

The Empathon: an agent aiming at mimicking empathy

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Outline

- Empathy, a few pointers
- Empathon, the direction of research
- First attempts

Richness of the concept of empathy

- Roughly: the ability to put oneself in the shoes of someone else.
- A. Smith's sympathy, in the theory of moral sentiments, is the main explanation of social behaviour.
- M. Scheler, E. Stein: empathy is the basis for religious experience.
- JP. Dupuy, link with consciousness

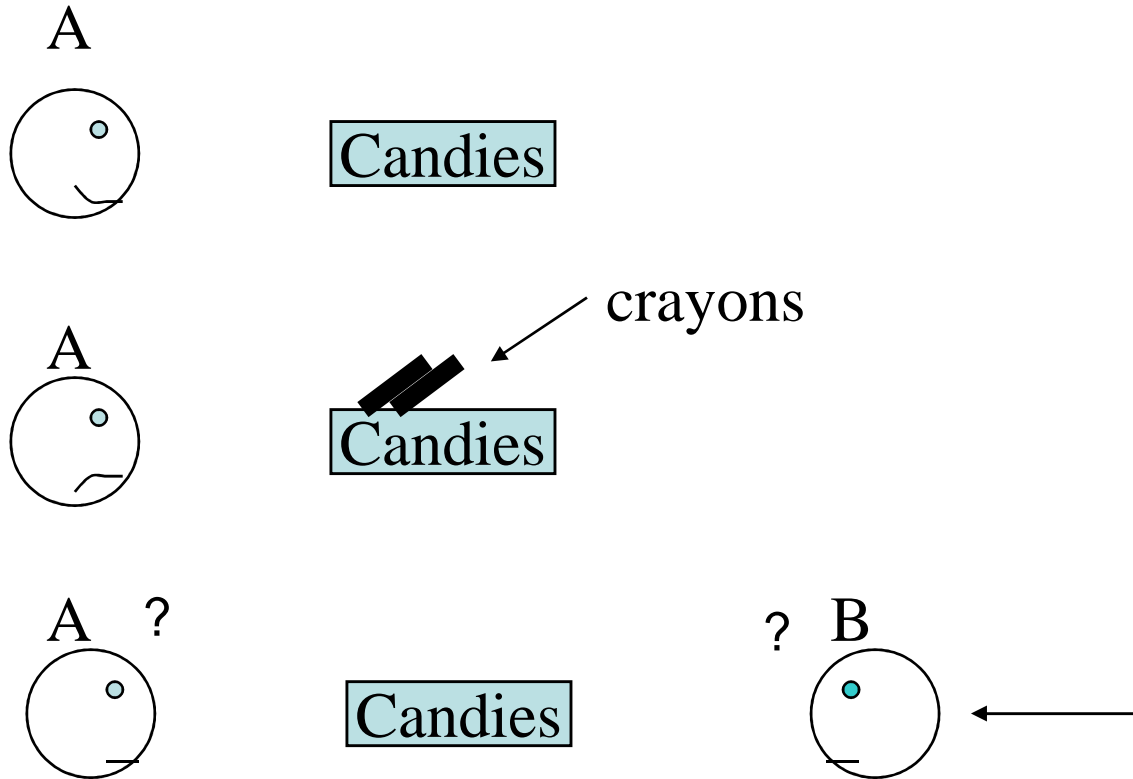
A. Smith

- Empathy applied twice, to feel oneself from outside (second order)
- Inspired by stoic philosophy, A. Smith considered an imaginary independent observer of all his acts: the man within.
- This man within can be in conflict with the imaginary observer representing actual others (the man without)

More recently

- Famous debate between theory of simulation and theory of theory.
- Debate about autism: For E. Baron-Cohen, autism is a total lack of empathy (super male brain)
- Study of children (A. Gopnik and the experiment of candies)

Experiment of deceived belief



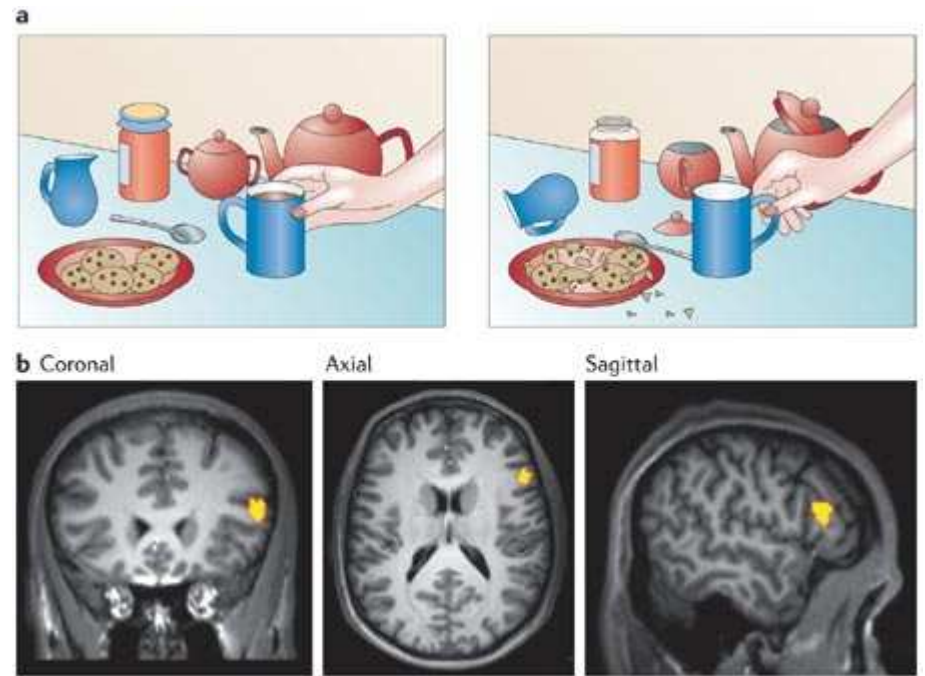
Mirror Neurons

- Discovered in 1996-1997, the mirror neurons provide a neural basis for empathy, and trigger a new interest.



General principle

- Some neurons that fire when we perform an action, fire also when we observe someone doing the same action.



Different perspective on action

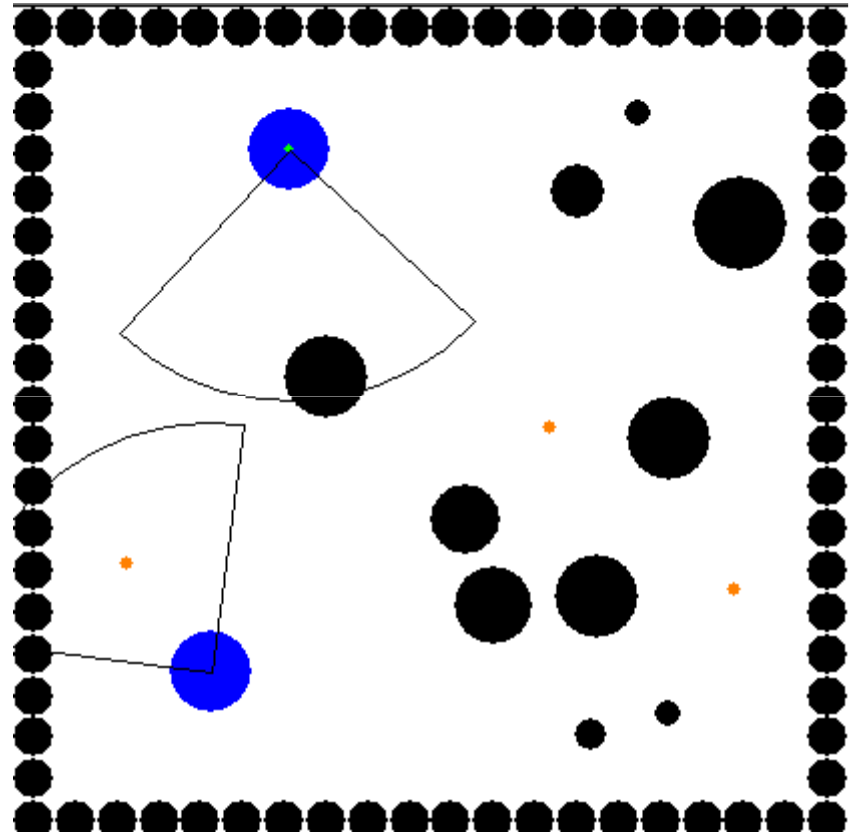
- Recent results tend to demonstrate a gibsonian system of perception, with affordances: an object is associated with the potential actions it suggests.

Research questions

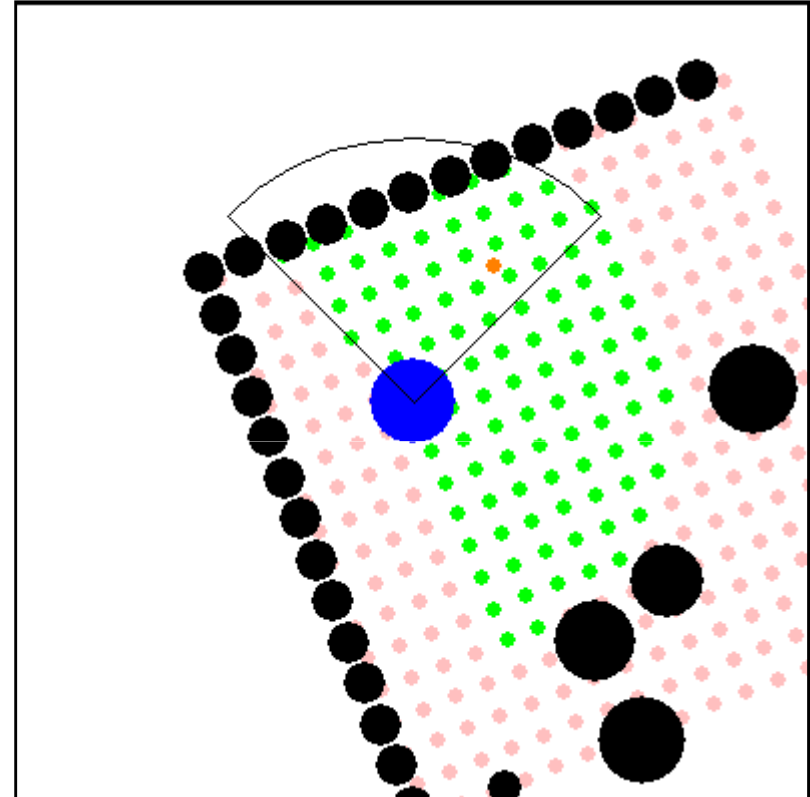
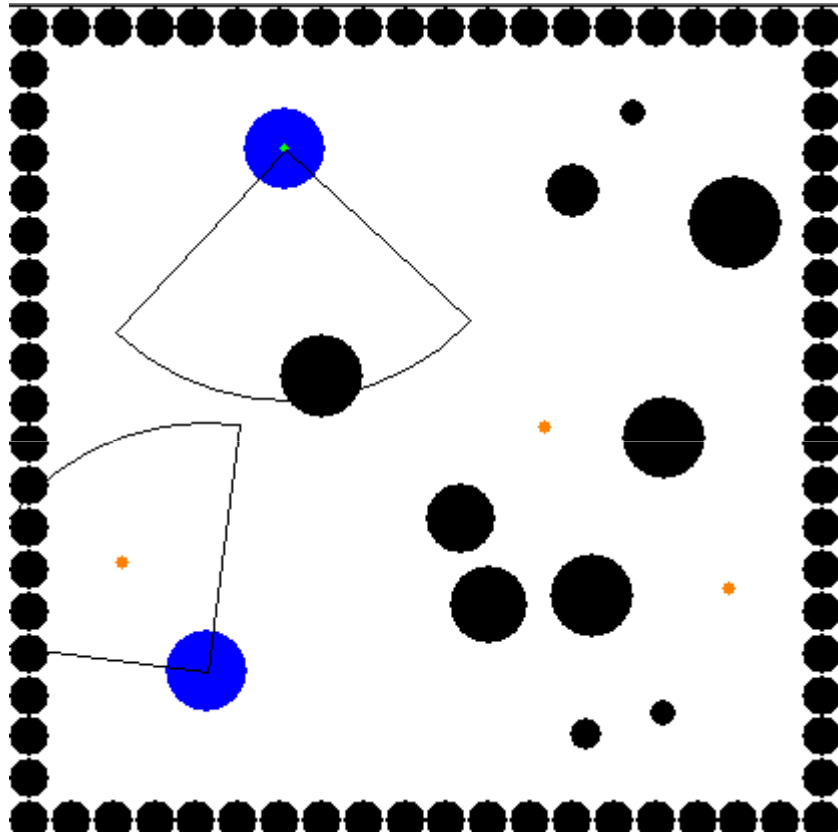
- Can agent-based approaches participate to this research, and provide particular insights ? and how ?
- Can this background about empathy and mirror neurons give new ideas about artificial agents ?

First attempt

- Simple agents evolving in a simple 2D geometric world.
- They have several possible behaviours connected with their perceptions, and they see observe each other.



Surrounding percept



The pink dots are in zones that the agent has not seen for long, whereas the green dots are zones which have been recently seen. The obstacles appear in the percept,. However, the target (brown) does not appear because this part of the space has not been explored yet (pink dots).

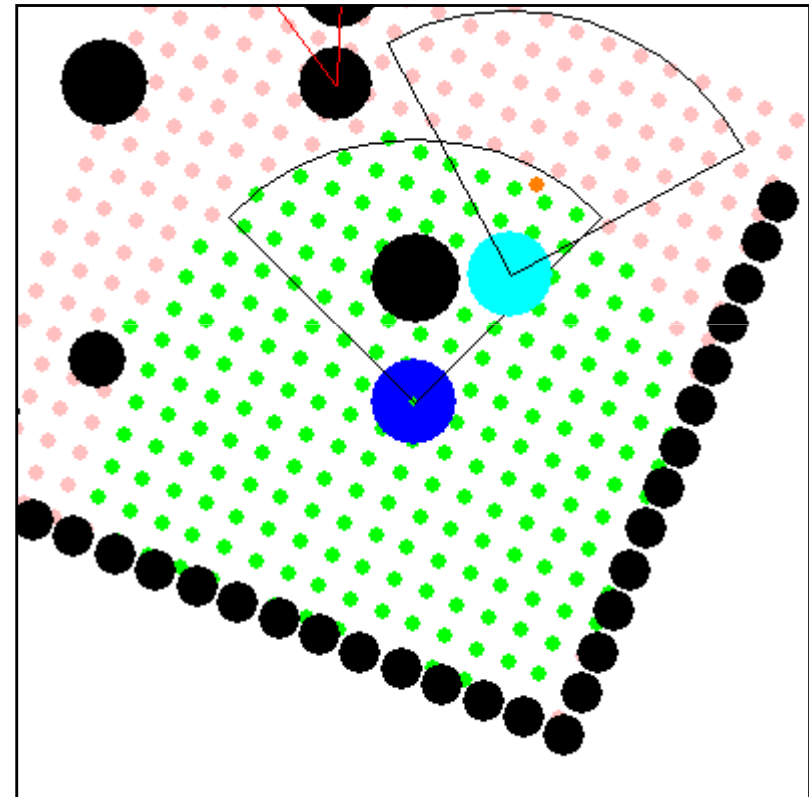
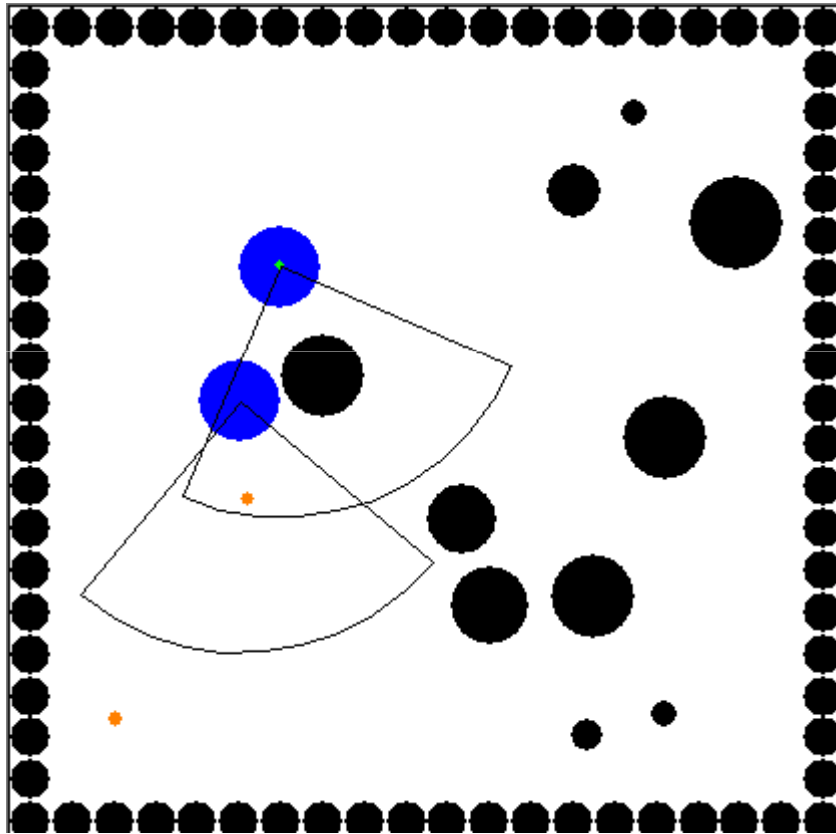
States and interactions

- Possible states:
 - Exploring: No target is in sight and the agent chooses at random a point that it has not seen recently and goes towards it.
 - Aiming at target: a target is in sight, and the agent goes towards it.
- Actions
 - Going directly towards a point.
 - Avoiding an obstacle.
 - Avoiding a group of obstacles.

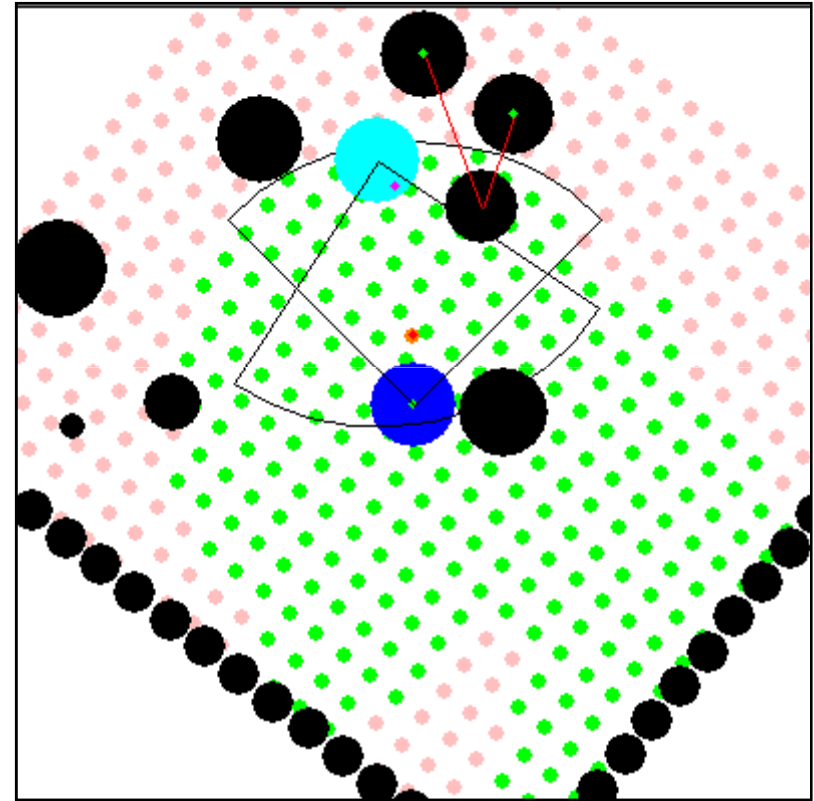
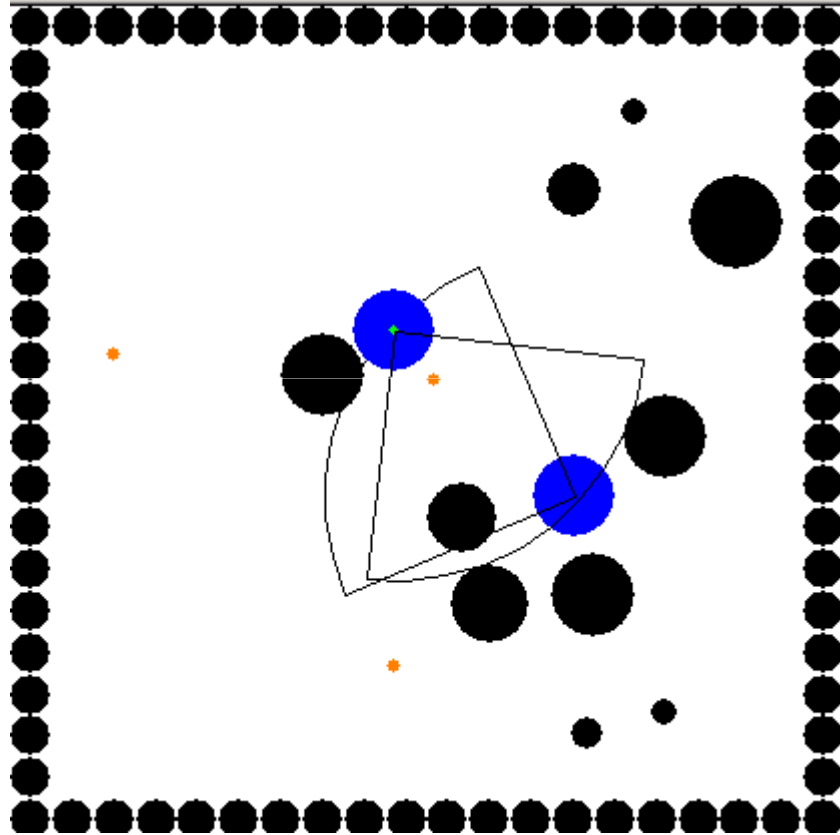
Interactions between agents

- Agents of type A0 see other agents simply as obstacles.
- Agents of type A1:
 - can access the state and the direction of sight of agents which are directly in their vision zone.
 - They can deduce if they are possibly trying to get the same target, and make the decision to drop or to keep the target.

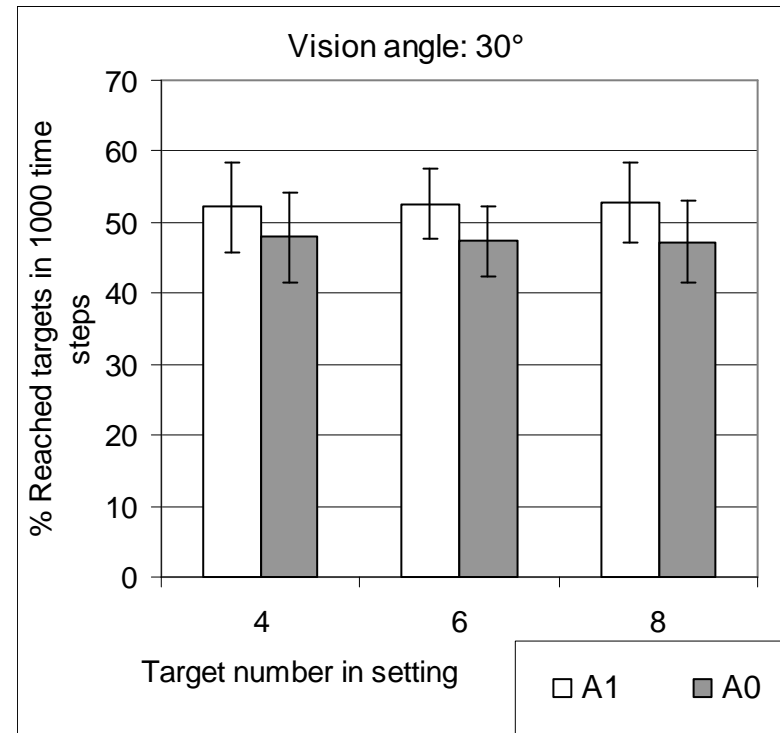
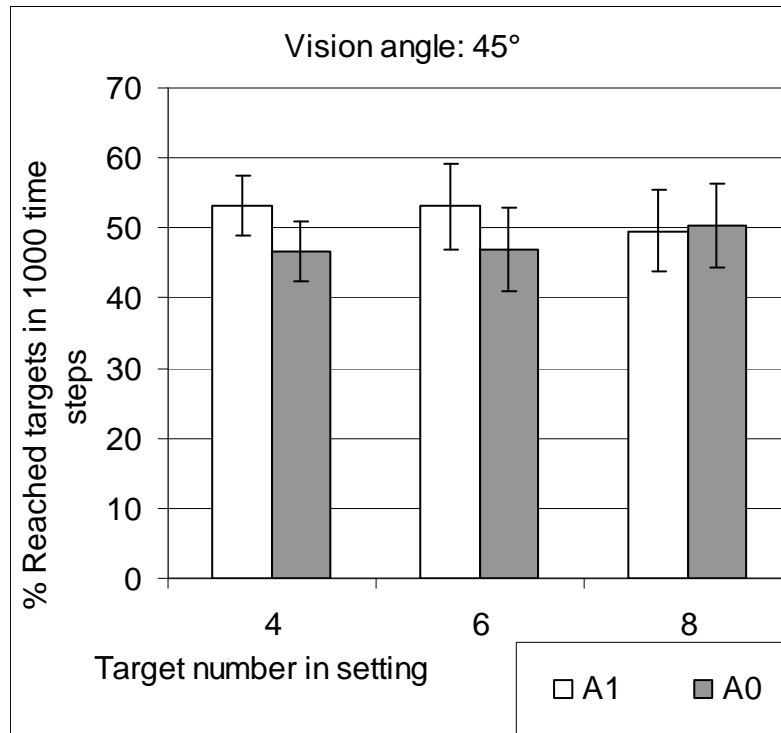
Dropping target



Keeping target

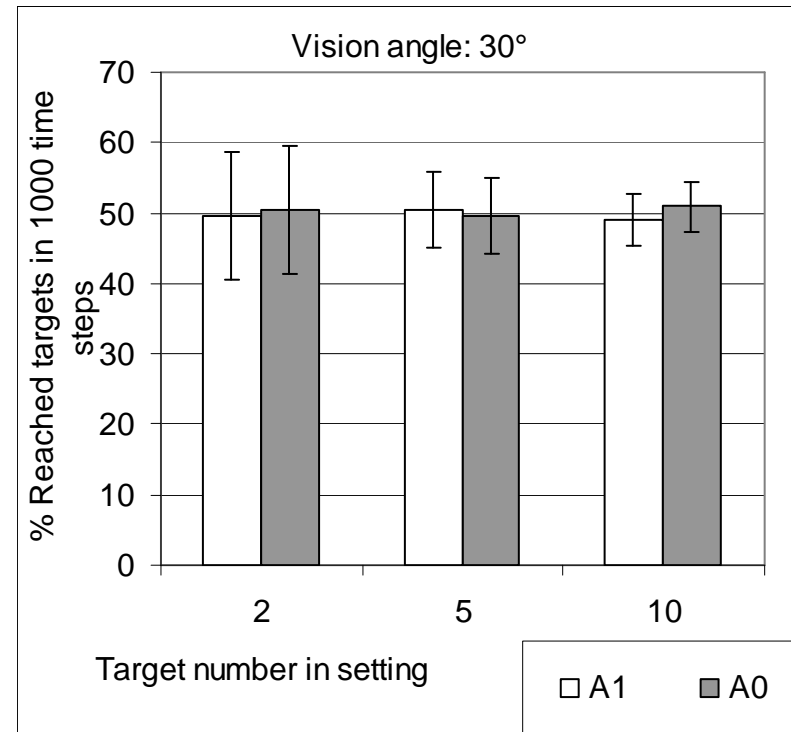
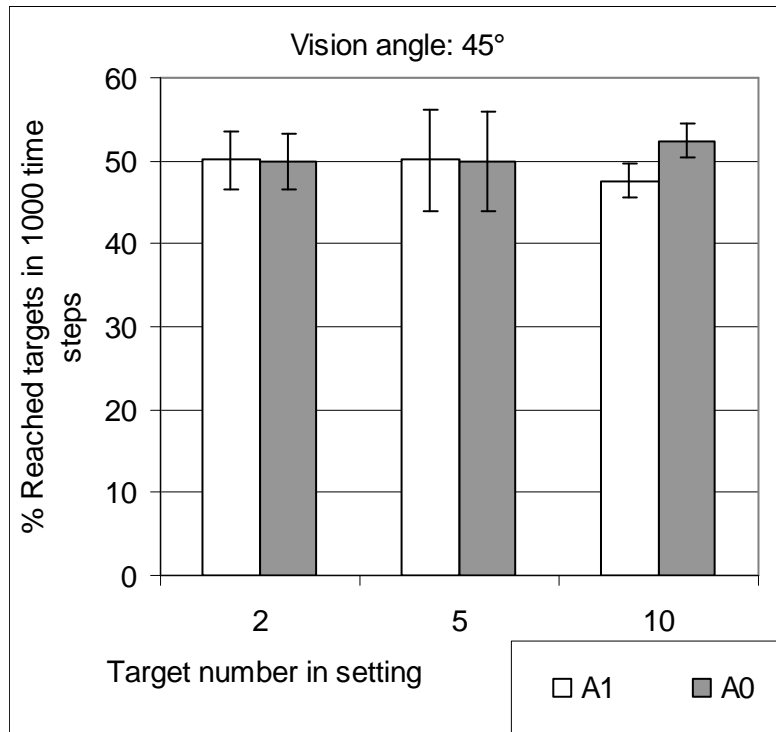


A1 has an advantage



No obstacle, vision length = 0.5, speed = 0.005

But not always significant



No obstacle, vision length = 0.3, speed = 0.025

Conclusion

- Main idea:
 - to ground the perception of agents and their actions into a simple geometric world that they share.
 - to use this knowledge to ground the perception of the state and intention of others
- Preliminary work.

To do next

- Direct interactions between agents: one wants to reach the other, the other one wants to escape.
- Possibility to create a safe place where the prey could escape.
- Introduce a variable for positive or negative feeling.
- Focus on the experience of being seen.