Course Introduction

AI-based HRI

2024 Fall Semester

Lecturer Information

Hyemin Ahn (안 혜 민, 安 惠 旻)

- Assistant Professor (2022.05 ~ Present)
  - AI & Human-Robot Interaction Laboratory, AIGS, UNIST.
- PostDoc. Researcher (2020.04 ~ 2022.04)
  - Human-centered Assistive Robotics (HCR) Group, TUM, Germany
  - Institute of Robotics and Mechatronics, DLR, Germany
- MS/Ph.D. Integrated Course (2014.03 ~ 2020.02)
  - Robot Learning Laboratory, Seoul National University.
- Bachelor Course (2010.03 ~ 2014.02)
  - Department of Electrical Engineering, Seoul National University.
- https://hyeminahn.oopy.io, https://sites.google.com/view/ahri-lab

Course Objective

Learn low-mid-high level (non-AI) knowledge for Robotics

Apply your AI, ML, DL knowledge to Real Robots

Syllabus

Mon, Wed
2:30-3:45 pm

1	2024/09/02	월	Course Introduction
	2024/09/04	수	What is interaction? & Basics of AI/ML/DL.
2	2024/09/09	월	(High Level) How to model and infer human intention
	2024/09/11	수	(High Level) How to learn from humans
3	2024/09/16	월	**Choo-Seok**
	2024/09/18	수	**Choo-Seok**
4	2024/09/23	월	(Mid-Level) Trajectory Optimization in Robotics
	2024/09/25	수	(Mid-Level) Trajectory Optimization in Robotics
5	2024/09/30	월	(Mid/Low-Level) (Kalman) Filters / Odometry / Object Tracking / ....
	2024/10/02	수	(Low-Level) Introduction to Kinematics [Forward]
6	2024/10/07	월	(Low-Level) Introduction to Kinematics [Inverse]
	2024/10/09	수	**한글날 / [Online] (Low-Level) Introduction to Robot Control**
7	2024/10/14	월	**No class due to IROS**
	2024/10/16	수	**No class due to IROS**
8	2024/10/21	월	(Low-Level) Introduction to Robot Control
	2024/10/23	수	**Midterm** **(Proj. group will be based on the midterm score, making mean score similar with others)**

Syllabus

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2:30-3:45 pm

9	2024/10/28	월	(Hardware) Motor Control
	2024/10/30	수	(Hardware) Motor Control
10	2024/11/04	월	(Hardware) Custom Robot Assembly
	2024/11/06	수	(Hardware) Custom Robot Assembly
11	2024/11/11	월	(Ideation) Project Team List Release / Designing HRI [Team Project in Class]
	2024/11/13	수	(Ideation) Designing HRI [Team Project in Class] -> Finalize Idea!
12	2024/11/18	월	(Software) ROS2 + alpha
	2024/11/20	수	(Software) ROS2 + alpha
13	2024/11/25	월	(Software) ROS2 + alpha
	2024/11/27	수	(Software) DL Algorithms (YOLO)
14	2024/12/02	월	(Software) DL Algorithms (Whisper + LLMs)
	2024/12/04	수	(Application) Direct Communication between Human and Robot
15	2024/12/09	월	(Application) Indirect Communication between Human and Robot
	2024/12/11	수	(Application) Physical HRI
16	2024/12/16	월	Team Project Presentation
	2024/12/18	수	Team Project Presentation
-	2024/12/23	월	Final Project Report Deadline
	2024/12/25	수	

What we would expect to each other

What students can expect from the lecturer:

- Teaching background knowledge about robotics.
  - From Perception (high-level) to Control (low-level).
- Teaching how to control real actuators ~~(Dynamic Cell~~ DYNAMIXEL).
- Teaching how to assemble custom robot manipulator.
  - Actuator + 3D Printing.
  - Materials will be provided in the class).
- Teaching how to control that custom robot with ROS2.
- Teaching how to apply recent AI on that robot.
- Showing example HRI application on that robot and advise how to do relevant research.

What we would expect to each other

What lecturer expect from students:

- Familiar with Python & Pytorch.
- Have background knowledge about AI, ML, DL.
- Familiar with mathematics for engineering.
    - Calculus, linear algebra, probability… + alpha
- Must bring laptop with Ubuntu (try install it in parallel) after mid-term.
- Avoid any absence.
    - It is difficult to follow up next class if you miss the one.
- Be ready to work with strangers in team project.

Expected Background knowledge will not be covered in the lecture.

Grading System

- Attendance: 10%
  - Absence more than quarter of lectures brings you F.
- Mid-Term : 30%
- Project: 60%
  - Presentation: 30%
    - 15% Peer review
    - 15% Lecturer review
  - Report: 30%

How to contact lecturer

- There is no TA in the course.
  - Please contact the lecturer directly for “important issues”.
    - hyemin.ahn@unist.ac.kr
- Please use the Blackboard system for announcement & materials.

Any Questions?