

## Introduction

Empathy can be defined as a psychological process that makes a person have “feelings that are more congruent with another’s situation than with his own situation” [1]. Empathy plays a major role in human relationships. It is related to moral acts, like helping, caring and justice [2].

Empathy allows us to relate to others and understand their situation. Therefore, if we want to improve the human machine relationship it is necessary to define systems capable of generating relationships with users by means of empathy [3].

Empathy depends on various factors such as affective link, context, mood or personality [4, 5].

## Objectives

### General

- Create a computer system capable of performing credible empathic interactions with human users.

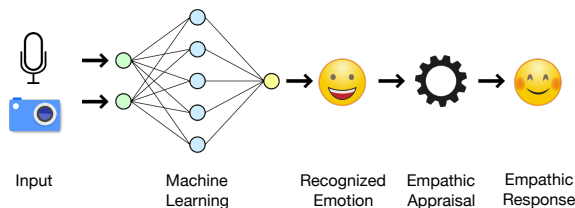
### Specific

- Define a computational model of empathy.
- Achieve plausible behavior through the modification of the internal characteristics of the agents.
- Incorporate this model into **GenIA<sup>3</sup>** (a general purpose architecture for affective agents [6]).
- Define two experiments: one to obtain the parameters that simulate empathy and other to test the proposed model.

## Empathic Agent Architecture

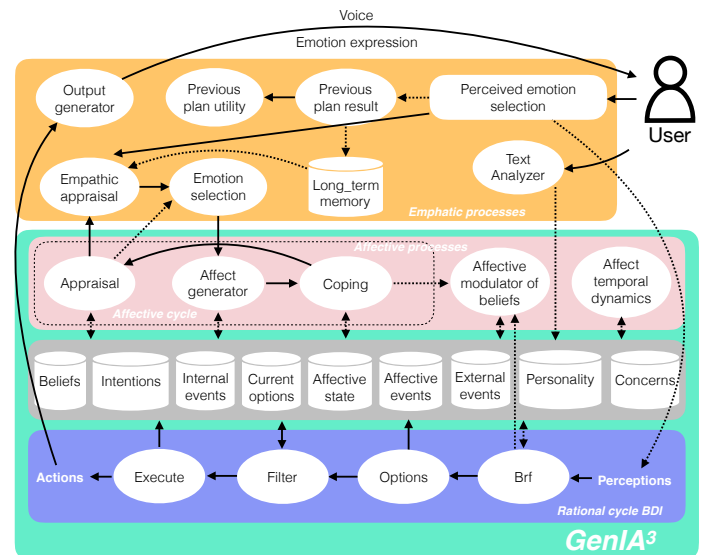
### To create an empathic agent it is necessary

- A multi-device **input** to capture different features like **voice**, or **face gestures** of the user.
- A **machine learning** algorithm to recognize the emotion by the input information.
- An **empathic appraisal** system to generate the **empathic emotion** and select the adequate behavior.



### Proposed Empathic Agent Model

- **Perceived emotion selection:** Selection of emotion with maximum likelihood.
- **Previous plan result:** The recognized emotion is used to determine if the executed plan was successful or not.
- **Previous plan utility:** Depending on the plan result, the plan utility is modified. This allows continuous learning and adaptation to cognitive user state.
- **Output generator:** Conversation and coping strategies.



- **Empathic appraisal:** Evaluates the recognized emotion based on the affective characteristics of the agent and produce an empathic emotion.
- **Emotion selection:** Depending on the level of empathy of the agent, the empathic emotion or the affective appraisal emotion is selected.
- **Long-term memory:** It produces in the user the feeling of being in a relationship with the agent that evolves over time.

## Expected results

- A conversational agent with empathy capable of interacting with humans.
- A computational model of empathy that lays solid foundations for future research.
- A validation of the computational model based on a experiment with humans.

## Possible applications

- Simulation of more credible agents.
- Treatment of autism in child therapies.
- Therapeutic assistants for the treatment of depression.
- Improvement of human companion systems.

## References

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- [3] Paiva, A., Leite, I., Boukricha, H., Wachsmuth, I.: Empathy in virtual agents and robots: A survey. ACM Transactions on Interactive Intelligent Systems (TiIS) 7(3) (2017) 11.
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