MTRX2700 Progress Report

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Description of the project and aims:

The aim of our project is to map the location of a “trolley” (the trolley will be modelled by a microcontroller on a wheely chair) within a “supermarket” (modelled by the Tron Lab). A user will be able to search for an item or category of items within the supermarket, and the trolley will then display:

* Trolley current location
* The aisle of the item location
* The location of that aisle

The trolley will then point in the direction of that aisle (within the constraints of the servo motor’s range) using the lidar to guide the user to their item.

The trolley will complete mapping using the following method:

* Magnet markers are placed on the floor of the supermarket at equal distances. Markers will alternate between horizontal and vertical.
* The controller will calculate the direction of movement for the microcontroller and both the current and previous magnet state.
* By knowing the direction and magnet readings, we can determine the location of the trolley using the following logic:
  + If current magnet X == HIGH and previous magnet Y == HIGH and velocity > 0:
    - We are at location of next magnet.
  + Else if current magnet X == HIGH and previous magnet Y == HIGH and velocity <0:
    - We are at location of previous magnet.
  + Else if current magnet X == HIGH and previous magnet X == HIGH:
    - We have moved back to the current magnet.
  + The above logic also applies if X and Y are swapped.
  + If both magnets == LOW and velocity > 0:
    - We are at the location between current magnet and next magnet.
  + Else if both magnets == LOW and velocity < 0:
    - We are at the location between current magnet and previous magnet.

Modules needed for project:

HCS12 modules:

* Magnetometer
  + This module should read in the raw data from the magnetometer. It should then return a binary response for both the x and y axes of the sensor – 1 if saturated (or above a certain threshold) and 0 otherwise.
  + Duncan is responsible for this module. Progress as of week 12 – none.
* Accelerometer
  + This module should read in the raw data from the accelerometers, and also take in the values from the magnetometer module. Some basic filtering should be completed to remove high frequency noise. The signals should be integrated once to determine velocity in x and y. The velocities are returned. These velocities should be reset every time the magnet reading is positive to reduce integration drift.
  + Daniel is responsible for this module (some small assistance from Will). Progress as of week 12 – partially complete (filtering the signals to avoid drift error in the integration has been challenging).
* Location module
  + This module should take in the binary responses from the magnetometer and the velocities from the accelerometer. It should then return the location of the trolley with respect to a 1-dimensional grid. The grid resolution is double that of the number of magnet markers.

Python modules:

* Serialisation module
  + This module unpacks the serialised data sent from the microcontroller to be used for updating the display.
  + This module has mostly been prewritten by Stewart. Only small modifications required to fit our specific data packets being transferred. Lemuel is responsible for this module. Progress as of week 12 – complete.
* Search module
  + This module allows the user to search for items or categories in the supermarket. This requires creation of a supermarket csv (or similar set of data), a search function with error handling (i.e. correcting misspelled searches or identifying when items are not in the supermarket), and returns the aisle the item is in.
  + Will is responsible for this module. Progress as of week 12 – complete.
* Mapping module
  + This module takes in the location data from the serialisation (trolley location) and search (item location) modules. It then displays these locations on a basic map of the Tron Lab using pygame. The map should also display the orientation of the trolley and orientation of the lidar.
  + Will and Lemuel are responsible for this module. Will is responsible for the pygame display and sprite animation, Lemuel is responsible for getting the data imported from the two modules so it can be displayed. Progress as of week 12 – partially complete.