INTELLIGENT TUTORING SYSTEM

BY

SHUBHASHINI

VIJAYASHREE

SHIVANGI

Intelligent Tutoring Systems

- Traditional CAI
  - Fully specified presentation text
  - Canned questions and associated answers
  - Lack the ability to adapt to students
- ICAI: intelligent computer-aided instruction
  - Reasoning
  - Rich representation of domain
  - User modeling
  - Communication of information structures

Knowledge Representation

- Knowledge is the key to intelligent behavior
  - The form in which we store the knowledge is crucial to our abilities to use it
  - No general form suitable for all knowledge
- Challenge
  - determine the type of knowledge required, and suitable representation for that knowledge, to support teaching particular subjects

Script Representation

- WHY, a Socratic tutoring system
  - Test student's understanding of the major casual factors involved in rainfall
  - Require a representation with different levels of abstraction
- Script
  - Nodes represent processes and events, links represent such relations as X *enables* Y or X *causes* Y
  - Each node have a hierarchically-embedded subscript
  - Roles are bound to geographic or meteorological entities in a particular case

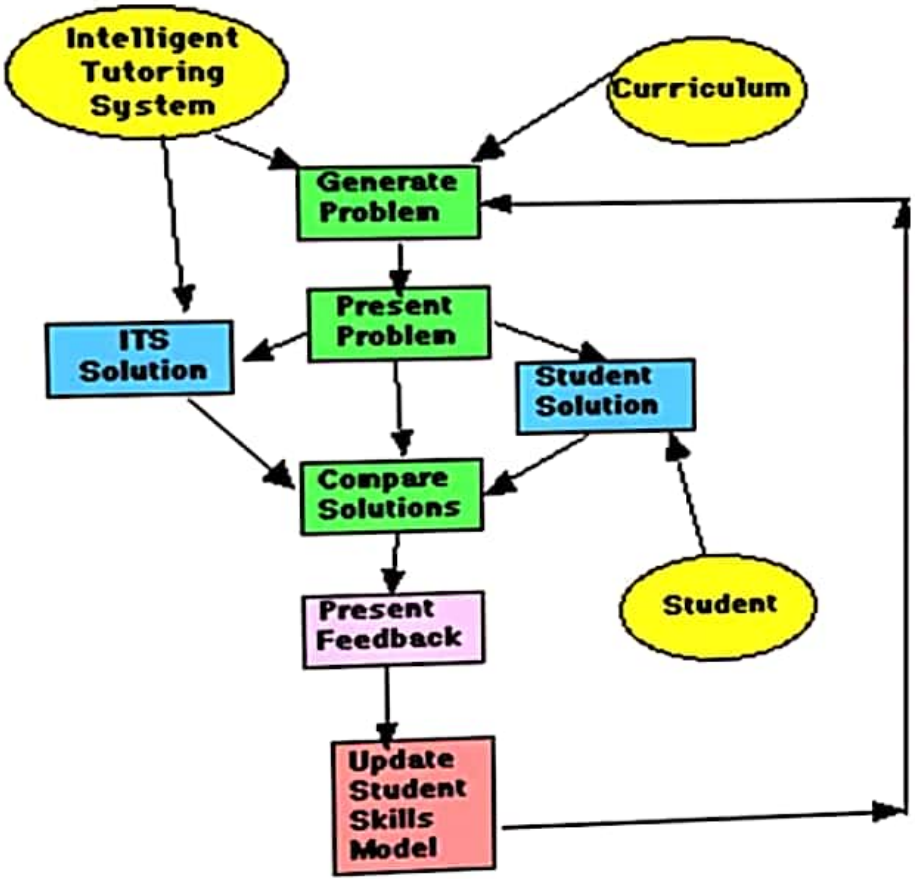
3. FACTORS INFLUENCING ITS
Student Modeling

- Overlay Modeling
  - student's knowledge is viewed in terms of the tutor's domain knowledge
- Several approaches
  - Semantic net with nodes and links are added as they are taught
  - Stars with the expert knowledge base and annotates deviations that are subsequently discovered
  - Skill modeler: student modeled by the set of skills he has mastered

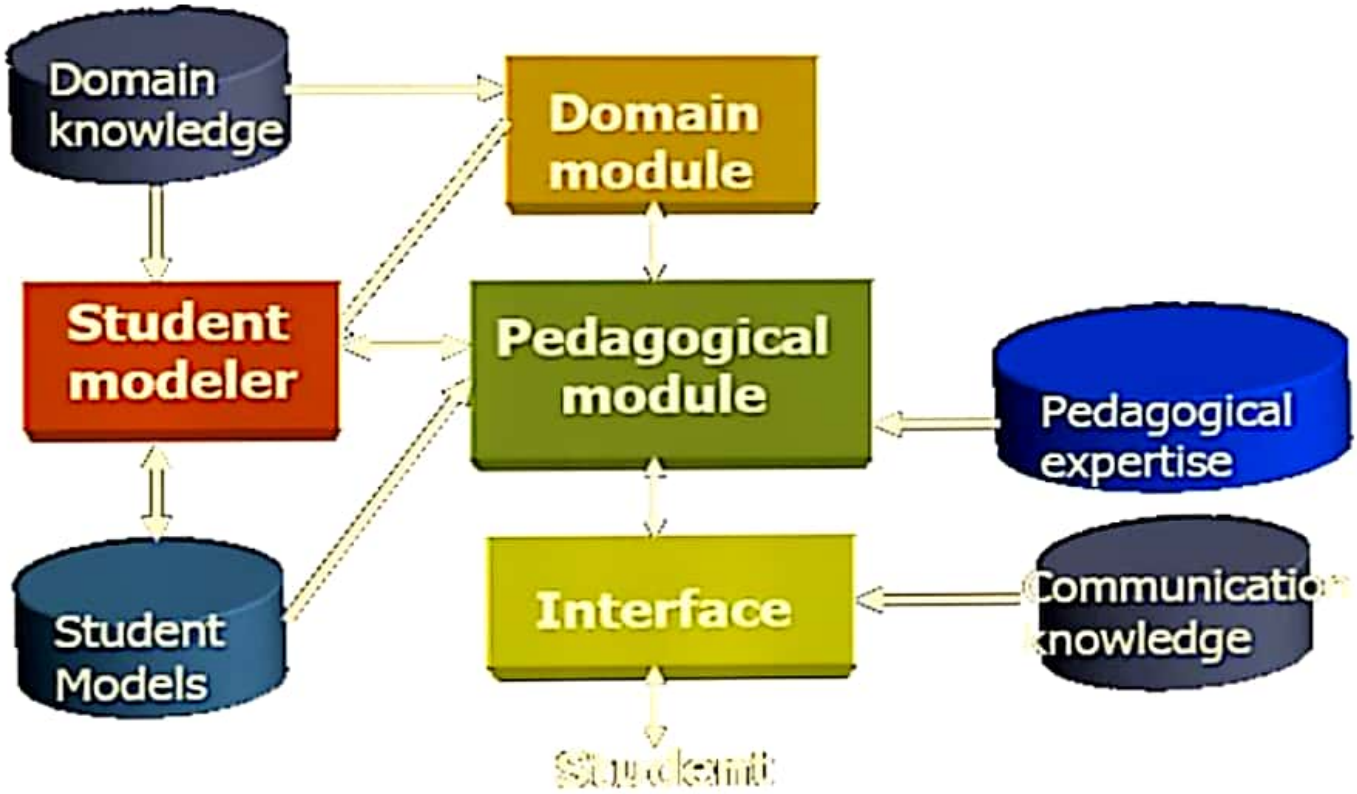
Problem Generation (Cont.)

- Problem generation, expert problem solving and student diagnosis can be viewed as a set of constraints on their solution
- We can evaluate student answers by checking that al constraints are satisfied
- Give student feedback on wrong answers by telling him which constraints he failed to satisfy

4. ITS CONVENTIONAL MODEL AND MAIN COMPONENTS



ITSs and Their Interaction



5. CASE-BASED REASONING (CBR) AND CBITS

- To represent the Student model and Domain Knowledge

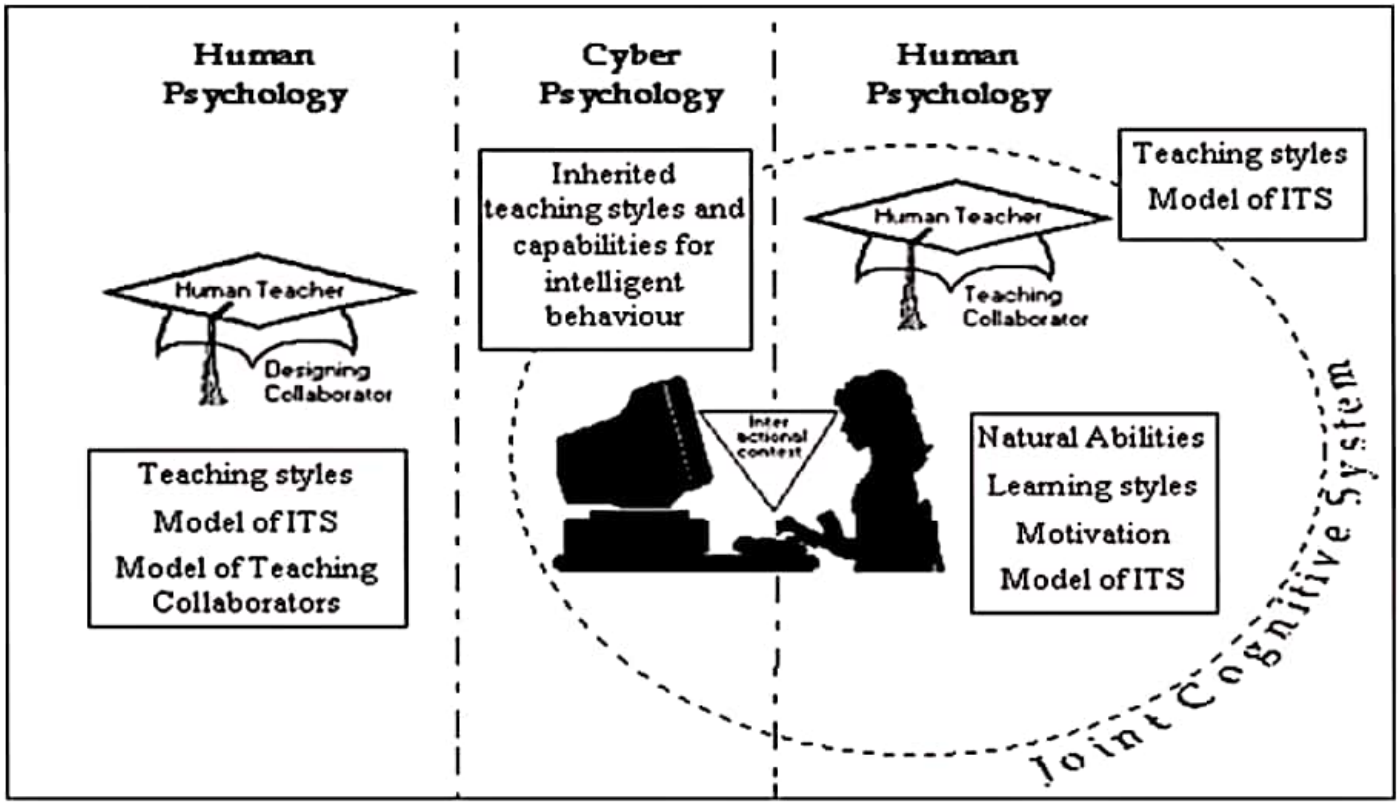
- There are different sources to obtain cases:
    - Produced by the learner himself
    - Experience from other learner
    - On-demand case generation
    - Predefined cases given by human tutors

6. PERFECT TEACHER AND ITS

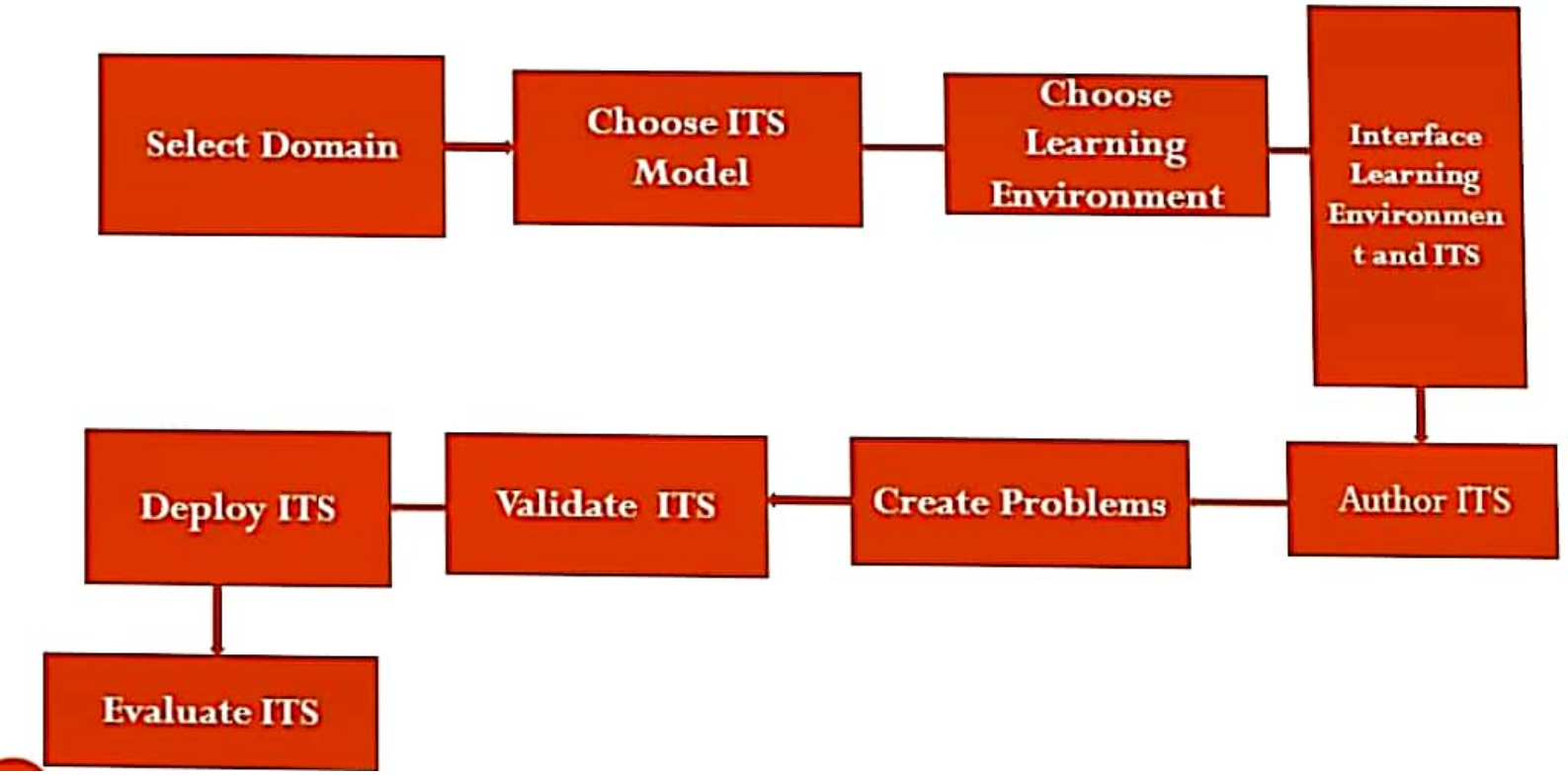
- Different roles of teacher:
  - ITS designer teacher
  - ITS implementer teacher
- (personality attributes, styles, preferences …)

- Many implementer teachers distrust ITS as **employing beliefs of the 'designer teacher**

Teacher and ITS



7. DEVELOPMENT PROCESS TO CREAT ITS



Main Stages of ITS Development Process

- Phase 1: Select Domain:

  - Choose domain where problem solving plays a major role.

  - Building an ITS requires high investment of efficient developers and their expertise.

- Phase 2: Choose ITS Model

  - Most popular models are cognitive tutors (Model Tracing, Knowledge Tracing) [Developed by Carnegie Mellon University, Pittsburgh, PA] and Constraint Based Tutor [Developed by Conterbury University, New Zeland]

  - Choose CT to teach procedural skills.

  - Choose CBT to teach open-ended domains.

Main Stages of ITS Development Process (Cont.)

- Stage 3: Choose Learning Environment:

  - Student interface has to be simple and adapted to the domain (reduce memory load, motivate, etc.)

  - A lot of learning environments exist already and can be reused)

- Stage 4: Interface Learning Environment (LE) and ITS:

  - Convert solution from learning environment into format required by ITS.

  - Possibly integrate LE into ITS to make it Web accessible.

  - Convert student solution to the XML web language format required by ITS.

  - Convert Java language application to Java applet required by Web

Main Stages of ITS Development Process (cont.)

Stage 5: Author ITS:

- Existing ITS Examples:

  * WETAS: a development environment authoring tool done through text files. WETAS is a domain model (knowledge base)

  * ASPIRE: a deployment environment authoring tool (ASPIRE Tutor). It guides author in the development process and considered a semi-automated process for building the domain model.

- Constraint Based Tutor Model domain with constraints

  * IF X **(relevance condition)** is true

  Then Y (**satisfaction condition)** has to be also true

- Feedback generated when:

  * Relevance condition is true

  * satisfaction condition is false

Main Stages of ITS Development Process (cont.)

- Stage 6: Validate ITS:
  - Test the knowledge base (constraints)
  - Test if generated feedback is appropriate.
- Stage 7: Deploy ITS:
  - Make ITS available to students
- Stage 7: Evaluate ITS:
  - Identify aspects to be evaluated (example: effectiveness of the feedback).
  - Use real students learning the domain
  - Pre- and post – test
  - Comparison group (uses full version of ITS)
  - Control group (uses version with no feedback).