

Maze Runner

Model Name and Number: Maze Runner YE.518

Topic: Ultrasonic Sensor and Touch Sensor (review from previous classes)

Accessory tools: 3 nail beams, 1 technical 9 beam ,1 angular nail beam, 4 large wheel rims, 1 Touch Sensor and 1 Ultrasonic Sensor.

Lesson's Goals:

- ❖ Students will practice Touch Sensor.
- ❖ Students will practice Ultrasonic Sensor.

Lesson Structure:

1. Explain the model built in class.
2. Demonstrate robot orientation in the room using sensors.
3. Operational Algorithm.
4. Construction.
5. Programming.
6. Play with the model.
7. Dismantle and rearrange the Young Engineer kits - 10 minutes before class dismisses.

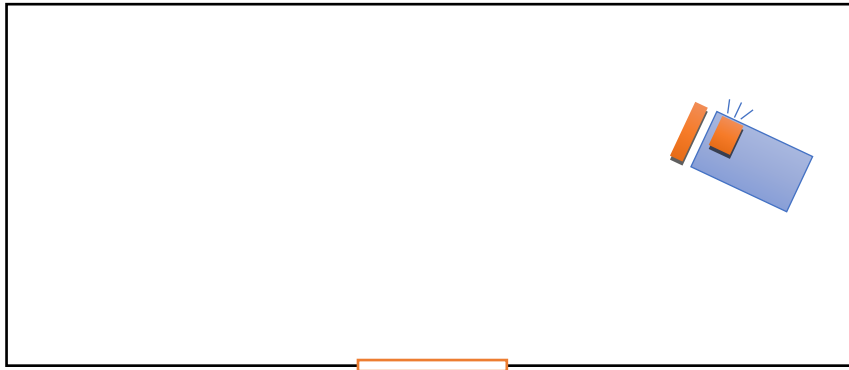
Explanation of the model to be built in class:

The model we will build in class is called "Maze Runner". The model can travel by sticking to the right side of the wall and avoid obstacles in front of it. The model includes an Ultrasonic Sensor which is located at the front of the model on the right side and turned sideways. This allows the model to detect distance from the wall.

The Touch Sensor is located at the front of the model (marked orange in the diagram below) to report obstacles. The two sensors will be read in a loop of code to determine if the model is too close to the right side of wall or if there is an obstacle or wall in front of it.

The model will always stick to the right side of the wall and circle the room until it exits. The sensor can also determine if a distance is too high (for example: an open door), if so, it will turn right and leave the room.

When the model encounters a wall, the Touch Sensor will alert the model to return slightly backward and rotate 90 degrees to the left to avoid the wall.



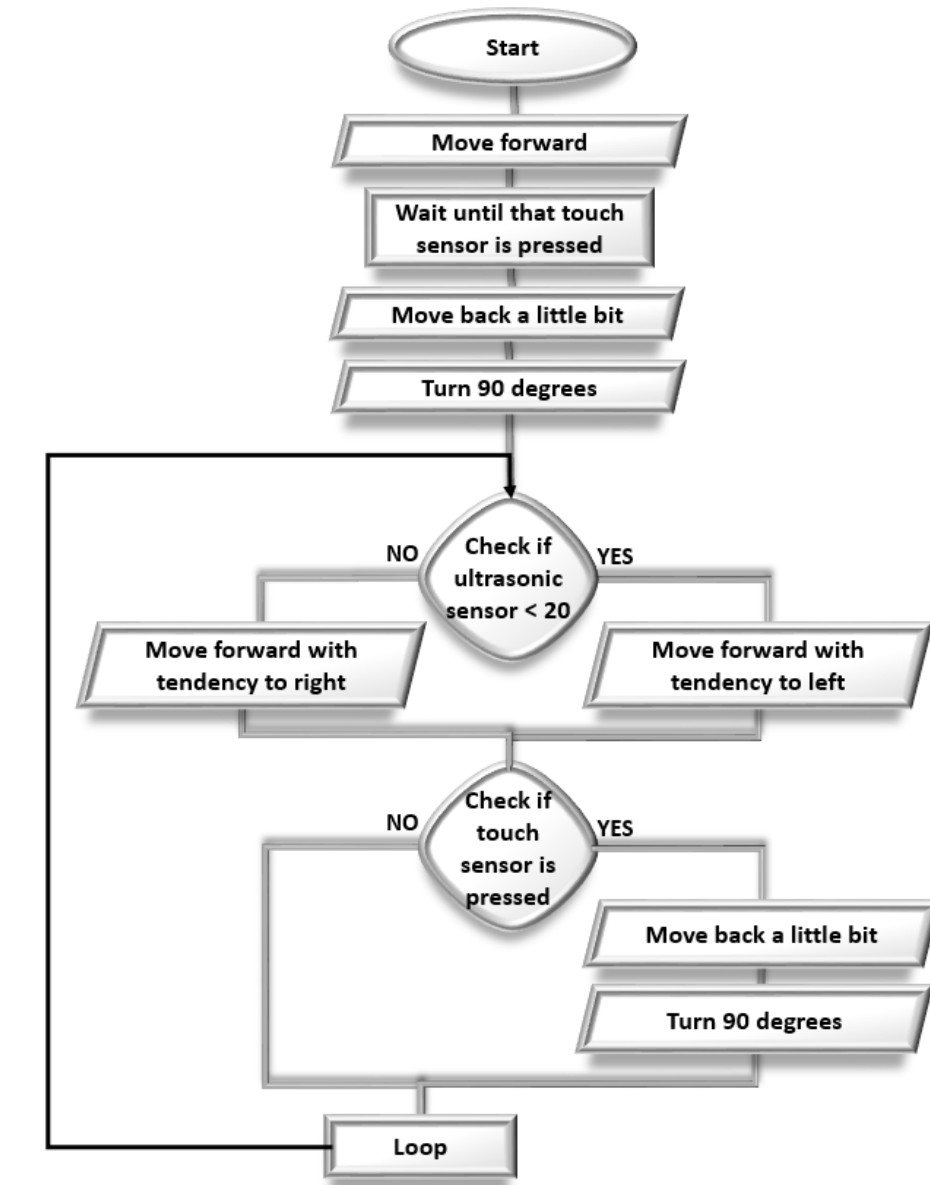
Demonstrate robot orientation in the room using sensors:

- Ask the students: how does a person know how to leave the room?
 - Answer: That it is easy, someone can leave the room through the door.
- Ask: How does a person know where the door is located?
 - Answer: They use their eyes to see and their hands to feel.
- Now ask them, how can a robot do this?
 - Answer: Sensors help robots to determine where the door is located. If the students don't know, help lead them to this answer.

Finally, explain that the model built today has a visibility limit. There are "eyes" only on it's right side (using an Ultrasonic Sensor) and a "hand" in front of the robot (using a Touch Sensor).

Operational Algorithm:

Note that with only two data points (Ultrasonic Sensor and Touch Sensor), the robot "understands" where the door is located and calculates its path according to distance measurement.



In this chart, we can see that at the first intersection, the question is whether the distance from the wall is less than 20 cm. If the answer is yes, the model is too close to the wall, the model will move left to stay away from the wall.

The second intersection determines if the Touch Sensor is pressed. If the answer is yes, the model is touching a wall, the model will return slightly so it can turn itself around and then turn to 90 degrees. If the answer is no, the model is not too close to the wall, nothing will happen and the model will continue to travel.

