Mapping the range of ALE techniques
Agents and Avatars

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## What is an *agent*

There is no consensual definition about agents in AI field (Mainly because it is a broad domain). A general definition, as found on wikipedia, is: an *agent* is one who acts for, or in the place of, another, by authority from him. This is true of agents in ALE, but it does not pinpoint how they are supposed to look like.

The definition most agreed upon in AI is the one put forward by (Wooldridge & Jennings, 1995) An agent is a computer system that is situated in some environment, and that is capable of autonomous action in this environment in order to meet its design objectives.

The environment can be just about anything, but it has to be defined. For ITS, this is the interaction between the system and the student.

Autonomous means not only independent once deployed, but also, if intelligent, *flexible* (Wooldridge & Jennings, 1995)

- *responsive* agents should perceive their environment and respond in a timely fashion to changes that occur in it
  for Pedagogical Agents this means input from the user (Thalmann et al., 1997)

- *proactive* agents should not simply act in response to their environment, they should be able to exhibit opportunistic, goal-directed behaviour and take the initiative where appropriate
  for Pedagogical Agents this means the set of normative teaching goals together with the teaching strategy (plans for achieving these goals) (Thalmann et al., 1997)

- *social* agents should be able to interact, when appropriate, with other agents and humans
  for Pedagogical Agents this means any associated resources in the learning environment (Thalmann et al., 1997)

There are 3 types of Pedagogical Agents (Giraffa & Vicarri, 1998) : *Tutor, Mentor, Assistant.* All are supposed to be domain experts, but differ in the development of the student model and pedagogical aspects (from Strong for the Tutor, to Weak for the Assistant).

## What is an *avatar*

In general, all ITSs have some kind of *agent* (even if not always independent of the other components).

Avatars can be used as virtual embodiments of agents. When discussing agents, Giraffa and Viccari (1998) identified several motivations for using an animated presentation agent for teaching/learning purposes:

- Add expressive power to a systems presentation skills;

- Help the students to perform procedural tasks by demonstrating them ;

- Serve as a guide through the elements of the scenario (simulations) ;

- Engage students without distracting or distancing them from the learning experience. (Hayes-Roth et al., 1994, 1995, 1997; Petta et al., 1997).

## Why & Where?

Agents have the capabilities of communication and interaction (agents can adapt and learn during an instructional session) (Giraffa & Vicarri, 1998). Avatars can communicate affectively and therefore add a social dimension to the tutoring.
In general, most ITSs have at least one agent (the AI bit that models the student and reacts through feedback or adapting otherwise). More advanced systems have also employed avatars to embody agents.

## Systems

- *Autotutor* the agent emulates a human tutor
  It models the student affect, through an *Affective Loop*

- *Betty's Brain* has 2 agents: a mentor and a teachable agent
  It is still a Pedagogical Tutor overall.

- *Crystal Island* has a cast of virtual agents, which have distinctive personalities, expressions and motivations
  Recognition and prediction of students goals help to drive narrative and tutorial interactions.

# References

M. Wooldridge and N. R. Jennings. Intelligent agents: Theory and practice. The Knowledge Engineering Review, 10(2):115152, 1995

Hayes-Roth,B.et alli. Directed Improvisation. Stanford: CA,1994. (Technical Report KSL-94-61)

Hayes-Roth,B.et alli. Directed Improvisation with animated puppets. CHI95: Conference on Human-Computer Interaction, 1.,1995.Proceedings... Denver: 1995.

Hayes-Roth,B.; Van Gent,R.; Huber,D. Acting in Character. In: Creating Personalities for Synthetic Actors: towards autonomous personality agents. Trappl,R.; Petta,P. (Eds.). Berlin: Springer Verlag, 1997.

Petta, P.; Trappl, R. Why to Create Personalities for Synthetic Actors. In: Creating Personalities for Synthetic Actors: towards autonomous personality agents. Trappl,R.; Petta,P. (Eds.). Berlin: Springer Verlag, 1997.

Thalmann,D.; Noser,H.; Huang,Z. Autonomous Virtual Actors Based on Virtual Sensors. In: Creating Personalities for Synthetic Actors: towards autonomous personality agents. Trappl,R.; Petta,P. (Eds.). Berlin: Springer Verlag, 1997.

Giraffa, L. and Viccari,R. The Use of Agents Techniques on Intelligent Tutoring Systems. sccc, pp.76, XVIII International Conference of the Chilean Computer Science Society, 1998