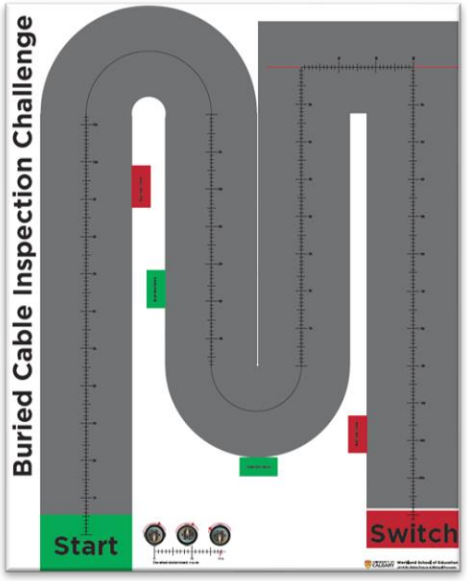
# Buried Electrical Cable Inspection Challenge

There is a buried electrical line on a well-known route with inspection points. Your task is to look at each inspection point. If it is red, sound an alarm, and drop a marker for the repair crews to see.




## Rules

- You can only handle your robot from the Start or Switch positions
- If your robot needs an extra marker it needs to reverse or continue on to pick up the next marker
- The marker needs to be dropped on Red
- Note: The position of the Reds may change for the challenge

## Challenge Scoring Guide

- 5 points for finding the damaged cables
- 10 points for no false alarms
- 20 points for dropping a marker for the electrical repair crew
- - 5 points for each time the robot leaves the cable route (grey area)

## Materials Needed

- ***Vinyl Mat.*** We suggest printing a high-resolution copy of the mat, using a 4ft by 5ft format. It will cost approximately CAD 200 to print on smooth vinyl at a local print shop.
  - Please find a copy in standard resolution HERE,
  - and a high-resolution copy is available for download HERE (7.3 MB).

  You may also need some tape to fixate the mat to the floor.
  Note: If you do not print the exact size the 1 cm ruler markings will not be accurate

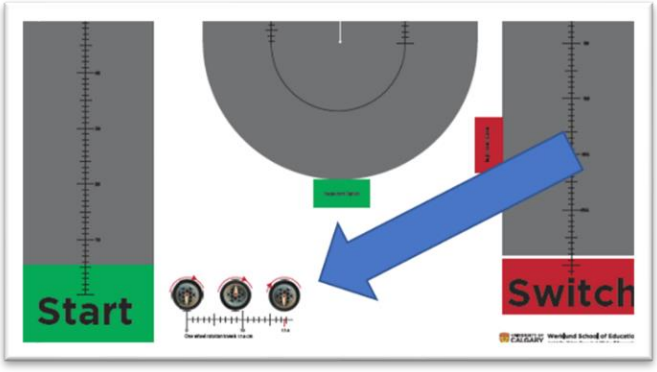
- For an ***extra challenge***, click HERE for additional printable inspection stations.
- Basic ***EV3 Robot*** built from the instruction manual
- An ***attached arm*** with a color sensor to detect inspection points (note: this arm does not have to move).
- A ***second attached arm*** or lever designed and built with the medium motor. This arm will need to be able to carry and drop an object, i.e., the marker.
- A ***small object*** for marking a damaged electrical line, e.g., a Lego block or Lego pylon.

## Key Understandings

- Relates of the length of straight segments to wheel rotations by estimating measurement and movement
- Relates the size of the radius of the turning curve to the steering setting of the <Move Steering> programming block
- Relates the distance the robot travels along a curve to the number of wheel rotations by estimating measurements and movement
- Translates measurements into programming code to move a robot a specific distance and move it along a curve
- Relates medium motor rotations to the angle of an arm turn

## Note for Teachers

- The ruler markings are to help students make connections to the distance traveled by the robot. There is a scale with the ratio of 1 wheel rotation: 17.6 cm.

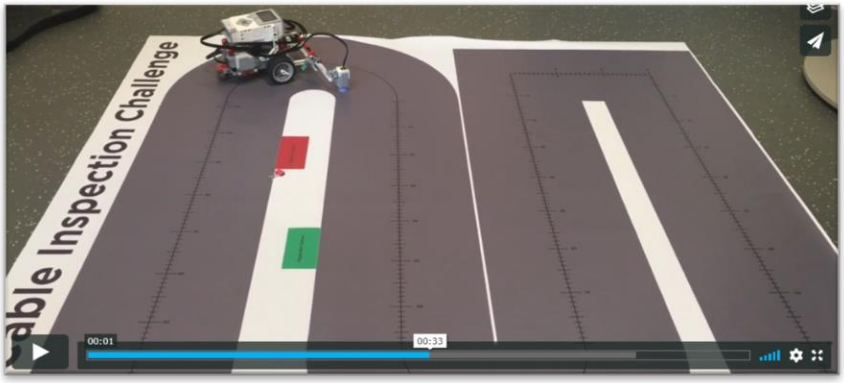


- Hopefully, the students will be able to use this proportion to start predicting how far each of the straight segments are. For example, if they mark the distance for one wheel rotation with their fingers, they can count how many times that distance is in the segment.
- There are 4 turns: a 25% steering, a 30% steering and two 100% steering. This is to help children gain experience with varying the tightness of turns. For help on how the move steering works, use the Move Steering Task.

## Design Notes

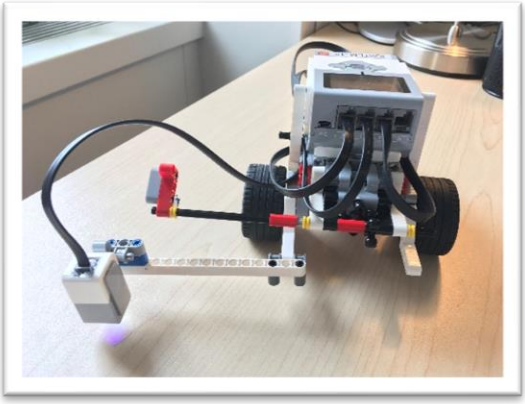
Please see a video of our final design by clicking on the link:

https://vimeo.com/268831271

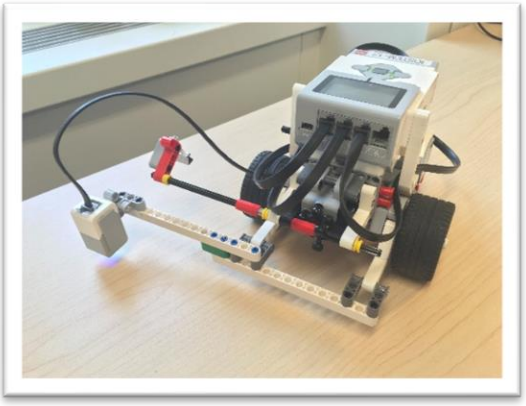



### Initial Design

We suggest that the color sensor can be attached to an arm off the side of the robot as seen in the picture on the right. This design is beneficial as the color can be detected right away.



## Final Design



We improved our design by adding some stabilizing bars, as the sensor on the arm appeared to be too “shaky”. Also, the color sensor was being inconsistent. Be careful that the color sensor is not too close to the source.

Also, we added a second arm that extends from the medium motor to the robot’s side to drop the maker, i.e., a paper clip. We added sounds to indicate which color has been detected.

## Please find our EV3 Program for the Final Design below: