BLG 456E
2021-2022 Fall
Projects

Guidelines

- Start Date: 8.12.2021
- Proposal Submission: 17.12.2021
- Last Submission Deadline: 12.01.2021, before class
- Presentation: 12.01.2021

Timeline For The Project

- Form groups of 3-4 people
  - Use message board to find a group or a group member
- Submit a proposal
  - Fill the Project Proposal Form with Project Topic, Timeline, Project Description and Tasks of the Group Members
- Receive a response from Abdullah Cihan AK, alter your project and continue
- Finish the Project by the Deadline
- Prepare a Video with Commentary(**Subtitle** or Voice)
- Make a 5-minute Presentation
- (Optional) Share your video with people
- (Optional) Get famous

Answers to FAQ about Group Size

- You are expected to form a group of 3 or 4 students.
- If you are confident enough that you can manage the Project with smaller size than 3-4, you may form a group with less members. This includes doing it individually. But it is not recommended because you would get under a burden of workload that was expected to be distributed among 3-4 people.
- Use Ninova message board to find additional group members or to find a group.
- If you want to form a group with more than 4 people, yes you may. But the expectation from the Project from such a group would increase. Make sure you can distribute everyone a robotic related and meaningful task. If not a random member can be moved into another group until 4 members left.
- If you could not find a group, you may be included into a random group.
- If you have formed a group with less than 4 people, a random student may be assigned to your group. (Priority lower number of group members)

Proposals

- Every group member needs to work on a robotic problem.
- State the problem. State the subproblems and assign group members
- Some examples (ROS)
  - Mobile Platforms
  - Multi Robot Systems
  - Robotic Arms
  - Robotic Hands
  - Humanoid Robots
  - Designing you own Robots
  - Social Robots
- Important: There are many robot platforms available in ROS. If you decide to use one, get used to it as early as possible.
- You can find different robots that would fit to your project using the following website. Use this website to search available platforms using tags and categories.
- https://robots.ros.org/
- You can use any simulation with any robot with any ROS, Linux distribution.

Proposals

- Keywords
  - Mapping, Trajectory generation, Trajectory following, Task allocation
  - Object Manipulation, Tabletop scenerios, Two arm manipulation
  - Sensing: Object Detection(position, type, sizes etc.)
  - Robot Execution: Manipulation with robotic arm(MoveIt),
- As a team, watch robot videos to get inspired
- At first think about a robot that you would like to have in real life (ie: ROVER)
- Do a little research to find similar applications (ie: Curiosity)
- Find the concepts you require (ie: Mapping, Trajectory generation and Following, Object Detection, Object Manipulation)
- Simplify and implement
  - Design a Rover, Detect rock, Pick rocks, Revisit the location to get more sample

Environments

- Simulations
  - Gazebo
  - Pybullet
  - CoppelliaSim
  - And more
- Real Robots (if you can find one)
- Arduino robots can be built and used in the Project if you are interested but you should think out of the box, I am tired of line following robots and sumo robots. Also it would be hard to work on such systems remotely as a group. I would not allow any such Project that does not have a solid proposal.

Example 1: Packing with a Robotic Arm

Packing with a robot using the colors of the objects. Red objects to Box1…

- Cihan#1
  - Designing a robot arm
    - Generate URDF
    - Define Controllers and Parameters
    - Tests
    - Video Duties
- Cihan#2
  - Using the robot arm
    - Use MoveIt
    - Goal Position Move
    - Swipe Behaviour(alt. Pick and Place)
    - Tests(with the new arm or UR5)
    - Presentation Duties
- These are not robotic tasks
- Cihan#3
  - Perception
    - Object detection using robot camera
    - Tests
    - Presentation Duties
- Cihan#4
  - High Level Planning and Testing
    - Get Perception Results
    - Use Goal Position Move and Swipe Behaviour on objects
    - Tests on the scenario
    - Video Duties

Example 2: Vaccuum Robots

A robot that autonomously maps the environment and traverse every location

- Cihan#1
  - Autonomous Mapping
    - Search Until Map is Full
      - Find Locations to seach and move
    - Tests
    - Video Duties
- Cihan#2
  - Localization*
    - Write your own Odometry
    - Test own Odometry
    - Write your own Localization using Map
    - Test own Localization
- These are not robotic tasks
- **Learning?**
- Cihan#3
  - Perception
    - Detect Dynamic Objects(Cylinders Walking) using Camera or Laser Scanner
    - Make robot to avoid collisions(Local Planner)
    - Tests
    - Presentation Duties
- Cihan#4
  - Trajectory Generation and Testing
    - Create Trajectory to traverse everywhere
    - Make robot to follow the trajectory
    - Test various approaches (traverse time, optimality of the trajectory generation)
    - Tests on the scenario

Evaluation

- Project Management (~%25)
  - Proposal
- Completeness of the Project (~%50)
  - Individual Tasks and Their Tests
  - Whole Task and Test
- Presentation and Video (~%25)
  - Did you state the problem well
  - Did you show, describe your approach well
  - Did you show tests and the results
  - (Optional to get Famous) Is your Project, Presenatation and Video cool???
- If you find and use approaches from academic papers you can get extra credits.