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### One Page Project Proposal: Autonomous Cart

For our capstone project, we intend to create a robotic embedded system capable of following a user equipped with a tracking beacon through an unfamiliar environment, to provide convenience to the user when transporting multiple objects. The system will need to be capable of sensing its environment, load, and user, localizing itself and the user within that environment, planning a route through that environment, dynamically detecting and replanning to avoid obstacles, and controlling motors in order to follow that path. We expect to face challenges including extracting information about the environment from sensor signal input, dynamically determining a path through the environment, and controlling motors to accurately follow the planned path.

We intend to use an existing wheeled robot platform kit as the basis for our system. We will equip the platform with a controller and sensors including video cameras for localization and target tracking as well as possibly IR distance sensors for collision avoidance. We will write software to combine sensor inputs to map the local environment and determine the target location, software to dynamically plan a path through that environment, and software to control the onboard motors to follow the planned path. We intend to evaluate multiple different path planning algorithms to determine which is the most effective for our use case. We can measure the success of our implementation by measuring the following:

- lag between the target moving and the cargo carrier following
- tracking failures per distance travelled

Our Minimal Viable Product will consist of a platform that can follow the user through a simple environment with minimal static obstacles. Once we have a working MVP, we can turn our attention to moving obstacles, finer control, and lower power localization methods.