

## Quiz: Obstacle Detection

### Introduction to Mobile Robotics > Obstacle Detection

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1. How does the Touch Sensor bumper detect obstacles?

**The Touch Sensor bumper detects obstacles by running into them.** When the bumper is hit in a way that presses the Touch Sensor, it triggers the program to stop the motors.

2. How does the Ultrasonic Sensor differ from the Touch Sensor when used as an obstacle detector?

**The Ultrasonic Sensor does not need to physically contact objects to know that they are there.**

This results in the robot being able to stop *before* it runs into objects, instead of after. The Ultrasonic Sensor can also detect objects over a range, and the threshold can be set. Using the Touch Sensor, there is no threshold to set because it is defined by the physical characteristics of the bumper itself (i.e. how wide or long or tall it is, so that something that hits it can push in the Touch Sensor).

3. Fancy Fragile is a store that sells expensive, breakable glassware. Everything in the store is made of glass, including the walls and shelves. The owner of Fancy Fragile would like you to develop a robot to help keep the store clean and count the items on the shelves to keep track of inventory.

Obviously, it is of utmost importance that your robot should not crash into the shelves, displays, or customers. For your robot's obstacle detection, you have three sensor technologies to choose from:

- Touch Sensor
- Ultrasonic Sensor
- Laser Reflectance Sensor (a long-ranged version of a light sensor)

a. Would the Touch Sensor be a good choice in this situation? Explain why or why not.

**No.** The Touch Sensor would force the robot to run into things to know that they are there. This is not desirable in a store full of fragile objects, where the robot could do serious damage to the fixtures and the inventory if it ran into them.

b. Would the Ultrasonic Sensor be a good choice in this situation? Explain why or why not.

**Yes.** The Ultrasonic Sensor can detect objects well at short distances, which is enough that the robot can stay at least a short distance away from the objects in the store. Therefore, it would not ever run into anything while going about its chores.

c. The Laser Reflectance Sensor senses distances by shining a laser forward and watching for light that reflects back from any object that may be in the laser's path. Would the Laser Reflectance Sensor be a good choice in this situation? Explain why or why not.

**No.** Though this is a good idea because it can sense objects without running into them, this would not work in a store that is entirely full of glass. Glass would refract the light from the sensor, rather than reflecting it back to the sensor. So the sensor would never know that the objects are there, and would tell the robot that there is nothing in the way, so the robot would run into things. Students may overlook this fact and conclude that using this sensor may be useful anyway.