AI- Project

Concept document

Rishabh Manoj Suryateja

International Institute of Information Technology Bangalore

March 30, 2017

Outline

Introduction

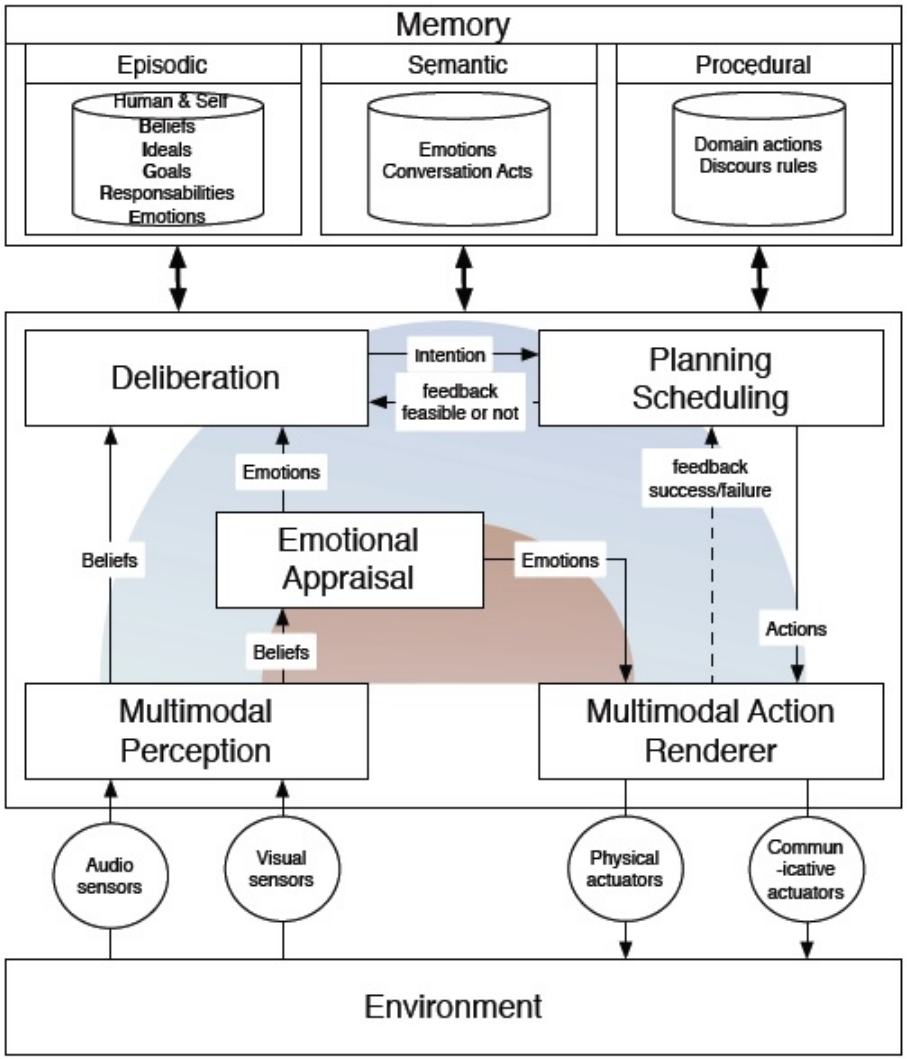
Human robot collaboration in industrial settings

- Robotics in industry
- Full Automation vs Intelligent automation (Collaboration)
- What is a robot model?
- A robot model primarily refers to the software framework for controlling the robot.

Goal Statement

- Formulating and Implementing a **Behaviour Dependant** and **Collaborative** robot model for robots in industrial settings.
- Behavior dependence refers to the adaptation of the robot to the human co-worker's behavior.
- Collaborative model refers to the robot models that consist of collaboration skills needed for effective team work as mentioned in [1]

CAIO Architecture[2]



CAIO Architecture[2]

- In CAIO architecture BIGRE model is used to decide the complex emotion that Emotional Appraisal module is supposed to output
- $\{$Belief, Ideal, Goal, Responsible$\} \rightarrow \{$Complex Emotion$\}$
- This model can output 12 emotions
- Example
- This Architecture has been implmented in python and has been tested on Nao Robot communicating using SWI-Prolog interface

Inclusion of Collaboration[1]

The following are some essential skills for the robot to work with a worker collaboratively[1]:

- Joint attention

Inclusion of Collaboration[1]

The following are some essential skills for the robot to work with a worker collaboratively[1]:

- Joint attention
- Action observation

Inclusion of Collaboration[1]

The following are some essential skills for the robot to work with a worker collaboratively[1]:

- Joint attention
- Action observation
- Co-representation

Inclusion of Collaboration[1]

The following are some essential skills for the robot to work with a worker collaboratively[1]:

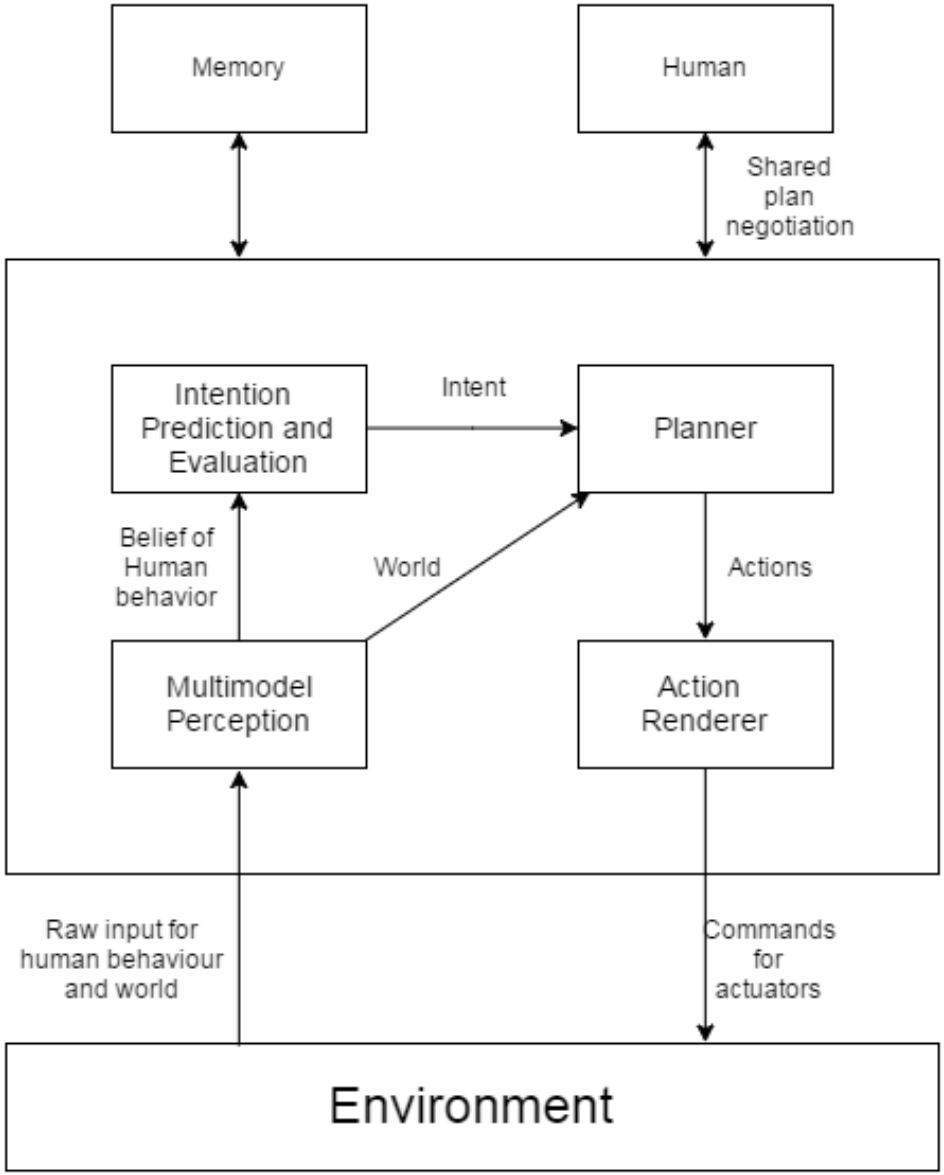
- Joint attention
- Action observation
- Co-representation
- Emergent coordination

Inclusion of Collaboration[1]

The following are some essential skills for the robot to work with a worker collaboratively[1]:

- Joint attention
- Action observation
- Co-representation
- Emergent coordination
- Planned coordination

Our Architecture



Technology

- The models have been implemented already in Python
- We will implement our architecture mostly in Python using SciKit, OpenCV etc.
- To render the actions into a robot, either Robot Studio or SWI-prolog will be used.

Milestones

Schedule Planning	
Date	Expected Work
24^{th} January, 2017	Implementation of Multimodal Perception in Python
1^{st} February, 2017	Implementation of Intention Prediction/Evaluation in Python
15^{th} February, 2017	Implementation of Planner in Python
21^{st} February, 2017	Implementation of Action Renderer in Python
10^{th} March, 2017	Rendering actions using ROS/SWI-Prolog/Robot Studio for a simple task
17^{th} March, 2017	First Draft Submission

References

Sandra Devin, Grégoire Milliez, Michelangelo Fiore, Aurélie Clodic, and Rachid Alami.
Some essential skills and their combination in an architecture for a cognitive and interactive robot.
arXiv preprint arXiv:1603.00583, 2016.

Sylvie Pesty.
Social human-robot interaction: A new cognitive and affective interaction-oriented architecture.
In *Social Robotics: 8th International Conference, ICSR 2016, Kansas City, MO, USA, November 1-3, 2016 Proceedings*, volume 9979, page 253. Springer, 2016.