

# Sharing human mental model with an AI agent to achieve team effectiveness

## 1 Background

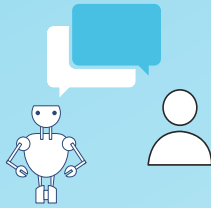


figure 1 : Human - AI robot communication

- Coactive design [1]
- Team performance
- Mental model

## 2 Shared mental model

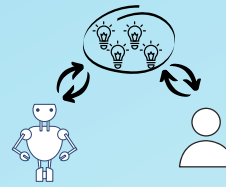


figure 2 : Human - AI shared mental model

"knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task, and, in turn, coordinate their actions and adapt their behavior to demands of the task and other team members"[2]

## 3 Components human can share [3]

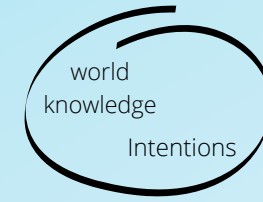


figure 3 : Shared mental model components

- World knowledge :**
- State of the world
  - State of an object
  - example : color / shape of the object
- Intentions :**
- Actions that relates to the tasks
  - example: picking a block and searching a room

**Hypothesis : the more information in the mental model is exchanged between the human-AI agent team, the higher the performance**

## 4 Experiment

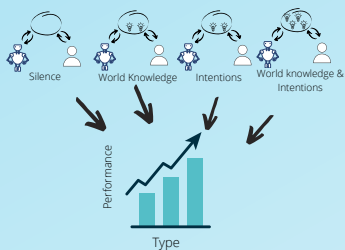


figure 4 : Information sharing during the experiment

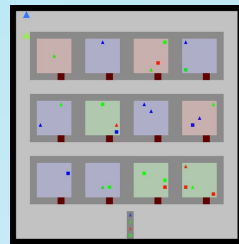


figure 5 : BW4T game

**Aim :** Deliver the blocks to the target blocks at the bottom of the map

- Measure the time taken in number of ticks
- Measure the number of messages from human
- Questionnaire about trust between human and agent.

## 5 Results

### Team effectiveness

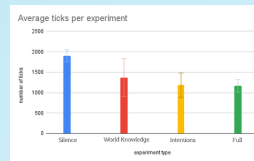


figure 6 : average and standard deviation of last tick per experiment

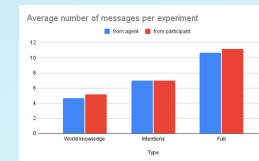


figure 7 : average number of messages per experiment

### Trust

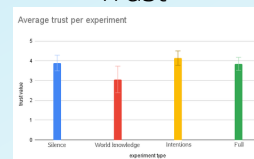


figure 8 : average and standard deviation of trust value per experiment

## 6 Conclusion

- The results showed a **positive** correlation between the increase of information shared and team effectiveness
- Also communication with insufficient information such as world knowledge only **lowers** the trust of the human in the agent
- **More participants** are needed to create a solid conclusion
- Participant's **strategy** affect the team performance
- **Intention** information sharing is speculated to be the best way for high team performance

[1] M. Johnson and A. Vera, "No ai is an island: the case for teaming intelligence," AI Magazine, vol. 40, no. 1, pp. 16–28, 2019.  
 [2] J. A. Cannon-Bowers, E. Salas, and S. Converse. Shared mental models in expert team decision making. In J. Castellan, N. John, editor, Individual and group decision making: Current issues, pages 221 (246. Hillsdale, NJ:Lawrence Erlbaum., 1993.  
 [3] M. Harbers, M. v. Riemsdijk, and C. Jonker, "Measuring sharedness of mental models and its relation to team performance," in Proceedings 14th International Workshop on Coordination, Organisations, Institutions and Norms, pp. 106–120, 2012.