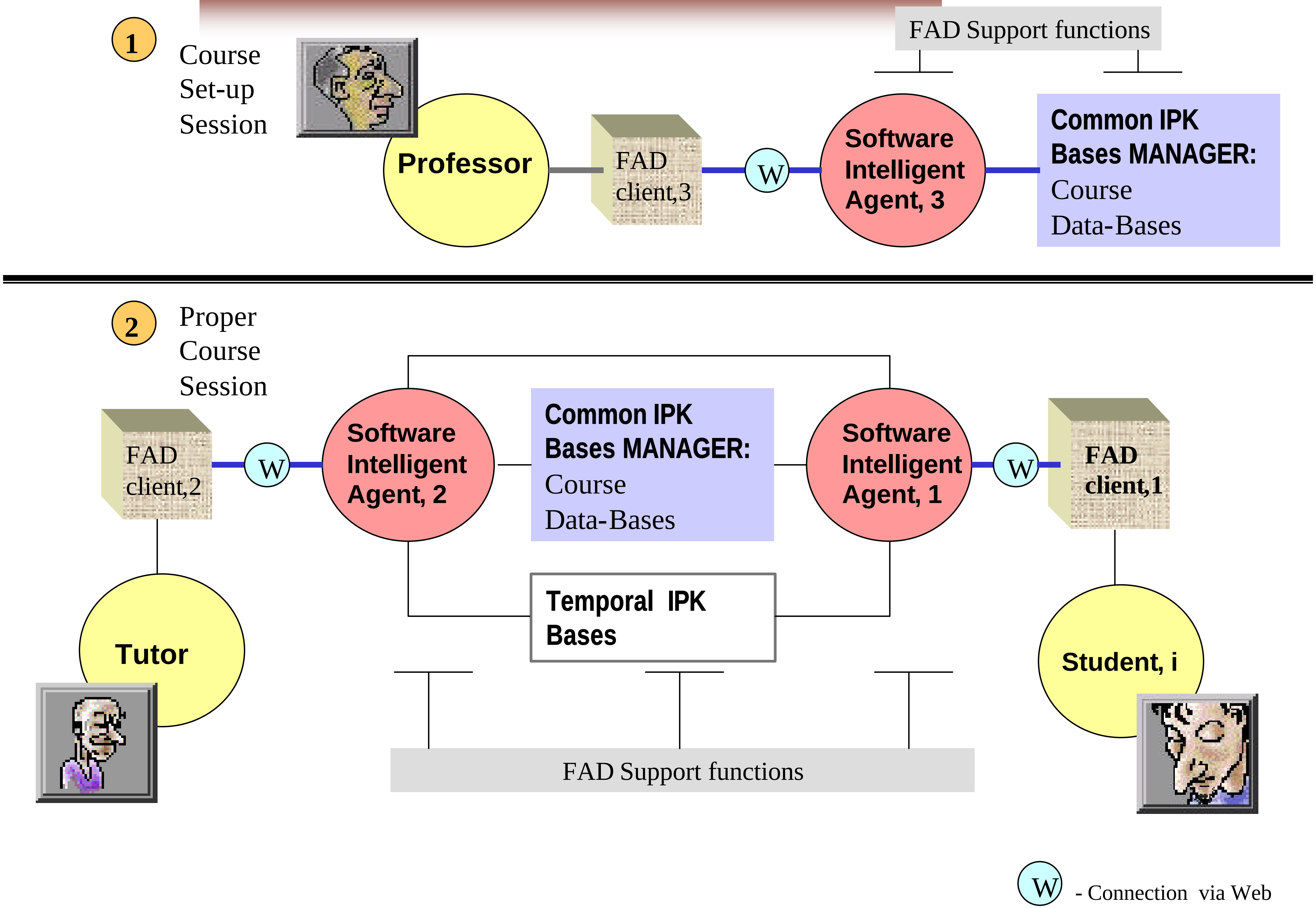


System-Goal Relations

FAD Objects-World Ontology is requested



FAD: functional relations flows



Scenarios: Five Main Sessions

Professor has:

S1. Course editing and updating session

Tutor has:

S2. Course Strategy set-up - a set-up tutoring function,

S3. Course management (can be asynchronized with student sessions) – a tutoring function

Student has:

S4. Course recognition session – information acquisition function,

S5. Self-Learning time-distributed session - a learning function

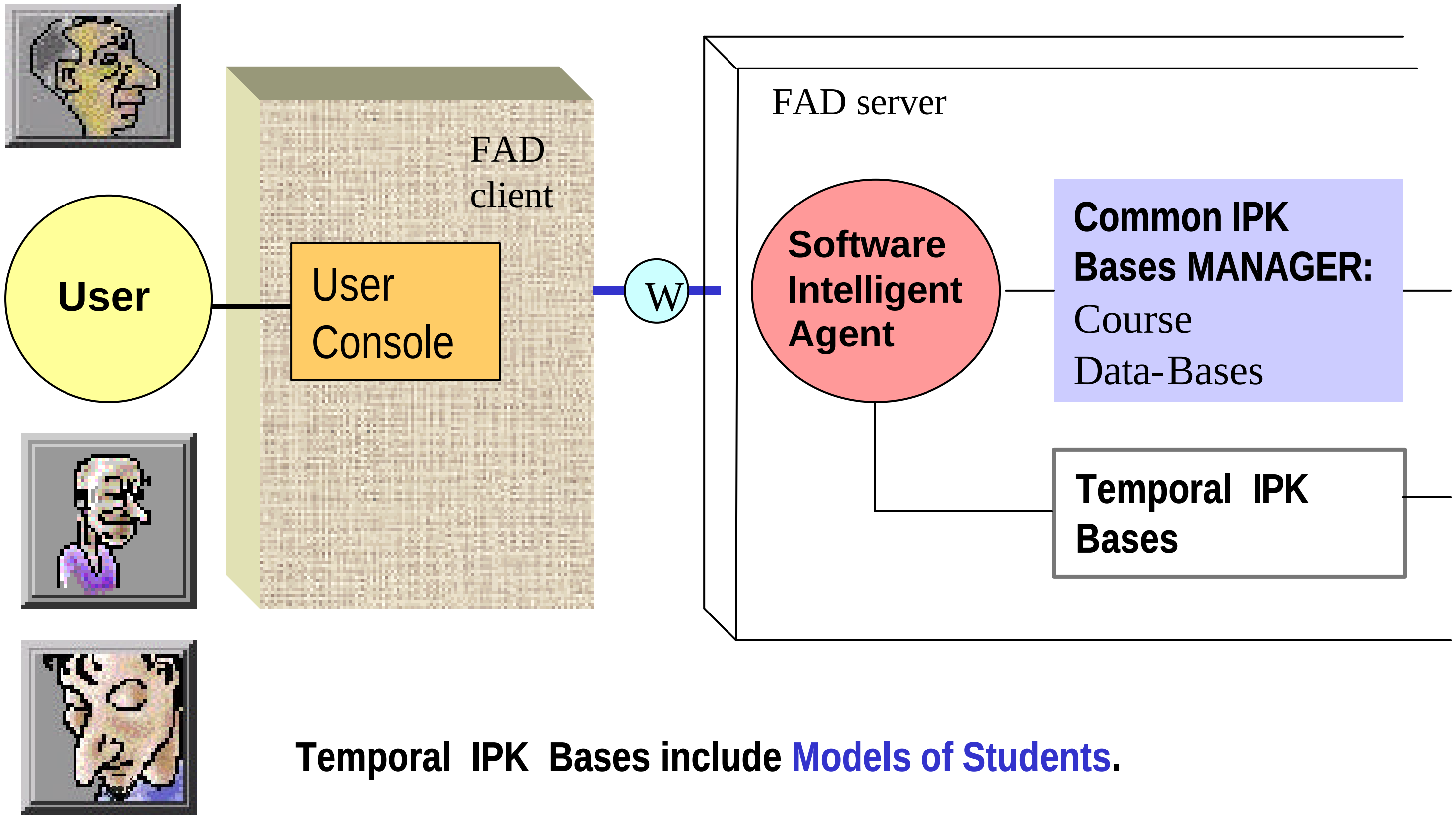
- Next Figure illustrates functional connections required for the sessions S2,S3,S4, S5 together, it is called 'Course Supervisory Session'.

In order to describe more precisely every session we need to pass to the next decomposition of the above figures.

FAD user-agent interactions: Interaction Interfaces

Every user realizes his/her role through a role-dependent user console.

User role and available **course resources** determine functions of ISA and of the User Console.



Temporal IPK Bases include Models of Students.

FAD Agent: Intelligent Tutor Assistant

Intelligent Tutor Assistant (ITA) acts on behalf on the tutor.

- It is always available for course students.
- It should understand/interpret student problems (questions and requests)
- It has (knows) set of actions which may activate according to its recognition of the student needs.
- Its responses (decisions) depend on the course program, student advancement, student individual troubles and his special interests.

In order to satisfy the above tasks, ITA need to have a properly structured

IPK (information, preference, knowledge) architecture.

Its detailed analysis is done in the course of this presentation.

Conceptualization of Course-Knowledge Transfer

Main process of FAD systems is the **transfer of course knowledge, CK.**

This knowledge is divided on weakly ordered course modules **Cm**, i.e. the order of CK acquisition is defined by three basic temporal relations:

before, **during**, **notduring**, **anytime**,

as follows:

Cm_i before Cm_k

Cm_i during Cm_n

Cm_i anytime .

The course modules are memorized as course chapters, paragraphs and items in the form of independent files (in directores) or records (in DataBases).

The order relation can be considered either *obligatory* or *suggested* by the tutor. If it only is suggested then it is represented as, for instance: **$during^S$** .

In this way, **CK** is represented in form of an oriented graph, for example.

Cm_1 **$during^S$ Cm_2 or before Cm_3.**

Supervisory of the Course-Knowledge Transfer (CKT)

Course-Knowledge Transfer can be interrupted and modified by:

- Questions of students
- Agent answers, communications
- Tutor answers, communications.
- CKT verification tests.
- Students responses.

All this actions produce IPK or meta-IPK. Therefore they require a meta-knowledge for the satisfaction of the supervisory process.

More precisely the supervisory of CKT requires **continuous monitoring of the following attributes of students:**

- amount of the knowledge acquisted

- velocity of the acquisition

- quality of the knowledge acquisited

- {Cm} set where specific individual difficulties have appeared

- {Cm} subset of specific individual interest of the student (student preferences)

This list of indicators can be enriched or modified in frame of the **student model**.

Student Cognitive Model

Two key questions

1. What does the student need to know/obtain in order to subscribe (decide to participate in) a FAD course?

2. What data and how to provide them in order to satisfy student expectations.

As specified before, for these purposes, the student has:

Course recognition session – for the acquisition of information about matter, goals, utility and realization of the course. It is meta-information acquisition function,

Self-Learning time-distributed remote sessions - a learning function.

Student is supported by a **chaterbot** with the course subject and course organizational knowledge

Identification of Student/Lerner

Remote student is a key element of the FAD system. All FAD functions have to be focused on his/her (h/h) needs and preferences, it should be adapted to h/h capabilities and knowledge. Therefore we should start from identification of h/h needs using a student cognitive model.

The above introduced concepts and their utility can be illustrated in frame of simple test scenarios.

. . .

Role of Student model in e-learning

For pedagogic perspectives:

Students come into our virtual e-classrooms with an established world-view, formed by years of prior experience and learning. Even as it evolves, a student's world-view filters all experiences and affects their interpretation of observations.

Students are emotionally attached to their world-views and will not give up their world-views easily.

Challenging, revising, and restructuring one's world-view requires much effort.

The **role of the e-teacher is raised from someone who simply dispenses information to someone who structures activities that improve communication, that challenge students' pre-conceived notions, and that help students revise their world-views.**

This individual initial student's model and his emotional preferences can be inserted to the system in frame of the hierarchical IPK frame.

Final Requirements

1. **Experimental & modelling effort**
2. **Development of strategies for cognitive distance interactions**
3. **Application and validation of advanced software and AI technologies**
4. **Standard proposals for e-learning modeling**