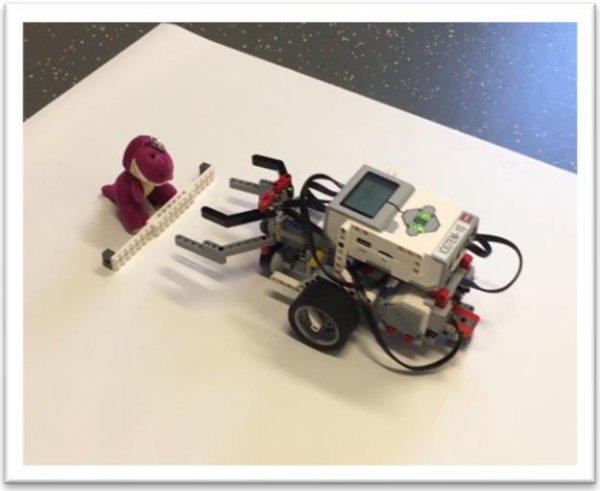
Search and Rescue Challenge

Task Description



The Search and Rescue Challenge is to design and program a robot that can save Tom. Tom was playing in a field (or by a cliff) and he broke his leg. There is poison ivy everywhere. It is unsafe for other humans to try and approach him.

The students are tasked to design a robot that can find Tom and bring him back to safety. Tom could be in any location in the field, so calculating distance will be too hard to do quickly. Students will be able to see Tom and line the robot up, however, they won't know how far away he might be. This robot is a little more complicated to built than the *SnowBot* or the one in the *Polygon Task*, as it requires a sensor and the medium motor.

Materials Needed

- Small stuffed doll or animal
- Masking tape or electrical tape to mark off a field. We used an upside down vinyl polygon mat
- Basic robot as per the EV3 Instruction Manual, AND
    - Ultrasonic sensor; please refer to this page for help
    - Medium motor

Set Up

Mark off a 2-foot by 3-foot area to designate a field. Place a small doll or animal in the field. The start line is on the opposite end. Note that the doll or animal needs to be solid for the ultrasonic sensor to work. Our stuffed dinosaur could not be detected consistently by the ultrasonic sensor until we place a solid row of Lego in front of it (see our final design video).

Instructions for Students

Design a robot that can rescue Tom. Tom was out playing in a field (or by a cliff) and he broke his leg. There is poison ivy everywhere. It is unsafe for other humans to try and approach him.

Your task is to design a robot that can find Tom and bring him back to safety. You will need to build an arm or gripper that can grab Tom and pull him back to safety. For the final task, Tom could be in any location in the field. You will be able to see Tom and line the robot up, however, you won't know how far away he might be. Use the ultrasonic sensor to approach Tom.

Hints:

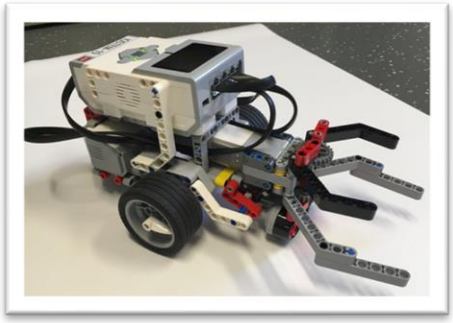
1. Slower speeds work better
2. Make sure that the number of wheel rotations moving forward does not exceed the threshold distance for your ultrasonic sensor

Key Understandings

- **Movement:**
  - Relates the robot turns to wheel rotations by estimating measurement and movement
  - Translates measurements into programming code to move the robot forwards and backwards
- **Sensing:**
  - Uses an ultrasonic sensor to stop when the robot is close to the object
  - Applies IF-THEN logic to program the robot to discriminate when robot is close to an object or not
  - Uses a loop and/or switch block so robot will respond to found objects
- **Medium motor:**
  - Uses gears and the medium motor to move an arm or gripper
  - Design and assemble an arm or attachment for the robot that can carry or drag object (Tom) back to start
  - Translates measurements of arm rotation into programming code to capture object (Tom)

Design Notes

- We decided to use a gripper idea. We modified the lifter-arm design found in the EV3 Instruction Manual (instructions starting on page 77). Please find a link to the instructions here: http://robotsquare.com/2013/10/01/education-ev3-45544-instruction/



- On our first design, we noticed that the arms were not long enough. So we extended the bottom arms and the robot was able to grab Tom. You may need to play around with the number of wheel rotations for closing the gripper. If it cannot close completely according to the instructions it gets stuck.
  Please see a video or our final design HERE.

- Lastly, please see our program below. The robot moves forward until the ultrasonic sensor detects Tom less than 5 cm away. Then it is grabs Tom and drags him backwards.

.