Firebot Challenge

Instructions for Students

A food warehouse has caught on fire, and it is too dangerous for human firefighters to go inside. It is up to you and your group to find the biggest fire and dump water on it. The building has 4 rooms, but it is impossible to tell which room the fire is in without going inside. The building could collapse at any minute, so it is important that you be very careful about bumping the walls. If any of the walls are completely moved off their support the building will fall on you, and you'll have to try again. Once you find the fire your robot needs to make a loud sound so that we know where it is, and then dump water (marbles, or pom poms) on the fire. After water has been dumped the robot should tell firefighters outside that it is safe to come in.

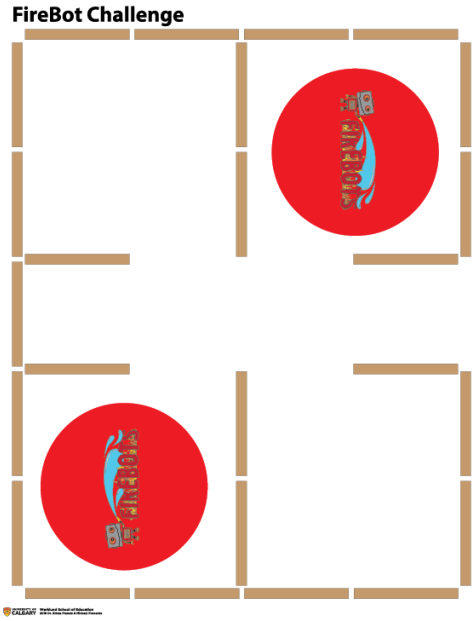
- Build your EV3 Robot as per the instruction manual.
- Attach a color sensor so it points down. You can find instructions on pages 68 – 72 in the EV3 Mindstorms instruction manual.
  (If you need some help programming the sensor, please refer to the Color Sensor Page)
- Then design and attach an arm to your robot that can dump water (pom poms) on the fire. You will need to use medium motor to move the arm. Note: If you program your robot's arm to move too far, your arm will get stuck and the robot will be stuck too. You will only need small rotations of less than 1/4 turns.
- Program your robot to move into the first room, search for fire, make a noise like 'red' when it finds it, then dump water (pom poms) on the fire.

Challenge: Can your robot enter, search for fire, dump water if it finds it in all 4 rooms?

Materials Needed

- Small pom poms – we like blue ones to resemble water
- Tape for the floor to create the building.
- You can also print this 4' x 6' vinyl mat (click to follow link). It will cost about CAD 200 to print on smooth vinyl at a local print shop
- EV3 Robot as per Lego Instruction Manual with color sensors attached, please see our page on the color sensor HERE
- The design task also requires learners to build an arm for dumping water, and using the medium motor to move the arm

Set Up



If you are using tape, mark out 4 rooms approximately 2' by 2'. Leave about 1' between the rooms. Use the image on the left as a guide. Also tape down red construction paper to represent the fires. On the Design Challenge Day, you can vary the location of the fire – as long as you warn your students beforehand.

Key Understandings

- Relates length (or width) of the enclosed area to robot's wheel rotations by estimating measurement and movement
- Relates the robot turns into wheel rotations by estimating measurement and movement
- Translates measurements into programming code to move a robot a specific distance and turn a specific angle
- Relates rotations of motor arm to angles (degrees or numbers of rotations)

Design Notes

Please follow this link to see the winning robot in a design co-opetition at Pakan School at Whitefish Lake 128 First Nation:

https://vimeo.com/145404678

Here is how they programmed their arm. We think their sophisticated programming using loops contributed to their success.