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Team JigglyPuff Project Proposal: Sentry Gun

Project Goal:

Integrate a LIDAR with a Nerf Gun through an mbed microcontroller to create a toy Sentry Gun that would locate, track, and shoot projectiles at the target.

Summary:

The Sentry Gun is a system that will detect objects by processing the data stream from a LIDAR. The data is then translated into commands to servos controlling a nerf gun in order to get the nerf gun to fire at specific objects in the field. The lidar sends and receives laser signals and outputs distance and angle to the point at which that particular laser bounced back from. Using this data, the lidar can essentially track anything in a certain field of vision, more specifically a view angle of 180 degrees to a distance of 80 meters at a resolution of 10 millimeters. Ideally, the lidar would be the eyes of the system and would aim and fire the nerf gun at different targets placed in the view of the nerf gun.

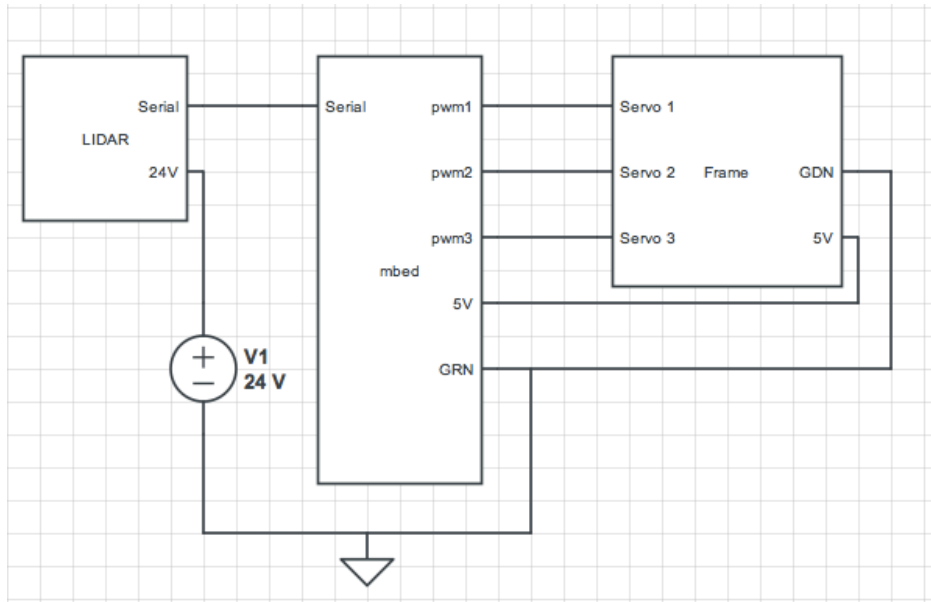
The goal is to implement the system on an embedded platform using an mbed. This will make the system independent from a PC allowing for the system to be more portable and readily deployed. The algorithm utilized in the system should be able to detect movement of objects in the field in order to distinguish between “threats” and stationary obstacles. By determining movement of objects, the nerf gun should be able to lead the “target” if necessary.

“Threats” are determined by the closest perpendicular distance to the baseline defined by the line the lidar and nerf gun are positioned on. Movement of objects in the field would be determined by comparing new data with the previous data. However, this wouldn’t always be necessary as the closest point would always be tracked anyways. Therefore, if there is any movement, the closest point would be updated and the nerf gun would point to the new position. Leading the target, on the other hand, would require that a general directional movement be determined.

Parts:

Lidar
mbed
Nerf Gun
Servo Motors + Tripod

Design:



Timeline:

Components of the project to get working by...

3/31:

- LIDAR: communicating with the mbed

4/7:

- LIDAR: Algorithm to identify a stationary single object
- Gun: Open up the gun and modify internals to interface with mbed
- Frame: Install servos and interface with mbed

4/14:

- LIDAR: Track moving objects and multiple objects algorithm.
- Calibration: Start debugging algorithm and test gun response

4/21:

- Calibration: test + debug any timing issue
- Extras

Extras:

- Post a Twitter message to indicate an intruder
- Panic mode:
 - if (out of ammo || target is at baseline) {
 - swing nerf gun wildly like a bat
- Voice commands: "FIRE!"