

Multidisciplinary Senior Design Project Readiness Package

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Project Title	Gesture Based Autonomous Robot
Project Number	P20001
Primary Customer	Student Project Team
Sponsor	
Faculty Champion	
Other Support	
Project Guide	To be assigned by MSD; Carlos Barrios requested
IP Considerations (must pick one)	a) IP assigned to [organization] b) Limited use agreement to allow [organization] to use outcome, team retains ownership c) Team retains ownership, no additional requests for use d) Client requires result to be placed in the public domain

Each section contains a brief explanation to help you complete the form. Please remove any gray text before submitting.

When complete, please submit this document through our online form, located at <https://goo.gl/forms/J3G8G2jhTUFuJCYe2>

Project Information

Overview

In this project, the problem being addressed is using alternative forms of communication to interact with robots. The goal is to create a robot that can process user-gestures (e.g., sign language) to perform tasks that the user may not be able to complete on their own. For this project, the robot will be designed to understand a gesture that indicates to the robot to pour a glass of water. The short term goal of this project is to be able to detect one specific gesture and have the robot do one simple task: pouring a cup of water. In the long-term, this project could support programs such as those that advance medical care and quality of life for those in assisted living.

The main purpose of this project is to create a robot that will pour a glass of water after the user does a certain gesture. The robot will stand idly by at its docking station until it is activated. Upon activation, the robot will recognize a specific gesture that will indicate to it to perform its task of pouring water.

The robot will function by using path mapping with object collision sensors and image recognition software. When the robot becomes active, it will immediately scope the area for the cup. After the robot has detected this object, it then waits for a specific gesture before performing the task. The robot will then perform environmental mapping using both image processing and collision sensors to create the best path towards the user. This path will be stored in memory so that it can take the same path back to the dock. When the robot reaches its destination, it will then pour the correct amount of water based on water level sensors that the robot has. After this task has been completed the robot will then return back to its docking station.

Part of the project is to design and create the robot. Because the robot is not on hand it does not know how to execute the pouring function. Because the robot is going to be made from scratch the budget can be a little tight. Additional funds from grants or other companies will be sought out for this project. There are no requirements for the software platform of the robot.

Final software and mechanisms can be flexible after engineering team has decided if the project is plausible within the time frame.

This project should consist no more of 5 team members: 3 EE (w/ Robotics Option), 1 Micro E, 1 ME.

Preliminary Customer Requirements (CR)

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- Does proper image detection
 - Robot recognizes the correct gesture
 - Robot moves to correct location without colliding
 - Robot does task correctly
 - Robot moves back to dock station correctly

Preliminary Engineering Requirements (ER)

- Robot will run off of 12V, 3A rechargeable battery
- Robot will recognize gesture after 2s of being activated
- Robot will move at a max rate of 1 mps
- Robot will pour water into empty cup until full
- Robot will fit in a 1ft by 1ft blueprint

Constraints

There are 2 major limits to this project. The first major issue would be how software intensive this project will be. The main concern comes from our lack of experience with real time image based processing. The second major issue would be the budget constraint because the \$500 limit will not be enough.

Project Deliverables

Minimum requirements:

- All design documents (e.g., concepts, analysis, detailed drawings/schematics, BOM, test results)
- Working prototype
- Technical paper
- Poster
- All teams finishing during the spring term are expected to participate in ImagineRIT

Budget Information

Include total budget, any major cost items anticipated, and any special purchasing requirements from the sponsor(s).

Intellectual Property

The student team expects to retain rights to any intellectual property generated by the team.

U.S. Citizenship

No restrictions indicated.

Travel Opportunities

None indicated.

Project Resources

Anticipated Student Staffing by Discipline

Please provide a brief explanation of the expected activities for each required discipline. This information helps us assign appropriate staffing. If you have identified team members already, list their names here. "Other" includes students from any department on campus besides those explicitly listed (e.g., Design, Business, Software Engineering, Civil Engineering Technology).

Department	Expected Activities
Biomedical Engineering	
Computer Engineering	
Electrical Engineering	Sensor Creation; Software Creation; PCB Creation
Industrial & Systems Engineering	
Mechanical Engineering	CAD Designs and Full Assembly
Other	

Required Resources

Describe the resources necessary for successful project completion. When the resource is secured, have the responsible person initial and date to acknowledge that they are aware and agree. We assume that all teams with ME/ISE students will have access to the ME Machine Shop and all teams with EE students will have access to the EE Senior Design Lab, so it is not necessary to list these. Limit this list to specialized expertise, space, equipment, and materials.

Faculty	Carlos Barrios - EE; Dr. Monteiro - Software
Environment	SMD Lab; Senior Design Lab; ME Shop
Equipment	Multimeter, Power Supplies, Oscilloscopes
Materials	IC Chips, Metals for frame, nuts and bolts etc...
Other	