

# Autonomous Code Activities

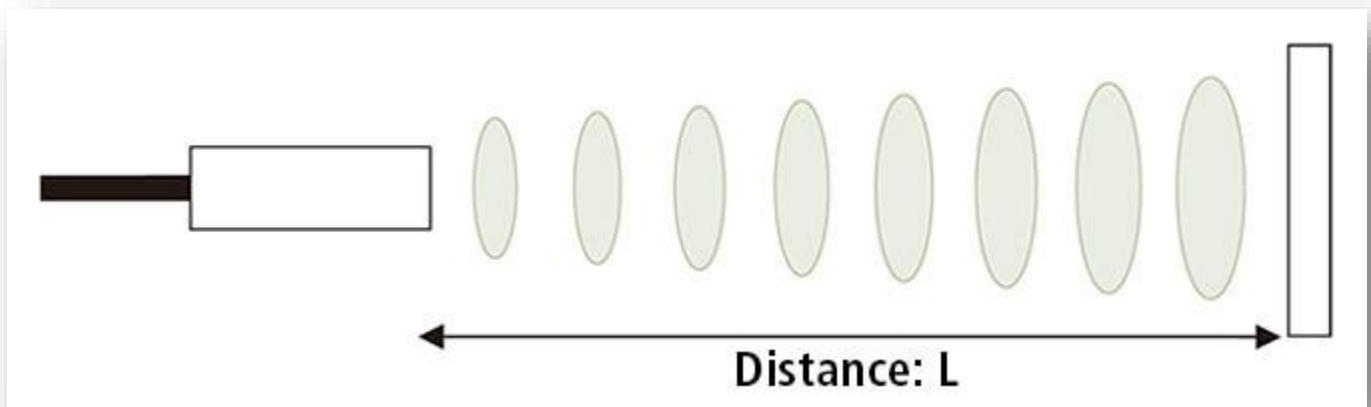
## Objective:

- Students will understand how ultrasonic sensors are used in robotics.
- Students will learn how to program autonomous robots by modifying the distance on ultrasonic sensors.

## Overview:

### What is an Ultrasonic Sensor?

As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.



### How does this relate to this year's Autonomous Challenge?

For this year's autonomous challenge 1 robot from each team will use the ultrasonic sensor to navigate the arena.



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## INSTRUCTIONS

Have students complete the activity located at the following web address:

[https://www.waveshare.com/wiki/Chapter\\_10\\_of\\_KitiBot-Microbit](https://www.waveshare.com/wiki/Chapter_10_of_KitiBot-Microbit) .

By following the step-by-step instructions students will learn how to:

- Read to ultrasonic value and display to LED matrix,
- Show distance value with bar graph,
- Detect obstacles,
- Turn when an obstacle is detected and
- Turn according to distance.

Based on the concepts covered in this activity students will understand how to program their robot to navigate arena 2. Additionally, two autonomous files have been pre-loaded to the [vbstemtrifecta](http://vbstemtrifecta) website. If you have trouble downloading the files I have inserted code links below.

Below is a description of the two autonomous files located on the website. These files can be used in as a starting point for your students.

- *Micro:Bit Obstacle Detecting*  
Ultrasonic sensor keeps detecting distance of obstacles in front, if distance is farer than 15cm, robot move forward, and stop if distance detected is less than 15cm. Note that you need to set servo degree to 90 on start, make sure ultrasonic sensor faces forward.  
Code: <https://makecode.microbit.org/4rP8WEdzjKAT>
- *Ultrasonic Sensor-Turn According to Distance*  
Here we add servo control code. Robot will rotate to both sides to detect distance (obstacle) and turn to the farer side when obstacle is detected in front.  
Code: <https://makecode.microbit.org/LRwD2bhPxUb6>

## Useful Links:

Paste this link in the extension link to get the correct ultrasonic package.

<https://github.com/waveshare/pxt-KitiBot>

Instructions on using Ultrasonic Sensor

[https://www.waveshare.com/wiki/Chapter\\_10\\_of\\_KitiBot-Microbit](https://www.waveshare.com/wiki/Chapter_10_of_KitiBot-Microbit)