

Keep Away - Arduino

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

An ultrasonic sensor can detect the distance from the object in front of it. A critical value is the distance between the object in front and mBot's ultrasonic sensor can be defined as the threshold to determine whether mBot should move forward (a threshold is a value of the condition under which an object is changed, which is also called critical value).

While Loop

A while loop is like the mBlock **repeat until** block. This loop keeps going until a condition is met.

In this example, the condition is **true**, the loop repeats forever.

```
while (true) {  
    // Your code here  
}
```

In the example program below, the keep away part of the program will continue to repeat until the set button is pressed. The program exits the loop. The mBot stops moving.

In this example the value of the ultrasonic sensor indicates the distance between mBot and the object in front of it. Given the threshold of 15cm, mBot will keep moving forward until its distance from the object is less than 15cm; the mBot will stop immediately when its distance from the object is less than 15cm.

Requirements

- The robot detects an object within 15 cm and stops.
- When the object is moved, the mBot starts moving forward.
- Test the keep away with your foot.

Starter Code

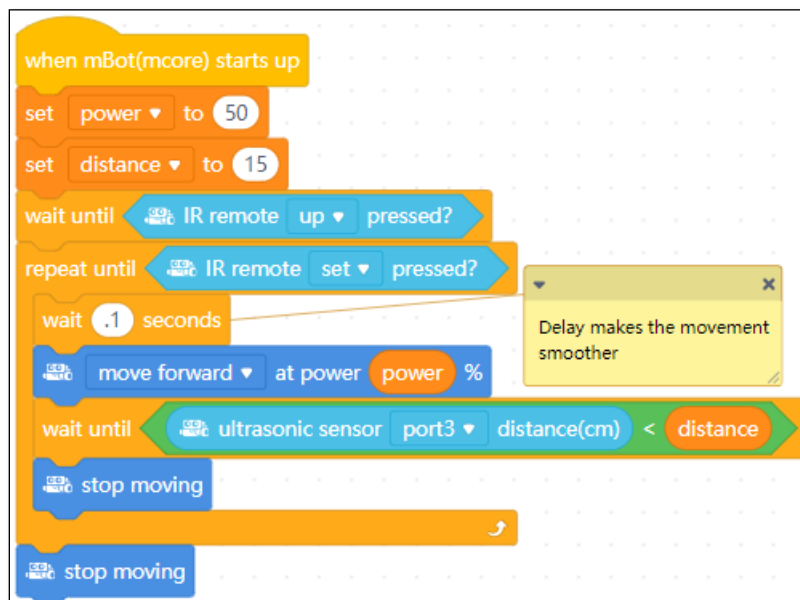
```
D-KeepAway$ Movement.h
1 /**
2   @file    SimpleObstacleAvoidance.ino
3   @author  William A Loring
4   @version V1.0.0
5   Revised: 10/06/2018   Created: 01/04/2017
6   @Description: Simple Obstacle Avoidance
7   If there is an obstacle, backup, turn right 90 and keep going
8 */
9 #include <MeMCore.h>
10 #include "Movement.h"
11 // Setup mBot hardware
12 MeIR ir; // Setup IR Remote
13 MeBuzzer buzzer; // Setup the buzzer
14 MeUltrasonicSensor ultrasonic(PORT_3); // Setup the ultrasonic sensor
15 MeRGBLed led(0, 30); // Setup the led's
16 const int OBSTACLE_DISTANCE = 10; // Constant to set Distance to obstacle
17
18 void setup() {
19   led.setpin(13); // Set the pin for the led
20   ir.begin(); // Begin listening for the ir remote
21 }
22
23 void loop() {
24   if (ir.keyPressed(IR_BUTTON_UP)) {
25     avoidObstacle();
26   }
27 }
28
29 void avoidObstacle() {
30   // Forever loop
31   while (true) {
32     // Your code here
33   }
34 }
```

Pseudocode

```
void keepAway() {  
  // Variable to store ultrasonic sensor reading  
  sensorState  
  // Infinite loop  
  while (true) {  
    Read ultrasonic sensor in inches  
    If sensorState is less than SHORT_DISTANCE of 8 inches  
      Set LED's to red  
      backwards  
    {else if sensorState < OBSTACLE_DISTANCE of 10 inches  
      Set LED's to red  
      stop  
    } else) {  
      Set LED to green  
      forward  
    }  
    Delay 100 milliseconds  
  }  
}
```

Assignment

1. Open the Arduino IDE. Save the sketch as **KeepAway**
2. Complete and test the program. Use the mBlock program as an example to get started.



- The robot also moves backwards if the barrier is moved closer to the mBot.

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.