

Agents

There are 5 computing trends that lead us to the world of Multi Agent Systems:

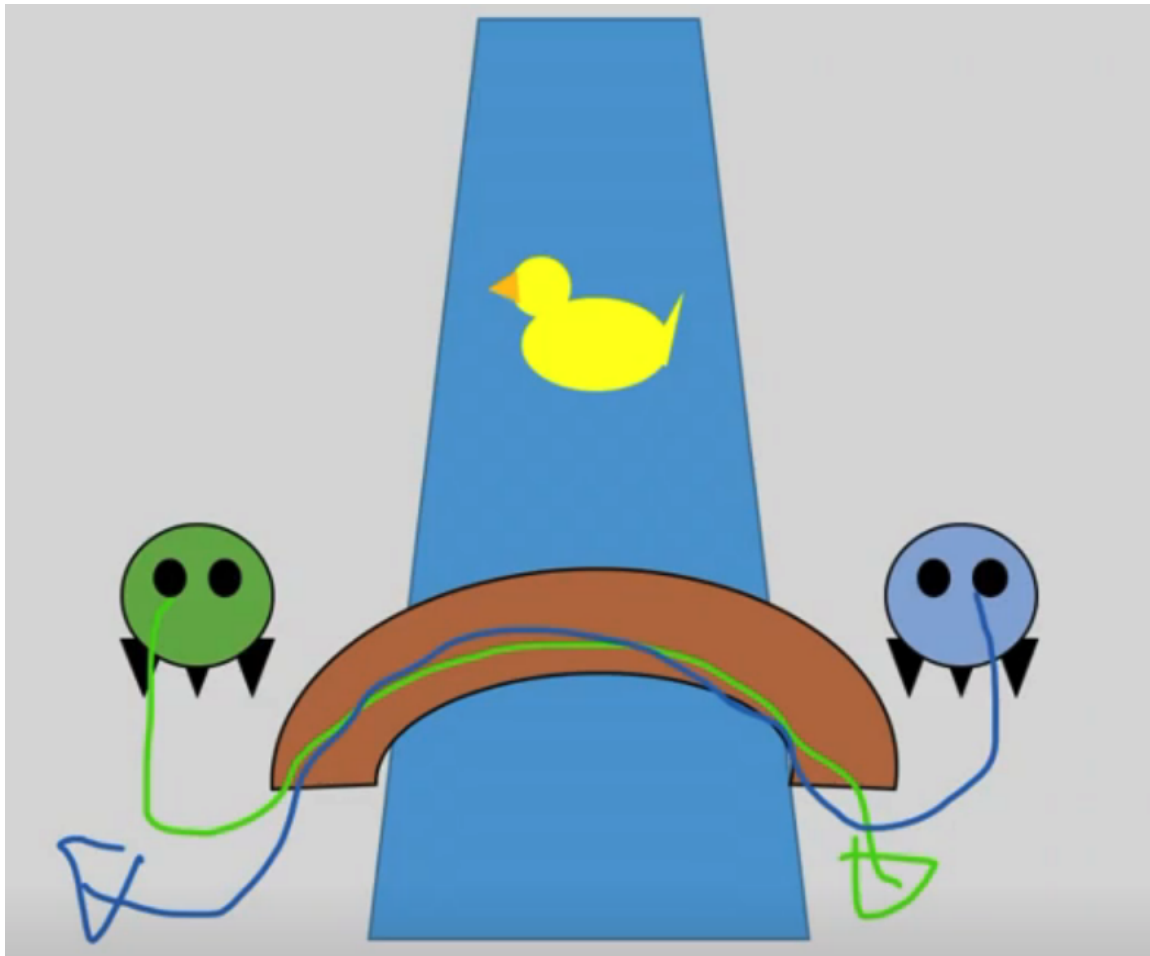
- Ubiquity
- Interconnection
- Intelligence
- Delegation
- Human Orientation

An agent is a computer system that is capable of autonomous action on behalf of it's user or owner.

A Multi Agent System consists of multiple agents which interact with one another.

▼ Example

Imagine we have two agents (green and blue) who are both told by their users they have to cross a bridge from opposite sides.



They are able to figure out their actions based on their goals. But they have a conflicting goal. They will need to negotiate, cooperate and coordinate to know who uses the bridge first, and for this they will need to interact.

There are two ways in which we can view the Multi Agent System's domain:

- Agents design: we must design an individual agent to complete a task (goal/agenda) in an autonomous and efficient way. How can we make it go from input to goal to action. That's the Agent Design Problem, or **Microproblem**.
 - Society Design Problem: how can we get agents to interact well. Also called the **Macroproblem**.
- ▼ MAS in relation to other fields of study

Other fields of study overlap with MAS, but there is a gap, something the other fields don't capture and MAS does.

- Distributed Computing: both have communication between nodes (agents communicating), but DC does not capture **strategy**. For example, in eBay, DC will not capture the strategic behaviour of bidders trying to get the best possible price, only their communication.
- Artificial Intelligence: we could claim something trying to pass the Turing Test is an agent. But AI looks at the individual aspect of this, so to **learn, perceive and solve problems**, but in MAS we want to **synthesise** them together as one.
- Game theory: both capture **strategy**, but GT does not take into account **computational concerns**. It doesn't think about the **finite resources** (memory and time) that MAS is filling.
- Social science: both study **interactions** between entities (humans, groups...) and have some kind of **society model**. However, **humans are not computational entities**. SC doesn't concern itself with interaction between computational entities.

▼ Applications of MAS

- Space probes are normally controlled by a ground crew, which is very costly, slow and inflexible. In 1990, NASA's DS1 probe was given some kind of autonomy, with goals and decision-making capability, lowering the load on the ground crew and making things more flexible.
- An agent can also search the internet on our behalf. It will require synthesis of input query, searching of the internet, synthesis of the gathered information, deciding if a query is answered and presentation of such information. This makes search engines and even virtual assistants (Alexa, Siri, Google Assistant) agents too.