

Homework 01

Ungraded Task (only for self-study):

1. Explain the difference between the three levels of collaboration – coexistence, cooperation and collaboration. Give 2 examples for each level from robotics.
2. What do you understand by the term “autonomy” in robotics?
3. How does the two-dimensional, human-centered view of autonomy presented in the lecture differ from the traditional Sheridan-Verplank view of autonomy?

Task 1: Human-Centered Interaction in Robotics (21%)

- 1.1 Give an example of a human-robot interaction scenario. (5%)
- 1.2. Discuss any four human-centered aspects of interaction between humans and robots in the above scenario. (16%)

Task 2: Robot Autonomy v/s Human Control (24%)

Read the following paper carefully:

Ben Shneiderman (2020) Human-Centered Artificial Intelligence: Reliable, Safe & Trustworthy, International Journal of Human–Computer Interaction, 36:6, 495-504, DOI: 10.1080/10447318.2020.1741118

Imagine that you are designing a robotic wheelchair for people with mobility impairment.

Consider the 2D framework of robot-autonomy and human-control presented in the above-mentioned paper and answer the following questions:

2.1. Give an example of a robotic wheelchair design for each of the following categories (8%):

- a) low robot autonomy + low human control
- b) low robot autonomy + high human control
- c) high robot autonomy + low human control
- d) high robot autonomy + high human control

2.2. Explain the pros and cons of each design you mentioned above (16%).

Task 3: Reading – Human-Robot Interaction (HRI) (15%)

Read the following paper and write a scientific summary in 300 - 500 words.

P. Vogt et al., "Second Language Tutoring Using Social Robots: A Large-Scale Study," 2019 14th ACM/IEEE International Conference on Human-Robot Interaction (HRI), 2019, pp. 497-505, doi: 10.1109/HRI.2019.8673077.

Please note that this task would help you in completing Task 4

Hint: You can check the following articles for tips on how to write scientific summaries:

<https://www.lib.sfu.ca/about/branches-depts/slc/writing/sources/summarizing>

https://writingcenter.uconn.edu/wp-content/uploads/sites/593/2014/06/How_to_Summarize_a_Research_Article1.pdf

Task 4: Classify HRI Study (25%)

4.1 Apply the taxonomy developed by Onnasch and Roesler to describe the experimental condition "1) Robot with iconic gestures + tablet" in Section II C. of the paper that you read in Task 3 (10%).

4.2 Explain your choice of categories (15%).

Note: Please use the HRI canvas provided in supplementary materials. Fill this canvas and submit it along with your solution PDF. If you have trouble in editing this file, then you can provide your answer directly in the solution PDF. However, explanations for your choice should be written in the solution PDF.

Task 5: Realize Behaviors on Pepper (15%)

In this task, you will use the *qibullet* simulation tool to complete the following subtasks:

1. Implement a behaviour that enables Pepper robot to speak a given text. (5%)
2. Implement a waving gesture on Pepper robot. (5%)
3. Add comments in your code to explain your logic. (5%)

Submission:

- Along with your solution PDF, please upload the source code that you have written or used for solving the task. You do not need to embed code snippets in the solution PDF. But you should comment your source code appropriately.
- Please also upload the screen recording demonstrating the above behaviours on Pepper.

Instructions to install and use qiBullet and Pepper robot simulation:

- To install and use qiBullet, please follow the instructions and examples provided in this github repository: <https://github.com/softbankrobotics-research/qibullet>.
- See also the tutorial at <https://github.com/softbankrobotics-research/qibullet/wiki/Tutorials:-Virtual-Robot>.
- For the names of Pepper's joints, see here: https://github.com/softbankrobotics-research/qibullet/blob/master/qibullet/robot_posture.py.
- A skeleton code has been uploaded in LEA to help you with loading and connecting to Pepper in qibullet.

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.