Thirty Gallon Robot, Navigation Component
Team FEAT

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Team Members:
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FEAT

Robots in Academia

- Not well funded and not affordable
- Toolset is not wide enough
  - Proprietary software and hardware
- Difficult to implement, compatibility wise

Michael Leverington

- Educator at heart
- Longtime developmental goal with this project
- Access to numerous resources
  - Create 3 robot by the Roomba creators
  - Multiple sensors and actuators
- Working to further the educational opportunities in Computer Science

Available Resources

- In the some of the past attempts previous groups lacked a functional robot
- Other groups had a homemade robot that has since broken down
- We have access to the Create 3 as opposed to a homemade platform
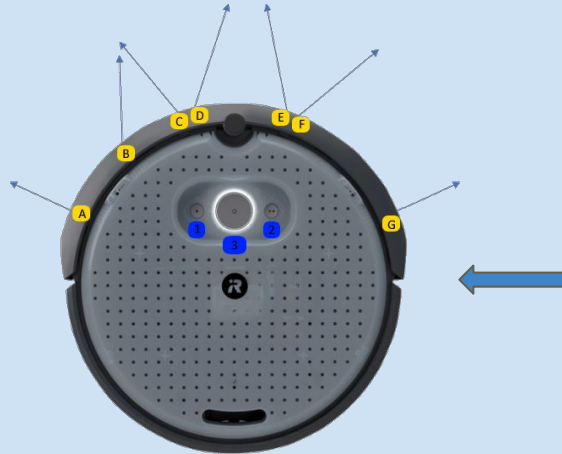
Problem Statement

- Combine sensors and actuators from a robot to demonstrate a self localizing navigation system
  - Must be modular and robust
- Prove to be modular with other sensors/actuators and environments
- Provide a simple program that guides a tour through a building

Self-Awareness + Modularity + Practicality

Solution Overview

- Using a required robotics operating system (ROS2), develop mapping functions, mobility, safety, and self localization functionality
- Compatible with differing sensor types
  - Actuators will depend on odometry accuracy
- Programmable with dependency on navigational components
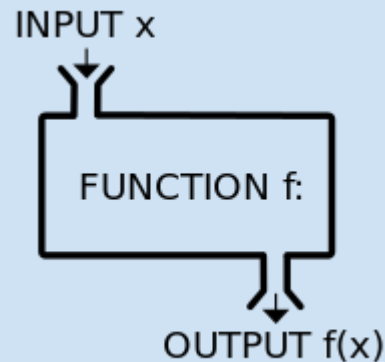
Key Requirements

- Robot Description
- Map Generation
- Navigation System
- Auxiliary Triangulation
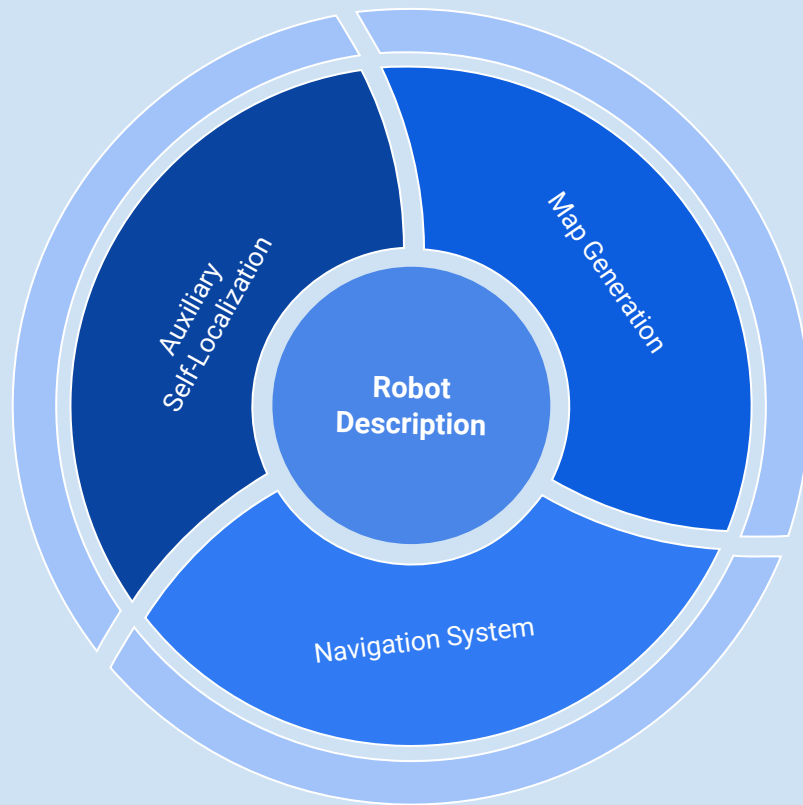
Functional Requirements
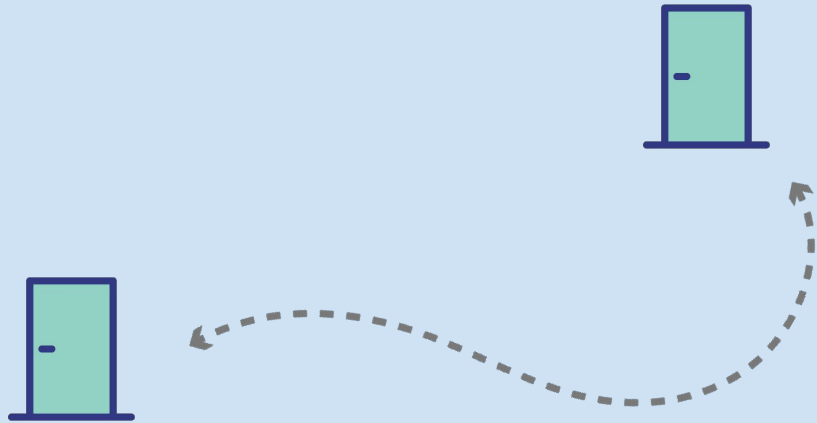
Map Generation:
- Robot will be able to map the entire floor:
    - A coastal navigation function used to draw a map of the floor
    - A function that will read sensor input

Performance Requirements

Navigation System:
- Generating the route in which the robot will take is dependent on user input of coordinates.

HOW?

Environmental Requirements

Auxiliary Self-Localization:
- For the purposes of this project, we are going to limit our scope to the list of routers available at NAU .

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Risks and Feasibility

- Sensor compatibility
  - Lidar input greatly differs from our standard IR sensors
- Odometry dependant
- Technical issues with wifi connection abilities
- Size and mobility differences between robots

Wifi

None

Google Wifi

Username: None

Password: None

Login
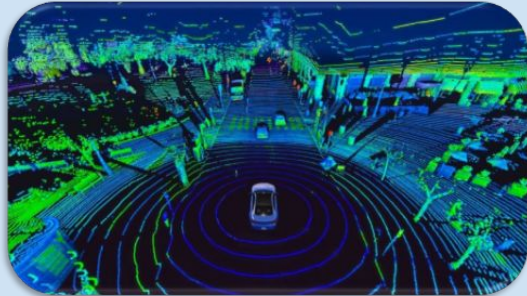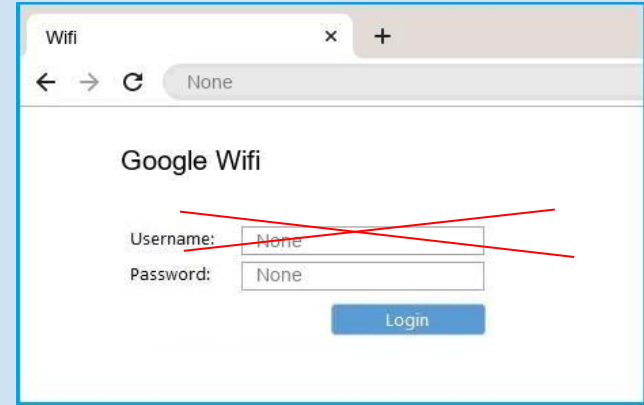
Lidar

IR

Project Organization

- Client Meetings
    - Thursdays: 4:00 PM - 5:00 PM
- Mentor Meetings
    - Thursdays: 5:00 PM - 6:00 PM
- Team Meetings
    - Thursdays: 6:00 PM - 7:00 PM
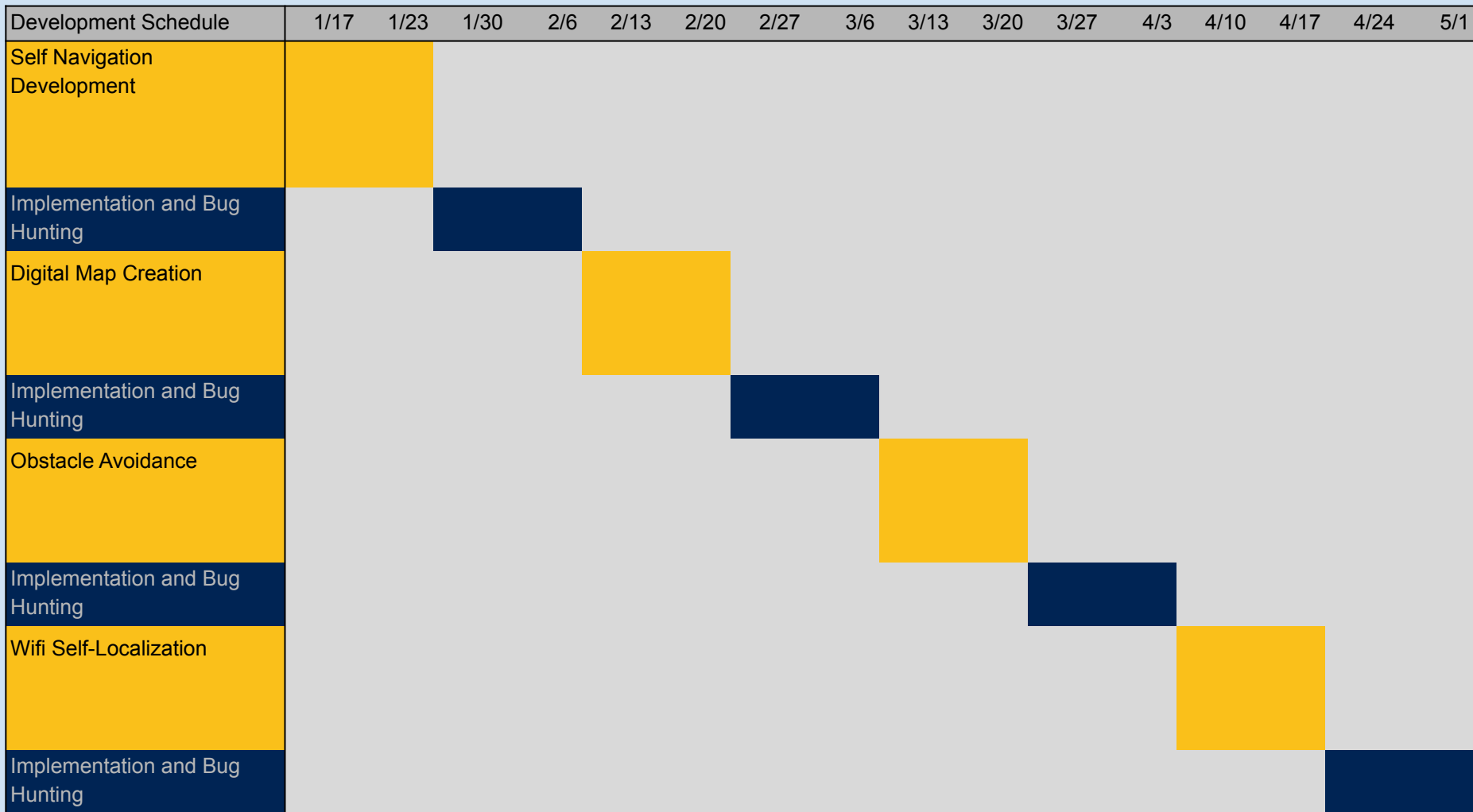

CS 476 Capstone

🔒 floor-explorer / 30-gallon-robot (Private)

FEAT

Group 7: Capstone Project

Schedule

- Guarantee robots safety mechanisms
- Implement basic functions with mobility and environmental awareness
- Map generation
- Object avoidance
- Self-localization mechanisms
- Program a tour and show proof of concept!

Development Schedule	1/17	1/23	1/30	2/6	2/13	2/20	2/27	3/6	3/13	3/20	3/27	4/3	4/10	4/17	4/24	5/1
Self Navigation Development	■	■														
Implementation and Bug Hunting			■	■												
Digital Map Creation					■	■										
Implementation and Bug Hunting							■	■								
Obstacle Avoidance									■	■						
Implementation and Bug Hunting											■	■				
Wifi Self-Localization													■	■		
Implementation and Bug Hunting															■	■

Conclusion

- Our robotics software has the potential to greatly improve academia in this industry
- We can mainstream a baseline for an affordable navigation software to anyone
- All while avoiding the proprietary hindrances that comes with patented software

Questions???