Book of Abstracts

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Toward Agents with Switchable Emotion Understanding Ability

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Introduction: According to the theory of emotional intelligence, four psychological abilities that enable humans to relate emotionally to one another are: (1) emotion perception, (2) thought facilitation using emotions, (3) emotion understanding, and (4) emotion management. This research focuses on improving emotion understanding, the cognitive activity of making inferences using emotional knowledge about why an agent is in an emotional state (e.g., unfair treatment makes an individual angry) and, which actions are associated with the emotional state (e.g., an angry individual attacks others). For better results in an emotion understanding system, agents should avoid misunderstanding. Considering an athlete is crying after winning a match, an intelligent agent may infer that he feels extremely distressed instead of extremely joyful. Situation awareness is an important cognitive skill for intelligent agents. The failure to perceive a situation correctly –among other factors– may lead to misunderstanding. Since emotion understanding in intelligent agents is a subset of machine understanding, we can use solutions of machine understanding to resolve emotion misunderstanding problems.

Methods: Our approach is to use switchable understanding to enhance emotion understanding ability and avoid emotion misunderstanding in intelligent agents. A multi-understanding system can have more than one understanding of an entity. A switchable understanding is a multi-understanding system, which can explore different possibilities to generate different understandings of an entity and can select the understanding most appropriate fit for a context. In this study, we propose a framework of emotion understanding that combines psychological theories of episodic and semantic memories with the rich paradigm of switchable machine understanding. Our switchable emotion understanding framework consist of (1) multiple meta-models: episodic memory, which stores details of specific events and semantic memory, which stores "general knowledge," such as the similarity of emotions, (2) a perceptor to percept emotions and agents, and (3) an evaluator, which switches between these memories to result an understanding.

Results: We implemented our emotionally intelligent agents in an agent system in which agents interact with each other with the aim of making the other agents experience target emotions. Agents do not have any experience at the beginning of the simulation, but some had general knowledge (as semantic memory) about emotions. They collected emotional knowledge during their interaction with other agents. We compare single vision and switchable emotion understanding in intelligent agents. Single vision understanding is a type of machine understanding that is based on a single meta-model, single perception, and single evaluation. In this configuration, our framework uses only the episodic memory. We used the precision, recall, and F-score in information retrieval science for comparing single vision understanding and switchable understanding. Switchable understanding has better F1 and F2 scores, but single vision understanding has better F0.5 score. This indicates that recall of switchable understanding is better than single vision understanding but precision of single vision understanding is better than switchable understanding. On the other hand failure of understanding in switchable emotion understanding is lower.

Conclusion: In this paper, we compared single vision and switchable emotion understanding in intelligent agents. Our comparison showed that switchable emotion understanding has lower failing than single vision emotion understanding. The switchable emotion understanding switched between an episodic memory and a semantic memory when there is no understanding. But the single vision understanding only used an episodic memory and if it could not have an understanding, it failed. For future work we are planning to investigate other types of machine understanding as well as avoidance of misunderstanding. Approximately 60 sources of machine understanding and misunderstanding have already been identified.

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