

TUTORIAL DIALOG

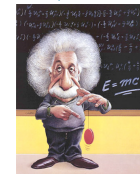
MD. FAISAL MAHBUB
CHOWDHURY

LECTURER:
DR. IVANA KRUIJFF-KORBAYOVÁ

Advanced Dialogue Modeling For Practical
Application'08-09

Tutoring

Discussion or
demonstration



MD. Faisal Mahbub Chowdhury
8th January 2009

Construction and
evaluation of
knowledge at the
same time



"My subject and verb have
agreed to disagree."

Tutorial Dialog

Learner's
knowledge
assessment



Socratic vs. didactic

- Didactic teaching involves spoken instruction. Teachers are central to this method of teaching because they control the content and layout of the entire session. Learning is generally passive, by watching and listening during the lecture, but students also have the opportunity to make notes for use in future learning. [Gray 2007]
- Socratic method is a form of philosophical inquiry in which the questioner explores the implications of others' positions, to stimulate rational thinking and illuminate ideas. [Wikipedia - http://en.wikipedia.org/wiki/Socratic_method]

Modes of tutoring/ Types of tutoring services

- One-on-one tutoring
- Supplemental Instruction
- In-Class Tutoring
- Workshops
- Mentoring
- Referrals

.....
.....
....
[Details are available here - http://www.castutoring.neu.edu/tutoring_services/types_tutoring/](http://www.castutoring.neu.edu/tutoring_services/types_tutoring/)

The Goals

- **Simulate** ideal human tutors
 - **Monitor** and **guide** student's progress while **supporting** the student's sense of control and self-confidence.
 - Active **construction** of student knowledge rather than information delivery system
 - **Collaborative** answering of deep reasoning questions
 - Approximate **evaluation** of student knowledge rather than detailed student modeling

[Rickett et al. 2002]

"A master can tell you what he expects of you. A teacher, though, awakens your own expectations."
Patricia Neal

"The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires."
William Arthur Ward

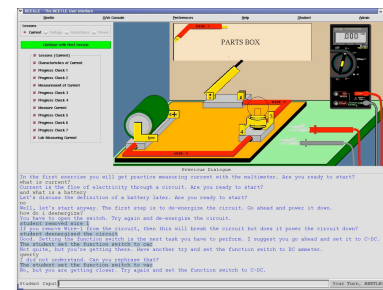
Modeling Human Teaching Tactics in a Computer Tutor

[Core et al. 2000]

BEETLE (Basic Electricity and Electronics Tutorial Learning Environment)

- The tutoring tactics are designed based on the analysis of a collection of dialogues where the students performed labs using GUI with the help of human tutors. Tutors and students communicated from different machine through chat. Tutor could monitor student's progress from her machine.
- The teaching tactics are identified and annotated in these dialogues for training the system.
- Some of the human teaching tactics identified from the data are –
 - If a student rephrases a wrong answer for a question again, the tutor does not repeat the same question and tries a different utterance.
 - Tutor is careful not to perform steps of a teaching tactic that are unnecessary.
 - Sometimes, even if the tutor thinks the student knows the instructions, the tutor does the followings –
 - Make the instruction salient
 - Make the student's action salient
 - Ask the student what steps remain
 - etc ...

BEETLE (Basic Electricity and Electronics Tutorial Learning Environment)



Focus on two aspects to support coherent tutorial dialogue:

- **Content planning:** plan how to teach a student a particular concept.
[Recursive Transition Network]
- **Communication management planning:** maintain the conversation (e.g., signaling topic shifts, acknowledging and accepting student utterances etc).

BEETLE (Basic Electricity and Electronics Tutorial Learning Environment)

- The tutor's curriculum contains a list of tutoring goals.
- Unachieved tutoring goals are placed in a data structure, called agenda.
- Plans are constructed using plan operators to achieve these goals.
- Plan operators are obtained from the plan library.
- If a plan operator contains certain actions to be performed, they are pushed onto the agenda followed by the preconditions of the operator.

MD. Faisal Mahub Chowdhury
8th JANUARY 2009

Tutorial Dialog

Conversational Game

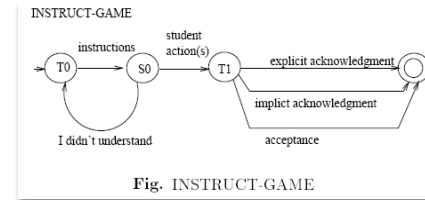


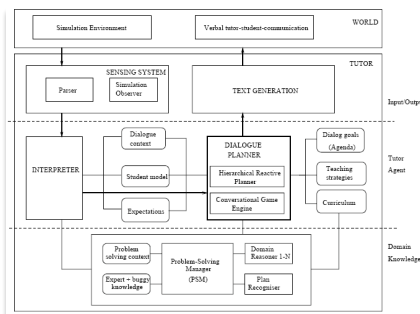
Fig. INSTRUCT-GAME

- A conversational game is a recursive transition networks where the link represent complex actions such as giving instructions or actions to the GUI.
- Each game handles the communication management associated with the system's utterances.

MD. Faisal Mahub Chowdhury
8th JANUARY 2009

Tutorial Dialog

Control Flow Through The Architecture



- If the student types input then the parser produces an underspecified logical form that the interpreter attempts to fully specify.
- The interpreter uses the problem solving manager, dialogue context, expectations, and curriculum to evaluate input (note, input to the tutor may simply be that the student is idle).
- The interpreter updates the student model.
- The interpreter may send messages directly to the dialogue planner (e.g., an evaluation of the student's answer to a question or an alert when one of the values in the student model falls below threshold)
- If a conversational game is in progress, then the conversational game engine runs it, else the reactive planner is run to load a new conversational game.
- The reactive planner is run if a conversational game ends or there is unexpected student input (e.g., the student says red wire instead of red lead).

MD. Faisal Mahub Chowdhury
8th JANUARY 2009

Tutorial Dialog

Dialogue on Measuring Current (BEETLE)

```

GUI:      1. In this exercise, you will get practice measuring current with
           a multimeter. This lab will lead you through the steps.
           Remember that when measuring current, you must power down the
           equipment first and then connect the meter in series with the circuit.
Student:  <turns off switch>
GUI:      2. Set the switch (i.e. the circuit switch) to off.
Student:  3. Correct.
GUI:      4. Set the Multimeter to adc.
Student:  <sets the meter correctly>
GUI:      5. Correct.
Student:  6. Choose the wire spanning the first position in the circuit where
           you want to measure current.
Student:  <selects wire 2>
GUI:      7. Correct.
Student:  8. Remove the appropriate wire and connect the leads of the
           multimeter to the circuit.
Student:  <only removes wire 2 from the circuit>
Tutor:    9. OK.
Student:  10. let's break this down into steps.
Student:  11. What did the instructions ask you to do?
Student:  12. remove the appropriate wire and connect the leads
    
```

MD. Faisal Mahub Chowdhury
8th JANUARY 2009

Tutorial Dialog

Dialogue on Measuring Current (BEETLE)

Tutor: 13. OK,
 14. and how much of this did you do?
 Student: 15. i only removed the wire
 Tutor: 16. Right.
 Tutor: 17. So what do you still need to do?
 Student: 18. connect the leads
 Tutor: 19. Right.
 Tutor: 20. And how are you going to do that?
 Student: 21. pick one of the wires on the right of the picture
 Tutor: 22. You mean the leads of the multimeter?
 Student: 23. yes
 Tutor: 24. Which one will you pick and where will you attach it?
 Student: 25. i believe that I'll pick the red wire and attach to where i removed the beginning of the wire
 Tutor: 26. OK,
 27. do you understand why you are doing that?
 Student: 28. because you need to connect the red wire to the beginning of the wire
 Tutor: 29. Why?
 Student: 30. I'm not exactly sure.
 31. i just thought that you connect the red wire to the beginning

Wrong terminology, vague, incomplete answer

Wrong answer

Dialogue on Measuring Current (BEETLE)

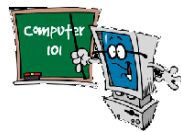
Tutor: 32. Do you understand what the goal of this lab is?
 Student: 33. to be able to connect the multimeter to the light and read the number of amps are flowing
 Tutor: 34. OK,
 35. in order for any amps to be flowing, what has to be true about the circuit?
 Student: 36. it has to be complete
 Tutor: 37. If you do only what you said you were going to do, will the circuit be complete?
 Student: 38. (with the exception if the switch being open)?
 39. no.
 40. i will also have to connect the red wire to the number 3 on the picture (above the lightbulb) i meant black wire not red
 Tutor: 41. Good. You are absolutely correct.
 42. You need to do both of those things before you press continue.
 [...]

Dialogue Planning Operators (BEETLE)

```
TEACH-STEP-BY-STEP ?a
effects: (student-performs ?a)
constraints: (AND (step ?a) (not (primitive ?a)))
preconditions: (foreach (?substep (PSM-ASK DECOMPOSITION ?a))
  (student-performs ?substep))

TEACH-NEXT-STEP ?a
effects: (student-performs ?a)
constraints: (AND (step ?a) (not (primitive ?a)))
preconditions: (AND (student-knows (next ?a))
  (student-knows (how-to-perform ?a)))

PRIME-NAME-NEXT ?a
effects: (primed (next ?a))
constraints: (AND (set instruction-list (PSM-ASK INSTRUCTIONS))
  (set actions-performed-list (PSM-ASK ACTIONS))
  (step ?a))
preconditions: (AND (salient (instructions instruction-list))
  (salient (actions-performed actions-performed-list)))
```

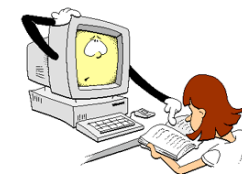


Dialogue Planning Operators (BEETLE)

```
ASK ?a
effects: (student-knows ?a) (student-states ?a) (salient ?a)
precondition: (primed ?a)
action: (ASK-GAME ?a)

INSTRUCT ?a
effects: (student-performs ?a)
action: (INSTRUCT-GAME ?a)

INSTRUCT2 ?a
effects: (student-performs ?a) (student-performs ?b)
action: (INSTRUCT-GAME ?a ?b)
```



Dialogue Planning Operators (BEETLE)

```
AGENDA: (student-performs (measure current))
-> A. (student-performs (de-energize circuit))
   B. (student-performs (set-meter-to-dc-current))
   C. (student-performs (select wire))
   D. (student-performs (remove wire))
   E. (student-performs (connect leads))
   F. (student-performs (energize circuit))
   G. (student-performs (read-amt-current))

.....
Tutor: 9. OK.
      10. let's break this down into steps.
      11. What did the instructions ask you to do?
Student: 12. remove the appropriate wire and connect the leads
Tutor: 13. OK.
      14. and how much of this did you do?
Student: 15. i only removed the wire
Tutor: 16. Right.
Tutor: 17. So what do you still need to do?
Student: 18. connect the leads
Tutor: 19. Right.
      20. And how are you going to do that?
.....

-> E) (student-performs (connect leads))
    E1) (student-knows (next (connect leads)))
        E1.1) (salient (instructions instruction-list))
            E1.1.1) (ASK-GAME (instructions instruction-list))
            E1.1.2) (salient (actions-performed actions-performed-list))
            E1.2) (ASK-GAME (next step-in-plan))
        E2) (student-knows (how-to-perform (connect leads)))
```

MD. Faisal Mahub Chowdhury
৯th JANUARY ২০০৩

Tutorial Dialog

At a Glance

- ❑ Tutor's curriculum contains a list of tutoring goals.
- ❑ Unachieved tutoring goals are tracked by the Agenda.
- ❑ Maintains updated student model during teaching.
- ❑ Constructs plans for achieving goals.
- ❑ Contents planning and communication management handled separately by different modules.

MD. Faisal Mahub Chowdhury
৯th JANUARY ২০০৩

Tutorial Dialog

AutoTutor [Graesser et al. 2004]

MD. Faisal Mahub Chowdhury
৯th JANUARY ২০০৩

Tutorial Dialog

A different perspective

- ❑ Authors have videotaped over 100 h of naturalistic tutoring, transcribed the data, classified the speech act utterances into discourse categories, and analyzed the rate of particular discourse patterns.
- ❑ These analyses revealed that human tutors rarely implement intelligent pedagogical techniques such as bona fide Socratic tutoring strategies, modeling-scaffolding-fading, reciprocal teaching, frontier learning, building on prerequisites, cascade learning, and diagnosis/remediation of deep misconceptions.
- ❑ Instead, tutors tend to coach students in constructing explanations according to the EMT dialogue patterns.
- ❑ The EMT dialogue strategy is substantially easier to implement computationally than are sophisticated tutoring strategies.

MD. Faisal Mahub Chowdhury
৯th JANUARY ২০০৩

Tutorial Dialog

A different perspective

- Although, an ideal answer (for the type question AutoTutor asks a student) is approximately three to seven sentences in length, the initial answers to these questions by learners are typically only one word to two sentences in length.
- AutoTutor engages the learner in a dialogue that assists the learner in the evolution of an improved answer that draws out more of the learner's knowledge that is relevant to the answer.
- The dialogue between AutoTutor and the learner typically lasts 30–100 turns.

MD. Faisal Mahub Chowdhury
8th January 2009

Tutorial Dialog

Design inspirations

- Explanation based constructivist theories of learning
 - Learning is more effective and deeper when the learner must actively generate explanations, justifications, and functional procedures than when he or she is merely given information to read.
- Adaptive intelligent tutoring systems
 - The tutors give immediate feedback on the learner's actions and guide the learner on what to do next in a fashion that is sensitive to what the system believes the learner knows.
- Empirical research on tutorial dialogue
 - The patterns of discourse uncovered in naturalistic tutoring are imported into the dialogue management facilities of AutoTutor.

MD. Faisal Mahub Chowdhury
8th January 2009

Tutorial Dialog

What does AutoTutor do? [\[Graesser et al. 2005\]](#)

- Asks questions and presents problems
 - Why? How? What-if? What is the difference?
- Evaluates meaning and correctness of the learner's answers (LSA and computational linguistics)
- Gives feedback on answers
- Face displays emotions + some gestures
- Hints
- Prompts for specific information
- Adds information that is missed
- Corrects some bugs and misconceptions
- Answers student question
- Holds mixed-initiative dialog in natural language

MD. Faisal Mahub Chowdhury
8th January 2009

Tutorial Dialog

Latent Semantic Analysis (LSA)

The underlying idea of LSA is that the aggregate of all the word contexts (inside a given large corpus) in which a given word does and does not appear provides a set of mutual constraints that largely determines the similarity of meaning of words and sets of words to each other [\[Landauer et al. 1998\]](#).

In other words, LSA is a statistical technique that measures the conceptual similarity of any two pieces of text, such as words, paragraphs, sentences etc.

MD. Faisal Mahub Chowdhury
8th January 2009

Tutorial Dialog

How the learner's answer handled

- Expectations-and-misconception-tailored (EMT) dialogue – as the learner articulates the answer, the content is compared with the expectations (anticipated correct answers) and misunderstanding (anticipated misunderstandings) using LSA. The tutor responds appropriately when particular expectations or misconceptions is expressed.
- Curriculum script (more in next slide)
- Dialogue moves facilitate covering the information that is anticipated by the curriculum script.

Curriculum script

- Curriculum script includes content associated with a question or problem.
 - 1) the ideal answer
 - 2) a set of expectations
 - 3) families of potential hints, correct hint responses, prompts, correct prompt responses, and assertions associated with each expectation
 - 4) a set of misconceptions and corrections for each misconception
 - 5) a set of key words and functional synonyms
 - 6) a summary
 - 7) markup language for the speech generator and gesture generator for components in (1) through (6) that require actions by the animated agents.

Managing One AutoTutor Turn

- Short feedback on the student's previous turn
- Advance the dialog by one or more **dialog moves** that are connected by discourse markers
- End turn with a signal that transfers the floor to the student
 - Question
 - Prompting hand gesture
 - Head/gaze signal

Dialog Moves [Graesser et al. 2005]

- Positive immediate feedback: "Yeah" "Right!"
- Neutral immediate feedback: "Okay" "Uh huh"
- Negative immediate feedback: "No" "Not quite"

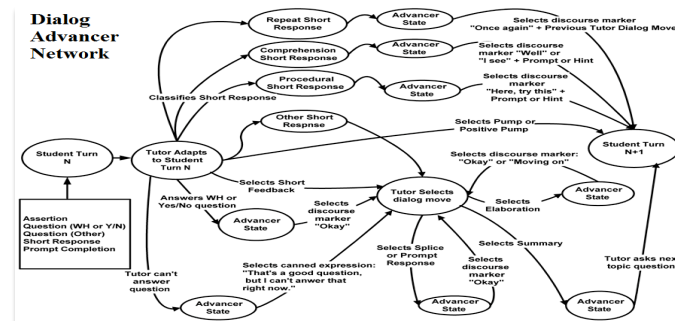
- Pump for more information: "What else?"
- Hint: "How does tossing the pumpkin affect horizontal velocity?"
- Prompt for specific information: "Vertical acceleration does not affect horizontal velocity."
- Assert: "Vertical acceleration does not affect horizontal velocity."

- Correct: "Air resistance is negligible"
- Repeat: "So, once again, how does tossing the pumpkin affect horizontal velocity?"
- Summarize: "So to recap, [succinct summary]"

How does AutoTutor select the next expectation? [Graesser et al. 2005]

- Don't select expectations that the student has covered
 - $\text{cosine}(\text{student answers, expectation}) > \text{threshold}$
- Coherence
 - Select next expectation that has highest overlap with previously covered expectation

How does AutoTutor know which dialog move to deliver? [Graesser et al. 2005]



Sample dialogue

AutoTutor: When a car without headrests on the seats is struck from behind, the passengers often suffer neck injuries. Why do passengers get neck injuries in this situation? (MAIN QUESTION)
 Student: The passenger experiences a backward acceleration, while the car moves forward.
 AutoTutor: And can you add to that? (PUMP)
 Student: This is because the passenger experiences a force opposite in direction to the force on the car.
 AutoTutor: Um, yes, correct! (POSITIVE FEEDBACK) When the neck provides a large force, what within the neck would get damaged? (HINT)
 Student: The spine.
 AutoTutor: Umm (NEUTRAL NEGATIVE FEEDBACK), I think you can get this. Damage within the neck will occur in the ligaments and the . . .? [spoken with rising intonation and accompanied with a prompting hand gesture] (PROMPT):

Student: Muscles.
 AutoTutor: Brilliant! (POSITIVE FEEDBACK) Ligaments and the muscles. (PROMPT RESPONSE) Let's keep going. (DIALOGUE ADVANCER) Additionally, when there is no headrest present in the car, what accelerates the head of the passenger? (HINT)
 Student: The impact from behind.
 AutoTutor: I am sure you can get this. The head of the passenger will be accelerated by the passenger's . . .? [spoken with rising intonation and accompanied with a prompting hand gesture] (PROMPT)
 Student: Car.
 AutoTutor: Wrong! (NEGATIVE FEEDBACK) By the passenger's neck. (PROMPT RESPONSE): [moving ahead 22 turns in the dialogue]
 AutoTutor: Do you perhaps have any general conceptual physics questions? (QUESTION PROMPT)

Student: No.
 AutoTutor: How would you answer my first question, having gone over what we've just talked about? (FINAL ANSWER PROMPT)
 Student: The passengers get neck injuries because ... [8 additional words].
 AutoTutor: Great! (POSITIVE FEEDBACK) To recap, when a car is struck from behind, the force of impact will cause the car to experience a large forward acceleration. The car seat is attached to the car and will also have the same large acceleration. When the car is hit from behind, the seat will exert the same acceleration to the torso of the body. In order for the head to go along with the torso, it will need to be accelerated at the same rate as the torso. Since the head has no acceleration being applied to it by a headrest, the neck gets stretched, damaging its muscles and ligaments in an attempt to produce the required large acceleration. (SUMMARY)

Demo



□ <http://www.youtube.com/watch?v=aPcoZPjL2G8>

□ <http://www.youtube.com/watch?v=ZDivTscX4j0&NR=1>.

Experiment on computer literacy

- Students were given three types of test questions – shallow and deep multiple-choice questions, and questions with ideal answers (with four content words deleted for each answer) used for AutoTutor training.
- The result revealed AutoTutor didn't facilitate learning on shallow multiple-choice test questions.

Experiment on conceptual physics

- The participants were given a pretest, completed training, and were given a posttest. The conditions were AutoTutor, textbook, and read nothing.
- The two tests tapped deeper comprehension and consisted of either multiple-choice questions or conceptual physics problems that required essay answers.

Experimental findings

- First, AutoTutor is effective in promoting learning gains at deep levels of comprehension in comparison with the typical ecologically valid situation in which students read nothing, start out at pretest, or read the textbook for an amount of time equivalent to that involved in using AutoTutor.
- Second, reading the textbook is not much different than reading nothing (surprising!). It appears that a tutor is needed to encourage the learner to focus on deeper levels of comprehension.
- Third, AutoTutor is as effective as a human tutor who communicates with the student over terminals in computer-mediated conversation.

Experimental findings

- Fourth, the impact of AutoTutor on learning gains is considerably reduced when a comparison is made with reading of text that is carefully tailored to exactly match the content covered by AutoTutor.
- Finally, performance is very much dependent on curriculum script.

Open questions

- Is it the dialogue content or the animated agent that accounts for the learning gains?
- What role do motivation and emotions play, over and above the cognitive components?

Questions

- **Milos** - What actually is tutoring?
- **Elahi** - How does the tutor skip a step which is already performed by the student?
- **Alexander** - The fact that surprises me is that the system doesn't try to find out what kind of user it is tutoring..... It starts with instructions right away and backs off to teaching only in situations when the student doesn't know how to execute a particular action..... Do I have a wrong view of tutoring?
- **Fabian** -what does "one-to-one tutoring" have to do with a computer system "explaining" tasks to a user? In my opinion, human factors play the most important role in teaching. It is essential for the teacher to motivate the student, to give a smile and to think positiveeven if the student's ideas do not contribute to the actual goal..... The computer system does not have any of those properties of "one-to-one tutoring", that's why I think that this is a bad comparison.

Questions

- **Raveesh** - In the described approach the notion of "action library" is something similar to the notion of "recipe" which we have seen in earlier seminars. I believe, domain knowledge about 'learning some X' is used to define these "action libraries" e.g. Fig 4 A-to-G, right? Authors also mentioned learning "tactics" from corpora, but what I am not sure is how the authors are using these "tactics" to alter the predefined action plan in the action library.
- **Lisa** - they want to test their teaching tactics in other domains. Do you know the results? Have they succeeded in building domain independent tutoring strategies? Do they have human examples from other domains? Are there universal teaching strategies, that are independent of the domain, the student and the specific tutor?
 - Charles Callaway et al. (2007), "The Beetle and BeeDiff Tutoring Systems"

Integrating Collaborative Dialogue Systems (CDS) with Intelligent Tutoring Systems (ITS)

[Rickel et al. 2002]

ITS and CDS

- Research on Intelligent Tutoring Systems (ITS) focuses on computer tutors that adapt to individual students based on the target knowledge the student is expected to learn and the presumed state of the student's current knowledge.
- Research on Collaborative Tutoring Systems focuses on computational models of human dialogue for collaborative tasks.

>> Tutoring is inherently collaborative.

Paco (Pedagogical Agent for Collagen)

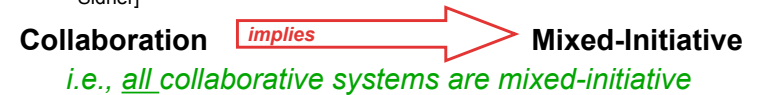
- Paco teaches students procedural tasks in simulated environments.
- It expresses various tutorial behaviors as rules for generating candidate discourse acts in Collagen.

Mixed-Initiative and Collaboration

[Rich et al. 2005]

Mixed Initiative: ...efficient, *natural interleaving* of contributions by users and automated services... [Horvitz]

Collaboration: A process in which two or more participants coordinate their actions toward achieving *shared goals*. [Grosz & Sidner]



Collagen

- Collagen is a middleware system based on collaborative discourse.
- Collagen maintains a model of the discourse state shared by the user and the computer agent.
- Agents constructed using Collagen use the discourse state to generate an agenda of candidate *discourse acts*, including both utterances and domain actions, and then choose one (discourse act) to utter or perform.
- Collagen's declarative language can be used to represent domain-specific procedural knowledge. This knowledge serves as a model of how domain tasks should be performed.
- Each task is associated with one or more recipes (i.e., procedures for performing the task).
- Each recipe consists of several elements drawn from a relatively standard plan representation.

Collagen as a Foundation for Teaching Procedural Tasks

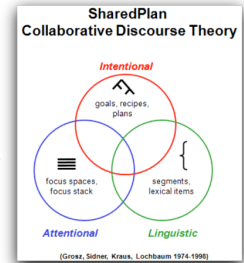
- Collagen model of collaborative dialogue includes two main parts:
 - a representation of discourse state and
 - a discourse interpretation algorithm, which specifies how to update the discourse state given a new action or utterance by either the user or agent. Its objective is to determine how the current act contributes to the collaboration.
- Collagen partitions the discourse state into three interrelated components:
 - linguistic structure,
 - attentional state, and
 - intentional structure.

MD. Faisal Mahub Chowdhury
8th JANUARY 2009

Tutorial Dialog

Collagen as a Foundation for Teaching Procedural Tasks

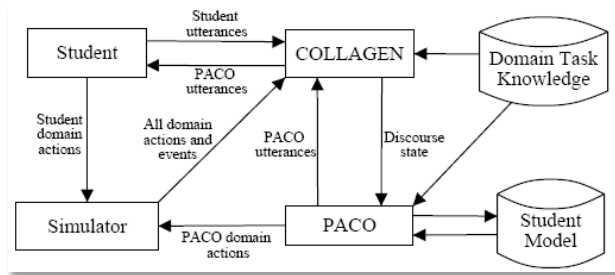
- The linguistic structure groups the dialogue history into a hierarchy of discourse segments. Each segment is a contiguous sequence of actions and utterances that contribute to some purpose (e.g., performing a subtask).
- The attentional state represents what the user and agent are talking about or working on at a given moment. It is represented as a stack of discourse purposes, called the focus stack. When a new discourse segment is begun, its purpose is pushed onto the stack. When a discourse segment is completed or discontinued, its purpose is popped off the stack.
- The intentional structure represents the decisions that have been made as a result of the actions and utterances (reflected by the linguistic structure and attentional state), independent of their order. The intentional structure is represented as plan trees. Nodes in the tree represent mutually agreed upon intentions (e.g., to perform a task), and the tree structure represents the sub-goal relationships among these intentions.



MD. Faisal Mahub Chowdhury
8th JANUARY 2009

Tutorial Dialog

Paco's Architecture



MD. Faisal Mahub Chowdhury
8th JANUARY 2009

Tutorial Dialog

Discourse acts (representing tutorial behaviors)

Act type	Add instance to agenda for...	Semantics	Subcases (if any)	Example gloss
Positive feedback (rank 1)	the user's most recent action α if it was, or it proposed, a valid next action and has not yet received feedback	$accept(should(\alpha))$	<ul style="list-style-type: none"> α finished subtask α wasn't proposed by tutor α caused unnecessary focus shift α finished top-level goal none of above 	Great job. Nice. That was a correct action, but I wasn't expecting you to do it now. We're done with this scenario. Good.
Negative feedback (rank 1)	the user's most recent action α if it was, or it proposed, an invalid next action and has not yet received feedback	$reject(should(\alpha))$	<ul style="list-style-type: none"> α was already done α's purpose was already achieved α has an unsatisfied precondition executing α violates an ordering constraint 	Whoops, you already did that. Whoops, you didn't need to do that. Whoops, you can't do that yet. Whoops, it's too soon to do that.
End interruption (rank 2)	each step ω that is an interruption on the focus stack	$propose(\sim should(\omega))$	<ul style="list-style-type: none"> ω has known purpose ω has unknown purpose 	Let's stop closing the fuel valves. That is not relevant to our current task.
Teach complete (rank 3)	each non-primitive ω in the current plan such that ω is complete and the student does not know when ω is complete	$propose(achieved(\omega))$		We succeeded in closing the fuel valves.
..

MD. Faisal Mahub Chowdhury
8th JANUARY 2009

Tutorial Dialog

Demo

- (1) **Paco** sets the state of the simulator.
- (2) **Paco** "I've reset the simulation so that we can try engaging an engine under slightly different conditions."
- (3) **Paco** "Let's engage engine one."
- (4) **Student** "Ok."
- (5) **Paco** "You take it from here."
- (6) **Student** "Let's start the generator."
- (7) **Paco** "Good."
- (8) **Paco** (Pointing) "Now, notice that the alarm light is on."
- (9) **Paco** "Before starting a generator, always make sure that the alarm light is off so that you'll know when a new alarm appears."
- (10) **Paco** (Pointing) "Press the alarm reset button on the generator in order to extinguish the alarm."
- (11) **Student** presses the alarm reset button on the generator.
- (12) **Paco** "Good."
- (13) **Student** "Ok."
- (14) **Paco** "You take it from here."
- (15) **Student** presses the on button on the generator.
- (16) **Paco** "Great."
- (17) **Paco** "We succeeded in starting the generator."
- (18) **Paco** (Pointing) "Now, notice that engine two is running."
- (19) **Paco** "Before starting an engine, always make sure that the other engine is stopped."
- (20) **Paco** "Let's stop engine two."
- (21) **Paco** (Pointing) "First, press the disengage button on engine two in order to disengage the clutch."
- (22) **Student** presses the disengage button on engine two.
- (23) **Paco** "Right."
- (24) **Paco** "The next step of stopping engine two is to close the fuel valves on engine two."
* * * * *

MD. Faisal Mahub Chowdhury
8th January 2009

Tutorial Dialog

References

- Gray, C. (2007). "Essential teaching skills". <http://student.bmj.com/issues/07/10/careers/361.php>
- Core, M.G., Moore, J.D., Zinn, C., & Wiemer-Hastings, p. (2000). "Modeling human teaching tactics in a computer tutor." Proceedings of the ITS Workshop on Modelling Human Teaching Tactics and Strategies.
- Graesser, A.C., Lu, S., Jackson, G.T., Mitchell, H., Ventura, M., Olney, A., & Louwerse, M.M. (2004). AutoTutor: A tutor with dialogue in natural language". Behavioral Research Methods, Instruments, and Computers, 36, 180-193.
- Graesser, A.C., Chipman, P., Haynes, B.C., & Olney, A. (2005). "AutoTutor: An intelligent tutoring system with mixed-initiative dialogue". IEEE Transactions in Education, 48, 612-618
- Landauer, T.K., Foltz, P.W., & Laham, D. (1998). "Introduction to Latent Semantic Analysis". Discourse Processes, 25, 259-284.
- Rich, C., & Sidner, C.L. (2005) "Collagen: Middleware for Building Mixed-Initiative Problem Solving Assistants". Symposium on Mixed-Initiative Problem-Solving Assistants, AAAI
- Rickel, J., Lesh, N.B., Rich, C., Sidner, C.L., & Gertner, A. (2002) "Collaborative Discourse Theory as a Foundation for Tutorial Dialogue". International Conference on Intelligent Tutoring Systems, pp 236-243, June 2002, Springer Lecture Notes in Computer Science.

MD. Faisal Mahub Chowdhury
8th January 2009

Thanks for your
patience.