IRobot

Model Name and Number: IRobot YE.514

Topic: Wait (Ultrasonic sensor) and Port View.

Accessory tools: 2 Large Wheel rim, 2 Nail Beams, 4 Cross Nails and 1 Ultrasonic Sensor.

Lesson's Goals:

- Students will learn Wait (Ultrasonic sensor).
- Students will practice Port View.

Lesson Structure:

1. Explain the model built in class.
2. Explain Ultrasonic Sensor.
3. Explain Wait (Ultrasonic Sensor).
4. Operational Algorithm - Flow Diagram.
5. Explain Port View.
6. Construction.
7. Programming.
8. Play with the model.
9. Dismantle and rearrange the Young Engineer kits - 10 minutes before class dismisses.

Explanation of the model to be built in class:

The model built in class today is called "IRobot". The model is a driven car that collects scattered Lego® parts from the floor. The model knows to avoid crashing into walls by using Ultrasonic Sensor. The model is driven by two motors, each motor is responsible for moving one wheel. There are two arms in front of the model that collect the Lego® parts.

Touch Sensor:

Present students with the Ultrasonic Sensor. This sensor works by using a microphone and speaker. The sensor produces sound through the speaker and sound can come from any surrounding object (wall, hand, Lego® brick). The sound is then returned to the microphone.

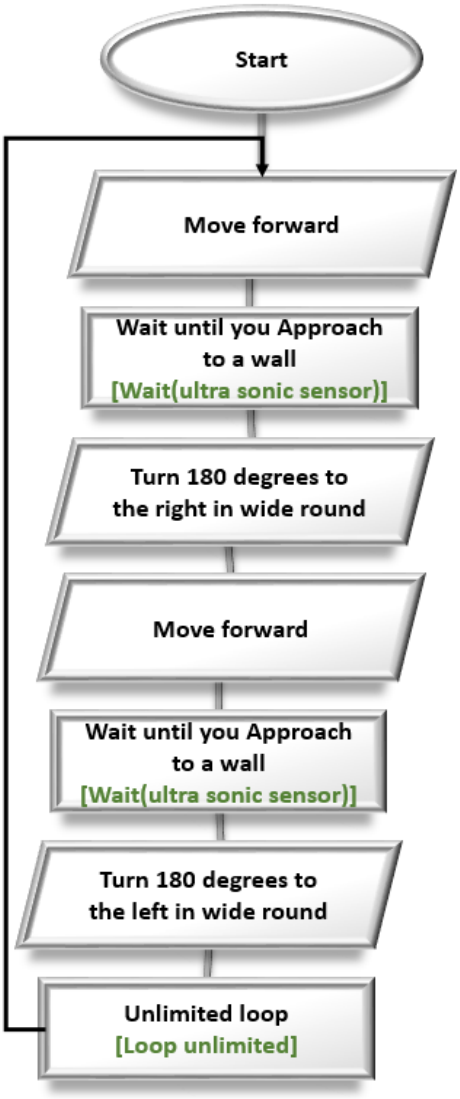
As the voice returns, if it is higher on the way from the microphone to the speaker, sound will be short. If the voice is low from microphone to the speaker, the sound will be longer. This is the same result when a friend calls you - if he is close by, I will hear him loudly, if he his far away, I will hear his voice low. In other words, the sensor knows how to perform an internal calculation, to calculate the time it takes the voice to leave and return. This concept is similar to bats who must rely on their sense of hearing due to their lack of sight. To move safely, the sensor produces sound and the pitch of the sound helps the sensor identify the distance. Measuring the distance by the sensor is only effective from 3 cm or higher.

Wait (Ultrasonic Sensor):

This command is designated to delay the reading of code. This command allows us to use Brick Buttons, the buttons behave the same way that the Touch Sensor behaves.

Selection 1 – We can choose the condition that the Wait Command delays the action. We will press Ultrasonic Sensor, then Compare and then Distance Centimeters.
Selection 2 – You can set the brick button by choosing the left, right, center, up or down button.
Selection 3 – We will define the value that corresponds to the conditions. Please note that this value is in centimeters. To convert to an inch, select number 1 – Distance Inches.

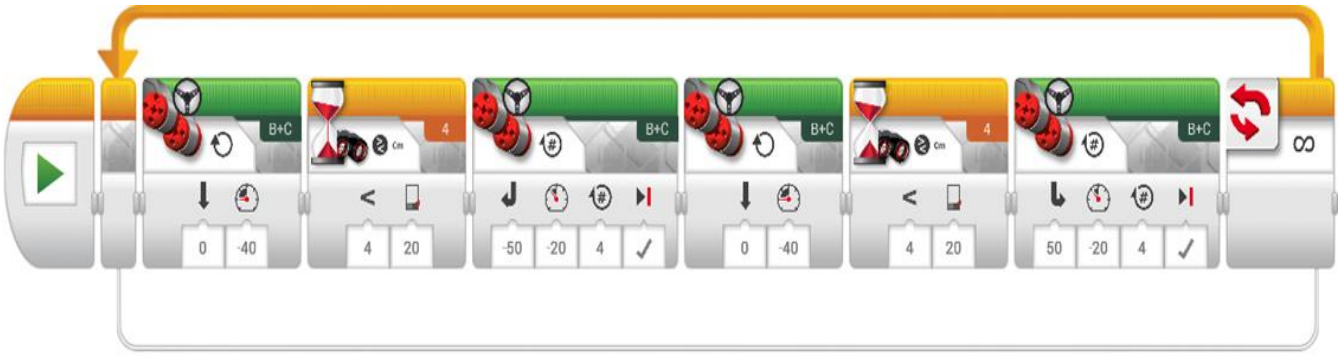
<u>Pseudo Code - Flow Chart</u>:



Practice Port Review:

To make a 180-degree rotation (turn) you need to implement tests when the car reaches 180-degrees. Turn the model towards the desired rotation and check the value displayed in the Port View for the tested motor. We will code the amount of rotations the motor completed to achieve the right turn. For accuracy, you will need to rotate the model slowly.

Screenshot:



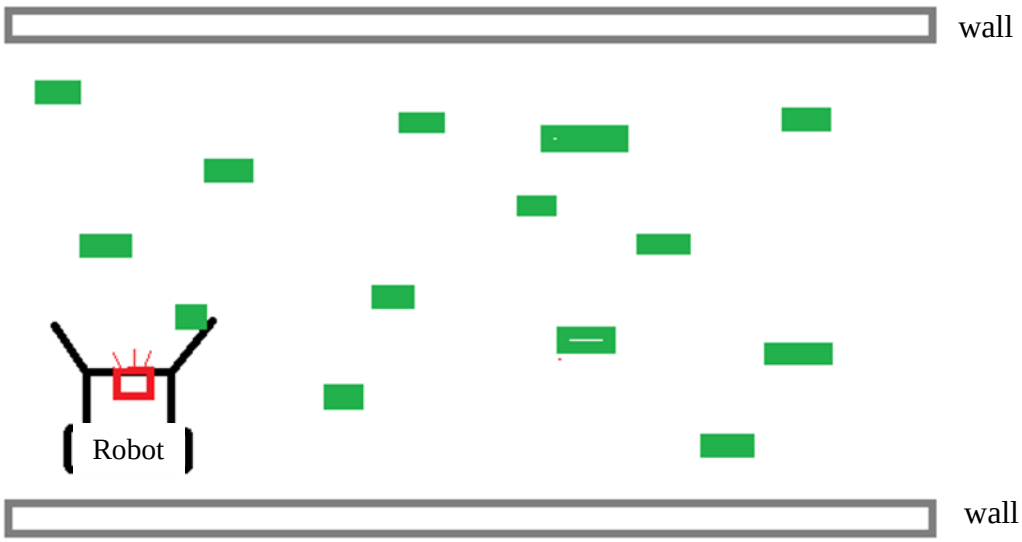
Playing with the model:

The Instructor will scatter Lego® bricks throughout the room. The robot will move straight until it reaches the wall, then it will turn around and once again move straight in the other direction. The robot will need to fix itself and move right towards the path.

There are two ways to complete this:

1. As soon as the robot reaches the wall, he can make a perfect turn by driving forward and slightly to the right. Then it will drive backwards and move slightly to the left to be in facing straight and then move forward.

2. As soon as the robot reaches the wall, it makes a wide U-turn and drives straight to the other path. A wide U-turn will be achieved by moving one wheel faster than the other wheel. You can stop the slow wheel completely to make an axis of rotation.
(The Programming and the flow chart demonstrate option number 2).



Notes for the instructor:

- ✓ Sometimes certain objects are at an angle, for example a ball. The voice will spread and the command will be inaccurate as it is impossible to measure the distance.