Simple Obstacle Avoidance (Stay Away from Me!)

Time required: 60 minutes

Please read all the directions carefully before beginning the assignment.

- Comment your code as shown in the tutorials and other code examples.
- Follow all directions carefully and accurately.
- Think of the directions as minimum requirements.

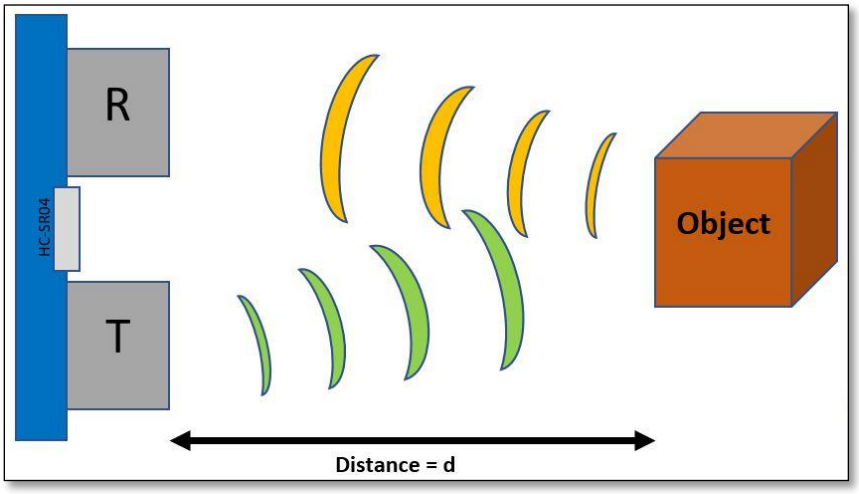
Understanding

Demonstrate understanding of:

Ultrasonic sensor, relational operators

Knowledge Points

The robot has an ultrasonic sensor on the front that detects objects and how far away they are. One "eye" emits ultrasonic sound waves while the other receives the signals bounced back. The distance is calculated based on how long it takes for the sound to return, much like a sonar.



Relational Operators

Relational operators test for true or false by comparing one value to another. In this program we will compare the distance the sensor detects to the distance that we have set.

Operator	Interpretation	Examples	Result
>	Greater than	9 < 10 10 < 10	true false
>=	Greater than or equal to	10 >= 10 10 >= 11	true false
<	Less than	9 < 10 10 < 10	true false
<=	Less than or equal to	10 <= 10 10 <=-9	true true
==	Equal to	9 == 9	true
!=	Not equal to	9 != 9	false

Program Description

The mBot Ultrasonic Sensor has a range from 3 cm to 400 cm, with a 30-degree angle of detection.

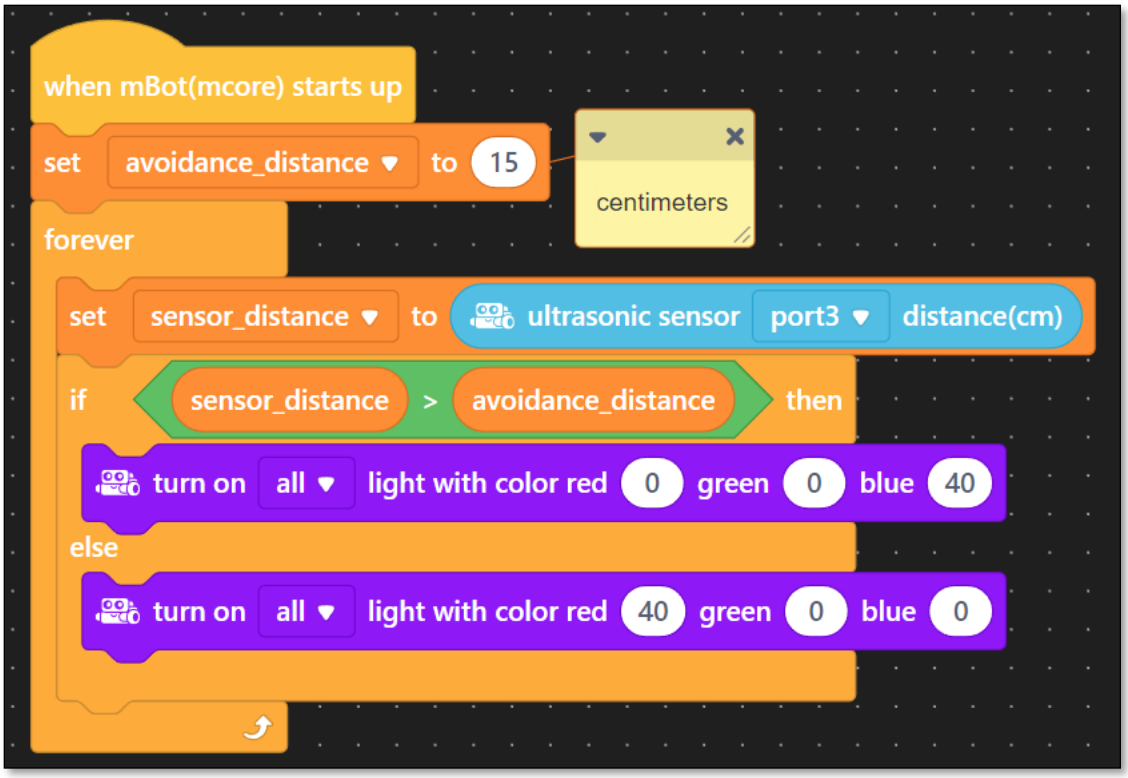
This program changes LED colors based on the distance of an object. The ultrasonic sensor assigns its reading to the distance variable. The distance variable is compared to the detection variable. When the object is within detection distance, the red LED's lights up, otherwise the LED's are blue.

Requirements

- When an object gets within 15 cm (6"), the LED's change from Green to Red.
- Check the accuracy of the sensor with a ruler.

Tutorial Assignment

1. Start mBlock. Save the program as **Simple Obstacle Avoidance**.
2. Go to **Variables**, and create a variable called **avoidance_detection** and one called **sensor_distance**.
3. This program introduces comparison operators (> < =), which are in the **Operators** category.
4. Complete and test the program as shown.

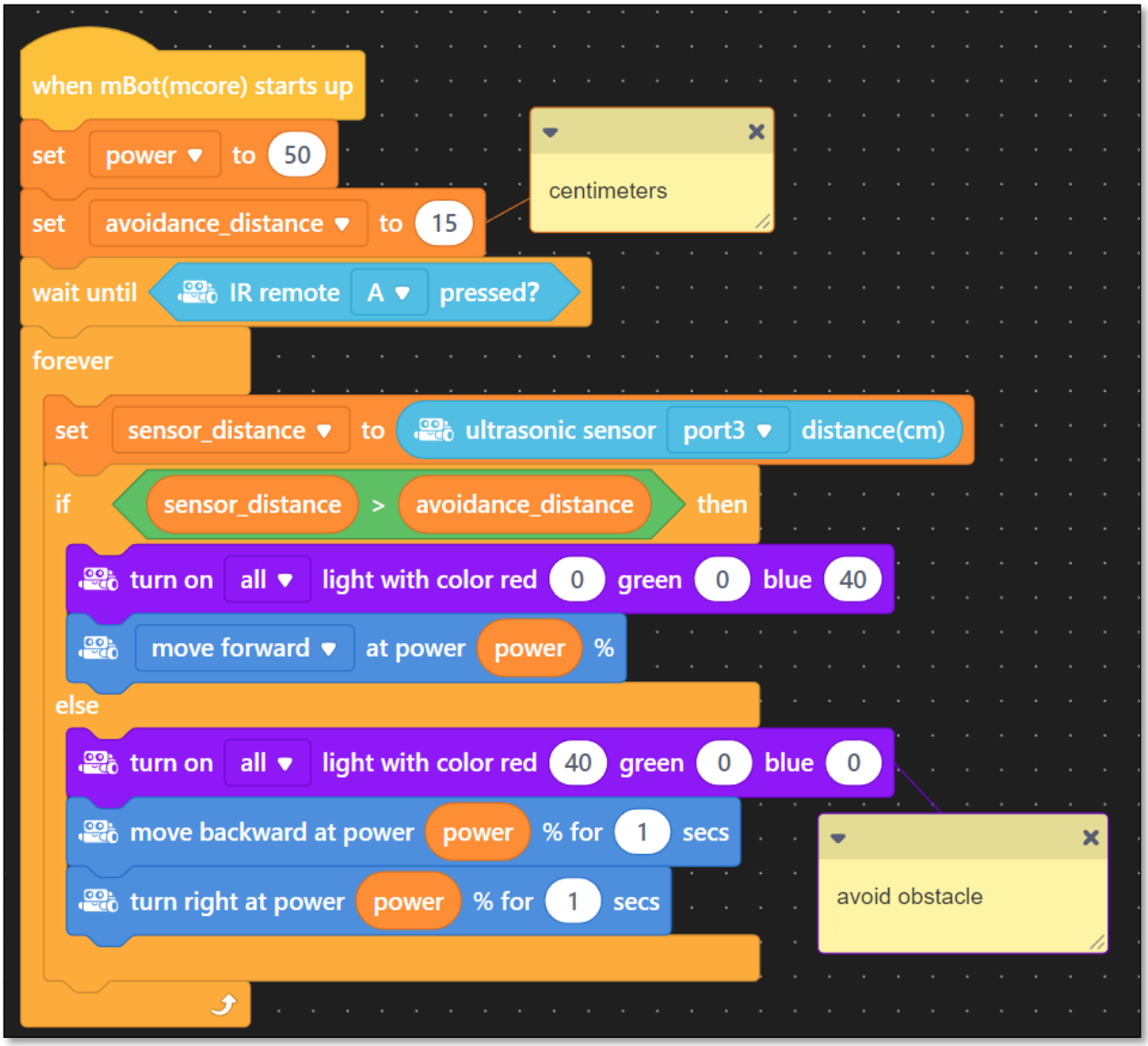


Requirements

- The robot detects an object within 15 cm, backs up, turns right, and moves forward.
- Test obstacle avoidance with your foot.
- Test the robot with an obstacle course of boxes or something similar.

Tutorial Part 2

1. Modify your program as shown for real obstacle avoidance.



Assignment

Start with your tutorial project and add the following.

- Add a sound and/or lights when an object is detected.
- Change the avoidance movement when an object is detected.
- Experiment with the detection distance.

Assignment Submission

- **All students** → Attach finished programs to the assignment in Blackboard.

- **In class assignment submission** → Demonstrate in person.
- **Online submission** → A link to a YouTube video recording showing the assignment placed in the submission area in BlackBoard.