MEGN540 Project Final Report

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1. Problem:

Many people are unable or unwilling to get up, walk to, and grab an item they need or desire around their home. Examples include elderly persons who need to take medication at a specific time daily but may be forgetful, and college students who are thirsty but too incapacitated to get their next beverage themselves.

We are designing and building a product that can deliver a necessary item to those people when they need it.

2. Design Concept:

We are building a two-platform tank-drive mobile delivery robot. The lower platform will secure our electronics, and the upper platform will carry the delivery payload. Upon activation, our robot will identify the person nearest it, drive to that person, and deliver the payload. Our robot will have the ability to:

1. Listen for and react to an activation signal. To begin, this will be a serial command issued via SSH.
2. Identify persons in its FOV and target the nearest person to it (if any).
3. Orient itself toward the person and drive to them in a straight line on a flat, carpeted surface.
4. Carry a payload of at least 16oz.
5. Stop within arm's reach of the target person to deliver the payload.

2.1. Sensors

- *Stereo camera:* Luxonis Oak-D Lite for visual odometry, depth estimation, and object detection.
- *IMU:* MPU-6050 for pose estimation and motion control feedback.
- *Load sensor:* MPS20N00400 sensor and HX711 amplifier to measure payload.
- *Wheel encoder (x2):* Hall encoders for motion control feedback.

2.2. Actuators

- *DC motor (x2):* 12V, 150rpm DC motors to power the robot's drivetrain.