

FAMU/FSU College of Engineering

Department of Electrical and Computer  
Engineering

Customer Needs

Team 315

Control Module/Interface for Service Robots

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## Needs

- Design control module
- The control module will be placed into a pre-built existing robot
- The control module will be dynamic and allow usage with different robots
- Robot will be able to detect obstacles
- The control module will interact with different types of cameras for obstruction detection
- Decision left to be made by SD team to determine response time of control module, research and physical testing required
- Decision left to be made by SD team to follow user outside of predefined area
- Robot will follow the person by tracking their phone
- Robot will follow the user unless physically incapable
- Control module will be powered by battery
- Decision left to be made by SD team to determine what hardware to use

## Customer Statements

- Are we designing a robot or just a control module?
  - Just control module
- Does the robot need to follow the user outside of the predefined area?
  - Up to the team to decide – robot will follow the user unless physically incapable
- How does the robot follow the person, a proprietary device or mobile app?
  - The robot follows the person by tracking their phone and using Cameras and image recognition software to detect obstacles
- What systems does the robot use for detection?
  - The control module must be able to interact with different types of cameras for obstruction detection
- How should the robot move?
  - The control module will be placed into an already existing robot, this falls outside our scope

- Physical limitations?
  - Control Module must be able modular to allow usage with different robots
- What is the Maximum response time of our control system?
  - Up to the team to decide - research and physical testing required
- How will it be powered?
  - Control module will be powered by robot it is being used by
- What hardware will be used for control systems?
  - Up to the team to decide - raspberry pi or another small portable computer
- How do Users interact with robot?
  - Users interact using a mobile phone app
- What safety percussions are necessary?
  - Up to team to decide – robot can not cause any damage to objects or environment, will notify user of any problems while running, will attempt to maneuver around obstruction, if possible, otherwise it will stop and enter standby mode.

Other Needs given without direct question:

- Figure out how to send commands to system
- For interacting with different cameras possibly use C.A.N. BUS Protocol
- Needs to follow
- Notify user if unsafe to follow

## Explanation of Results

Customer statements were gathered through a Q&A meeting where the team asked the above questions. Customer prefers team to answer their own questions and then comment on solutions. Project is a standalone control module that will interface with a robot's camera and motors. The module must be generic enough to work with different robots. The module will be able to detect obstructions and path around them. If the algorithm determines there is no safe path, then it will stop moving, enter standby, and notify users of the situation.

## Needs with Design Solutions and Alternatives

- Design control module
- The control module will be placed into a pre-built existing robot
  - Control module can take the form of a raspberry pi or other microcontroller, including camera or LIDAR input
- The control module will be dynamic and allow usage with different robots
  - Software can detect device drivers to interact with multiple types of motor systems
  - Control module can require specific components
- Robot detects obstacles
  - Can use cameras
  - Can use LIDAR
- The control module will interact with different types of cameras for obstruction detection
- Decision left to be made by SD team to determine response time of control module, research and physical testing required
- Decision left to be made by SD team to follow user outside of predefined area
- Robot will follow the person by tracking their phone
  - Robot will use the control module Bluetooth connection with the mobile app to determine distance to follow
  - Can use GPS location from mobile app
- Robot will follow the user unless physically incapable
  - Can use obstruction detection to identify who to follow
  - Can use GPS along with rail system
- Control module will be powered by battery
  - It's a battery
  - Can utilize a solar panel
- Decision left to be made by SD team to determine what hardware to use