

COMP 150: Developmental Robotics
Homework 3
Due Monday, Dec 11th

Pick 3 of the following questions. Your answers should be at least 2-3 paragraphs long.

1. In class, we discussed how a robot can use different sensory modalities to recognize different object properties. For example, a robot learned that the haptic modality can be useful for perceiving an object's weight while the auditory modality may be useful for perceiving an object's material. The robot, however, did not relate one sensory modality to another and used them independently instead. How may you go around enabling a robot to discover relationships between different modalities? What kind of possible relationships are there?

2. In one of the readings and lectures, we discussed a robot learning words that humans use to describe objects. What are some linguistic / semantic concepts that may be useful for a robot to learn? What kind of interaction would a robot need to perform within its operating environment to learn them? What would the interaction with humans look like?

3. Summarize the main points of O'Regan and Noë's theory. What aspects of their theory do you like the most? The least? How does that theory inform robotics (or does it)?

4. Human beings do not learn complex tasks from scratch and instead, learn via a curriculum that may be formal (i.e., school) or informal (i.e., a progression of more complicated environments as we grow older). Describe something that a robot may need to learn to operate in human environments (e.g., a concept, a motor skill, an affordance, etc.) and sketch out a curriculum for learning that task. How would you structure the robot's environment in ever more complex ways to make learning the task easier?

5. Find a published research article in robotics that is related to your project. Summarize its main contributions, experimental setup and evaluation, and results. Then discuss the limitations of the proposed approach / methodology. How may some of those limitations be addressed in future work? Make sure to include the citation to the article along with a link to it in your answer.

6. Consider the three articles on human language learning assigned in the readings. Pick an aspect of human language learning described in one of them and sketch out a roadmap for how a robot may try to model that aspect. What kind of data would you need? How would the robot's embodiment affect what is learned? How could a human teacher help?