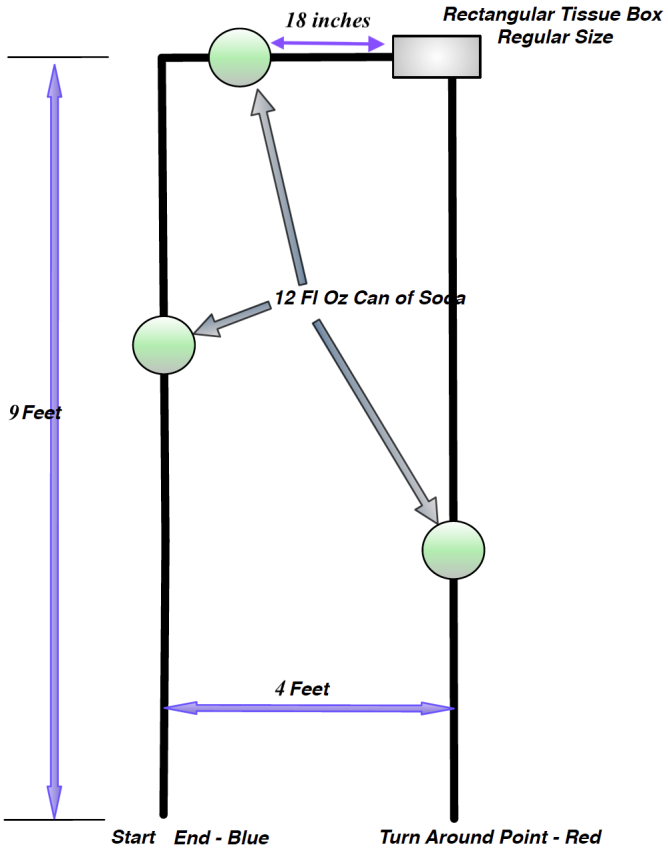
COLORADO MESA UNIVERSITY

Assignment 2 Part 1 of 2 **15%**

Sensing for Collision Avoidance and Feature Tracking

Build & Program a mobile Robot using Lego Education EV3, using LabVIEW

Design & build a suitable rolling platform that is autonomous (no outside control while running) the design is completely up to you, the evaluation of the design will be based on your submitted design document, visual inspection, and robustness during the run test demonstration. You may modify your previous task Robot (probably to augment it with 2 more sensor) to achieve the task.



The task which I expect will influence the design is to travel the path depicted in the schematic above, the robot needs to track the path (sensing task 1), the path should not be programmed into the robot control code. The robot should also avoid collision with obstacles by detecting them with the Ultrasonic sensor (sensing task 2), deviate from the path to circumnavigate the obstacle (planning task 1) and return to the path (complex controller task 1). Once back to the path it should continue tracking it until the end or next obstacle. The robot should use the Gyro (sensing task 3) to plan it action to recover the path (complex controller task 2) it had deviated from to avoid collision. Obstacles are as follows: the cylinders are 3 x 12 fl oz Aluminum Soda Cans (standard size Coca Cola cans are adequate), a regular size Tissue box (preferably unopened). The ultrasonic reflectivity profile for different material affect the sensor's ability to return good quality data, thus following the description of the obstacle material is strongly recommended.

Run field is a uniform color hard surface in the robotics lab. Line color shall be the cream/beige painter's tape I provided although if all teams agree you may use a different color painter's tape, starting, ending zone shall be a blue colored letter 1/2 size paper affixed to the ground, while the turn around point shall be a red one.

Filed dimensions are marked on the schematic above. Field obstacles placement to reflect the schematic's intent. The red marker tells the robot it is time to turn around at the turn around point.

Run field light conditions are up to you, please note different lighting conditions will render different readings from the sensor, you will need to tune it to the conditions so the tracking is reliable.
Control software shall be implemented using NI LabVIEW2016 for EV3 (lego extension) .

Non - Competitive Run Grading: 7 Points
Speed:
(Relative) From slowest runner to fastest runner grade spread of 2 points (scaled). 1st place all points, middle of the field gets 1 points, last place getter 0.5 point, fail to complete :(

Success:
(Relative) From least success to perfect run spread 3 points (scaled).
No collisions, finds the line quickly after each obstacle = all points.
Collide with all objects but tracks the line well 1 point.
Collide with no objects but does not track the field width line (with box and can) 2 points.
Helping hand: -0.5 point lost per touch (max 2).

Failed run restart cost 3 points (non cumulative - teams are allowed 2 restarts thence deemed "fail to complete") Demonstration video setup- these are task requirements (videos will be part of the showcase 2 minute clip per team):

- It is important that the recording is done in optimal lighting conditions from a fixed mounting recording device
- The visual must be in perfect focus throughout the recording
- "Turn-Around" visual design and build inspection video (opaque light background)
- Video of a slow "Turn Around" commentary describing the design recommended here
- Vision in full frame (occupying the majority of the frame) in perfect focus
- Use a kitchen turntable device (Lazy Susan) or improvise a similar device
- Code:

  All code files .vi must be submitted in a subfolder labelled Control VI

  Submit in your group D2L submit dropbox, in compressed archive which when decompressed will contain a single folder marked Assignment 2

Prepared by S. Antoun on February 17, 2022
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Typeset with texshop.