MEGN540 Project Proposal: Delivery Rover

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1. Concept and Requirements

We will build a mobile delivery robot. Upon activation, the robot will identify the person nearest to it, drive to that person, and deliver a payload. The system must have the ability to:

1. Listen for and react to an activation signal.
2. Identify persons in its FOV and target the nearest person to it (if any).
2. Drive to that person in a straight line on a flat, carpeted surface.
3. Stop upon arriving at the person and deliver the payload.

2. Budget and Plan

Budget: $300 ($100 per team member).

Initial Plan: We will plan our work/deliverables in two-week increments to keep tabs on progress and enable us to react quickly to any issues that arise. Table 1 shows a first-pass plan describing these increments.

Table 1: Tentative project plan.

Milestone	Date	Description	Requirements
1	2024-02-07	Material acquisition and planning	• Bill of Materials created • Ordered necessary materials
2	2024-02-21	Software module design	• Project repo instantiated • Module specifications created • ROS framework installed
3	2024-03-06	Prototype build and PCB design	• PCB design finalized • Materials assembled
4	2024-03-20	Software implementation	• Visual odometry module implemented • Object detection module implemented
5	2024-04-10	Software implementation	• Path planning module implemented • Motion control module implemented
6	2024-04-24	Prototype refinement	• PCB installed/integrated • Path planning and motion control tuned
7	2024-04-30	Deliverables	• Project is demonstrated to the class. • The project report is submitted.

3. System Components

3.1. Sensing and Affecting

• **Sensors:** Stereo camera (RGB-D) for visual odometry, depth estimation, and object detection. Wheel encoders for motion control.

• **Affectors:** DC motors to power the robot's drivetrain. Servos to actuate the payload delivery mechanism.

3.2. Software

• Visual odometry module for depth perception and pose estimation.
• Object detection module for person identification.
• Path planning module for trajectory generation.
• Motion control module to power motors and follow the trajectory.

3.3. PCB

We will create a PCB to activate power to the system and include LEDs to indicate the system's state (powered on, identifying recipient, planning path, making delivery).

4. Prototyping

All three team members are in Mechatronics and SLAM, and we have experience with all system components. We view this project as an opportunity to "put it all together" and feel confident in our ability to build a functioning prototype.