

Supplemental ODD Document

This document shows the details of the ABM used in this experiment through a standard Overview, Design Concepts, Details (ODD) format.

1.1.1 Purpose

This ABM simulates the decision of a team tasked with making a decision based on limited information. It's purpose is to compare different cognitive models' abilities at making specific predictions.

1.1.2 State Variables and Scale

There are 9 attributes, each attribute has a value from 1-3, and the sum of all values determine the final value of the decision. There are 3 possible outcomes: a sum of 17 or less is friendly, greater than 19 is hostile, all other values are neutral.

There is a total of 9 agents, each agent takes 3 of the attributes as inputs in order to make a decision. There are 2 different ways workers can receive attributes, *blocked* or *distributed*. In the blocked model each agent sees a different set of attributes, no agent sees the same subset as any other, and each attribute is seen by 3 different agents. In the distributed access model groups of agents see the same attributes, but no group sees overlapping information.

There are no visualizations used in this model so scale is irrelevant.

1.1.3 Process Overview and Scheduling

Each tick represents an arbitrary amount of time where parameters are passed to agents, decisions are calculated, and results are checked to determine if we should change the agent's model. Time is used to measure the effectiveness of the learning of the model over time.

1.2 Design Concepts

- **Emergence:** The FCM that represents the cognition of an agent emerges through the development of the model.
- **Adaptation:** In each tick the current effectiveness of the FCM is evaluated, if necessary the FCM adapts randomly by adding or removing connections or weights to the FCM.
- **Fitness:** The Fitness is determined in the model by the learning threshold. If a model calculated a correct answer 80% of the time, it stays in memory.
- **Sense and Learning:** Agents learn by remembering model weights and connections that result in correctly identifying values based on inputs.
- **Prediction:** Agent's predictions are a result of the inputs being run through their current FCM based cognitive model.
- **Interaction:** Agents don't interact directly, but their decision output is added together to form a final result.
- **Collectives:** Individuals are grouped into 3 teams of 3 agents, the combined result of all team members results in the final decision for each tick.

- **Observation:** Observation is done by comparing the known result to the agent's guess of the result.

1.3 Details (initialization and inputs)

Each agent is initialized with the same FCM which has been shown to make predictions given the current inputs and expected outputs. To initialize the model all memory for the agents is empty. For each tick the inputs are randomly selected and input into the agents.

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	State variable and scale		There are 9 attributes, each attribute has a value from 1-3, and the sum of all values determine the final value of the decision. There are 3 possible outcomes: a sum of 17 or less is friendly, greater than 19 is hostile, all other values are neutral. There is a total of 9 agents, each agent takes 3 of the attributes as inputs in order to make a decision. There are 2 different ways workers can receive attributes, <i>blocked</i> or <i>distributed</i> . In the blocked model each agent sees a different set of attributes, no agent sees the same subset as any other, and each attribute is seen by 3 different agents. In the distributed access model groups of agents see the same attributes, but no group sees overlapping information. There are no visualizations used in this model so scale is irrelevant.
	Process overview and scheduling		Each tick represents an arbitrary amount of time where parameters are passed to agents, decisions are calculated, and results are checked to determine if we should change the agent's model. Time is used to measure the effectiveness of the learning of the model over time.
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