

Human-Centered Interaction in Robotics

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Homework 02

Ungraded Task (only for self-study)

1. Explain briefly the ethno-socio linguistic model for communication in humans.
2. Name the components that constitute spoken dialog systems. What is the role of each of these components?
3. Explain the symbol grounding problem in robotics.

Task 1. Verbal and Nonverbal Behaviours (30%)

1. Comment on the nonverbal communication capabilities of TIAGo Pro, NAO robot and aibo robot. Focus on kinesics (facial expressions, hand gestures, body movements, eye gaze) and vocalics, from the production and consumption points of view. (20%)
 - Technical details of TIAGo Pro: <https://pal-robotics.com/robots/tiago-pro/>
 - Technical details of NAO: http://doc.aldebaran.com/2-8/family/nao_technical/index_naov6.html
 - Technical details of aibo: <https://helpguide.sony.net/aibo/ers1000/v1/en-us/contents/TP0001970140.html>
2. Represent the multimodal communicative behaviour shown in Figure 1 in the Behavior Markup Language format. (10%)

Note: You can assume that the human is standing in front of the robot and the robot only needs to lift up its head by a specific amount to gaze at the face of the human. You are free to set/tune the durations of each sub-behavior as you find appropriate/realistic.

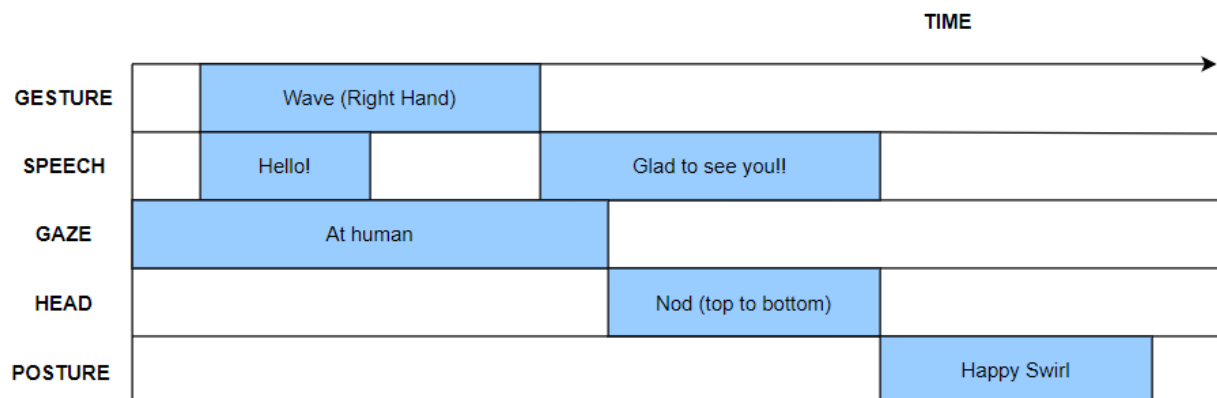


Figure 1: An example multimodal behavior.

Task 2. Realise Multimodal Behaviour on Pepper (45%)

In this task, you will use the qiBullet simulation tool to realise the multimodal behaviour shown in Figure 1. Please complete the following subtasks:

1. Specify the shown multimodal behaviour in the form of a dictionary in BML syntax. (10%)
2. Extend your source code from Homework #1 to realise the behaviour shown in Figure 1. (30%)
3. Add comments in your code to explain your logic. (5%)

Note: You can use the threading feature in Python to start behaviours simultaneously, if necessary. Remember to reset the agent to the default state after the execution of the given behaviour episode.

Note: Please refer to the software requirements specification uploaded in LEA along with the homework.

Submission:

- Along with your solution PDF, please upload the source code.
- In addition, please upload the screen recording showing the multimodal behaviour implemented on the Pepper robot.

Note: You do not need to insert and explain code snippets in your solution PDF.

Food for thought (ungraded): Did you observe any challenges while synchronizing the different modalities? If yes, what information could have helped you to plan and schedule the behaviours more efficiently?

Task 3. Incremental Dialog Processing (25%)

Read the paper (Skantze and Schlangen, 2009) and answer the questions given below:

1. What do you understand by "incremental dialog processing"? (5%)
2. How does incremental dialog processing support human-centeredness in interaction? (10%) [Hint: See Section 2 in paper]
3. In the example presented in the paper, how did prosodic analysis contribute to incrementality? (5%)
4. In the architecture for spoken dialog systems presented in the paper, why is TTS connected to Discourse Modeller? (5%)

Gabriel Skantze and David Schlangen. 2009. Incremental Dialogue Processing in a Micro- Domain. In Proceedings of the 12th Conference of the European Chapter of the ACL (EACL 2009), pages 745{753, Athens, Greece. Association for Computational Linguistics.

Note: The PDF of the paper is uploaded in LEA along with the homework.

Feedback:

Please answer the following:

1. How much time did you spend on doing this sheet per person? Anonymize your answer!
2. Was this sheet too easy / easy / ok / hard / too hard?
3. What additional resources (blogs, papers, books, tutorials, etc.) did you use? Please provide links or references.
4. Did you face any issues while solving this sheet?

Submission Procedure:

Upload the PDF of your solutions and the relevant source code files in LEA as a single Zip archive. For the naming convention for your submission, please follow the instructions under Course Rules in LEA.