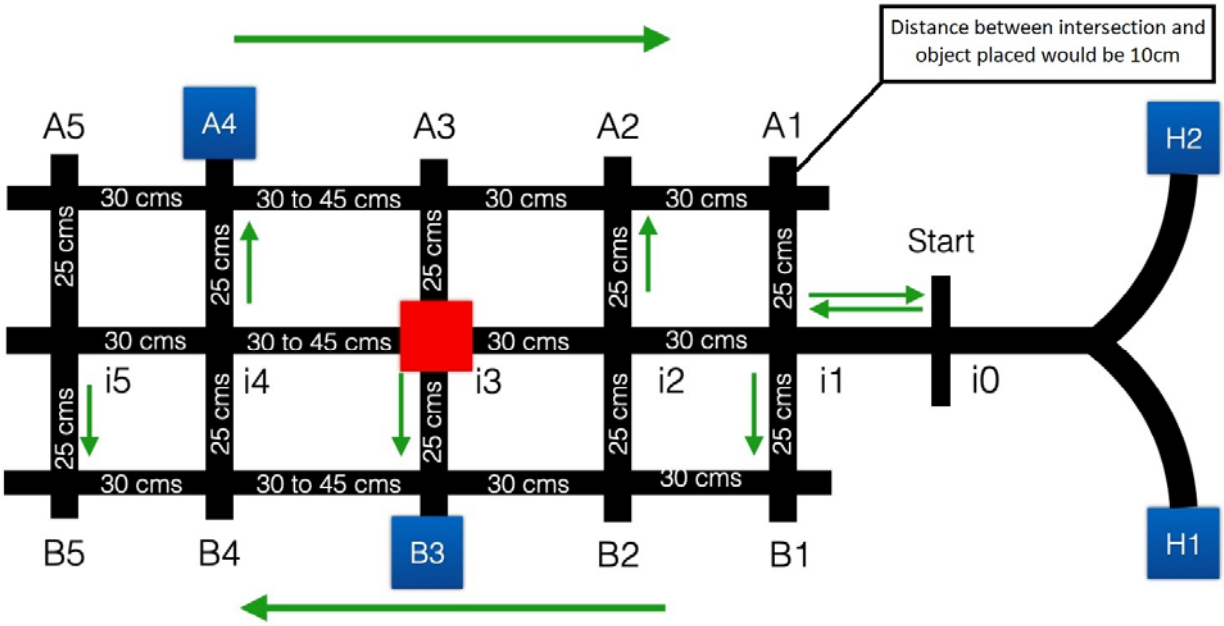
# Propeller Project – Revised

## Problem statement

You're tasked with the responsibility of designing an autonomous robot that will drive around the streets of Manhattan to deliver COVID test kits for persons who are unable to venture out to acquire the test kits on their own. The robot must reach specified locations while following all the traffic rules and should avoid obstacles (if any).

## Describing the scenario




**Note: Figure not to scale**

**Figure 1: Manhattan streets with a grid-like structure (The arena)**

- There are two home locations of the test kit provider denoted by H1 and H2.
- The curved black tape represents the path to exit from each home location. The rest of the black tape represents the Manhattan streetscape with a grid-like structure. The width of the tape will be between 1.8cm to 2.6cm.
- There are a total of 16 intersections labeled i0, …, i5 (central intersections); A1, …, A5 (upper intersections); B1, …, B5 (lower intersections); where i0 is the start point.
- The green arrows represent the direction of the traffic flow on the indicated street (the direction is applicable to the whole length of the street).
- The central lane/street has bi-directional traffic.
- **One** obstacle (traffic congestion) will be **RANDOMLY** placed at either intersection i2, i3, or i5 (depicted in the image as a red box at intersection i2 for reference)
- The minimum height of the obstacles used (representing a car) will be 20 centimeters.
- The desired locations to reach will be <u>randomly assigned</u> and are marked in blue boxes in the figure above. <u>B3 and A4 are shown as delivery locations ONLY for illustration purpose here</u>.

## Task descriptions

- The robot will be placed at either one of the home locations.
- The robot must always follow the path (black tape).
- The robot must reach i0 (start position) and should **NOT** stop at any time during its full run.

- The robot must detect intersections and provide an indication of the detection (using an LCD display, seven-segment display, etc., on the go without stopping).
- Upon detecting the obstacle on its path, the robot must avoid it.
- The robot must move towards the desired locations to reach them; and should provide an indication of reaching each location on the go by some means (e.g., LED, piezoelectric buzzer, etc.); Reaching locations essentially would mean reaching the corresponding intersection of the location.
- The robot should reach two locations assigned (example here- A3 and B5).
- Right before starting your demo, you would be given the knowledge about your team's destination locations (boxes will be placed on those locations as well) and the location of the obstacle (box will be placed on the main path) as well.
- You would be assigned target locations from among A1-A5 and B1-B5 such that you will be able to reach them without breaking any traffic rules.

## Deliverables and Grading (Total: 100 points)

1. Line following robot - **15 points**
2. Can the robot detect and indicate an intersection - **30 points (3 points will be deducted for each missed intersection or mis-detected intersection)**
3. Can the robot detect, avoid, and maneuver around the obstacle - **15 points**
4. Can the robot reach the two randomly assigned delivery locations and provide an indication - **40 points (2*20 per target location)**
5. If your robot breaks traffic rules for any segment by travelling in the direction opposite to the allowed direction, **3 points will be deducted** for each such incidence.

## Note

- IR remote control allowed only for deliverables 3 and 4
  (Max points = 70% of the points for those tasks)
- Autonomous control preferred (100% of the points)
- Performing an action (monitor, compute, indicate, etc.) on the go requires using dedicated cores for such actions

For any questions, please feel free to reach to out the TA's: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