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 (broad domain).
(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.
For ITS, the environment is the interaction system - student.
Autonomous means not only independent once deployed, but also, if intelligent, *flexible* (Wooldridge & Jennings, 1995):
responsive for Pedagogical Agents : input from the user (Thalmann et al., 1997)
proactive for Pedagogical Agents : the set of normative teaching goals & teaching strategy (plans for achieving these goals) (Thalmann et al., 1997)
social for Pedagogical Agents : 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: expressive power, demonstrate tasks, guide for simulations, engage students.

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.

Where to find more

For agents, the (Wooldridge & Jennings, 1995) is the go to book, and most of it is available on google books.
For a good review of all agents & avatar related, see (Giraffa & Vicarri, 1998).
After 1998, until recently, either there is a gap in the literature or we have very poor research skills. It might be because the principles have not changed.
For a view of the usefulness of agents in computer based learning see (Prakasm & Suresh, 2010). We did not include any content from it in our presentation, but it might be useful.
For uses of avatars we recommend looking at systems that employ them and maybe (Thalmann et al., 1997).

References

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