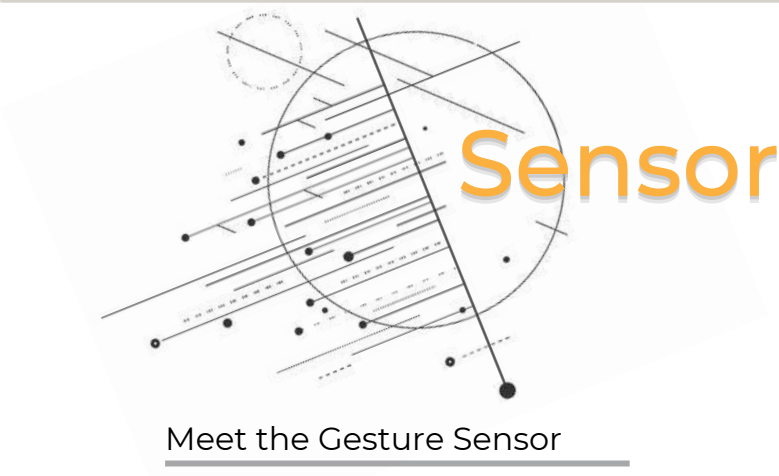


Sensor Starters

Grades: 6 & Up
Time: 15 Minutes -PDQ 1 & 2

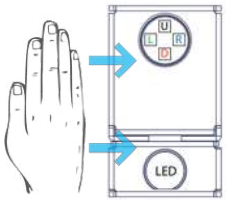
Subject: Physics, Technology, Data Science, STEM
Topics: Gesture, Motion, LED, and Infrared

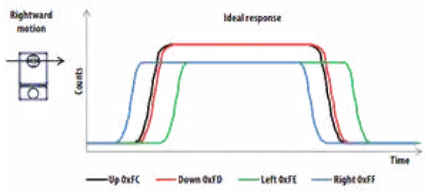
Meet the Gesture Sensor

A gesture sensor, also known as a gesture recognition sensor or gesture detector, is a type of electronic device or sensor that can detect and interpret human gestures or movements. These sensors are often used in various applications, including consumer electronics, industrial automation, virtual reality, and human-computer interaction.

Background

A gesture sensor is used to read and interpret hand movements as commands. Gesture recognition is a type of TUI (Touch User Interface) controlled without touch. When you move your hand or finger in front of the sensor, it responds accordingly. Gesture recognition is often found in smartphones, tablet computers, video game consoles, human-machine interfaces, and automobile industries.





The direction of motion is detected by looking at the timing of changes in the feedback for each photodiode. The gesture sensor has two parts: a light-emitting diode (LED) and a receiver (4 directional diodes). When an object gets close to the sensor, the infrared light from the LED reflects off of the object. When a hand/finger is swiped across 4 receivers, the direction of the swipe can be determined by looking at the amount of light reflected back to the diodes.

What You Will Need/Prep

- databot™ 2.0 & Vizeey™
- IOS/Android Smart Device
- Use Vizeey™ to scan the QR Code for **Gesture**

Gesture
Left, right, up, down - databot's gesture sens...



The gesture sensor is just one sensor in a module that is located top center of your databot™. It is a multifunction module that also senses light, gesture, and proximity.

Sensor Starters

Important Terms

Gesture: The word gesture can refer to any non-verbal communication that is intended to communicate a specific message.

Infrared: Infrared radiation (IR), or infrared light, is a type of radiant energy that's invisible to human eyes but that we can feel as heat.

An **LED** (**Light Emitting Diode**): a semiconductor device that emits light when an electric current passes through it.

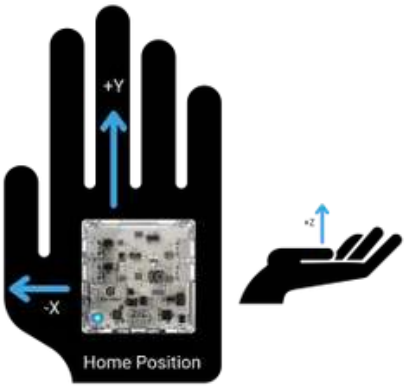
What Does a Gesture Sensor Detect?

The gesture sensor detects hand motion. The directions of hand motion like UP, DOWN, LEFT, and RIGHT. When the hand/finger is swiped infront of the sensor the direction of the movement will be detected by it.

Exploration Preparation!

In the coming activities you will be exploring your local environment and exploring the **gesture** using databot. databot is loaded with sensors and capabilities and it helps to have a common orientation for holding it and conducting experiments. That way if you are communicating with a partner you can communicate clearly - moving left, moving right, etc.

"Home position," shown here, is holding databot flat in the palm of your hand with the power and programming port oriented to the back of your palm. In this position sensors are facing up and you can move freely in any direction. You will also be able to have a common reference point for “left” and “right” etc. when you are using the gesture sensor.



databot in "home position"

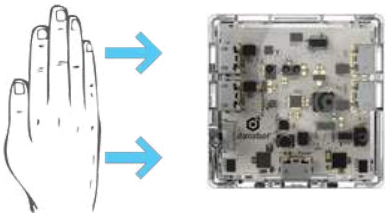
Sensor Starters

PDQ1 : Thrill with Gesture

Using the databot™ Gesture sensor it is possible to determine the direction of motion! In order to understand the working of the sensor familiarize yourself with the data obtained from the sensor and determine the maximum distance sensor detects your gesture.



- Open the Vizeey App on your smart device
- Turn on databot.
- Tap on **"Gesture"** in Vizeey™ to load the experiment.
- Use these icons to start and pause the experiment:
- Make databot rest on the table, swipe your hand towards right from left, and see the result. You should see the **gesture** value as LEFT.



Rest the databot and swipe your hands

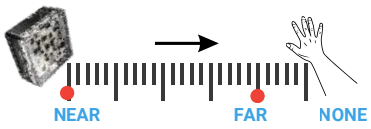








- In a similar fashion, swipe your hand in different motions (RIGHT, UP, DOWN) and read the results.
- Now, find the maximum distance your databot can detect the gesture by slowly moving your hand away from your databot.
  - You should see the **gesture** value as FAR or NEAR.



Move your hands away from the databot and find the max distance

Challenge: Does the change in light condition affects gesture? Try how the gesture sensor works in different light conditions. Does it work similarly in dim light as same as a bright light?

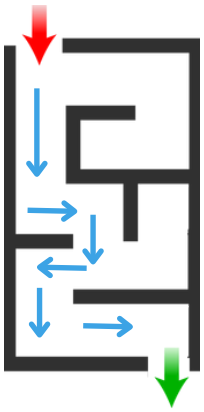
Sensor Starters

PDQ2 : The Adventure Maze

Using the databot's gesture sensor you need to go through a maze.

One participant moves his or her hand in front of the sensor. The sensor detects the direction of movement (for example, LEFT). The other player move the object in the corresponding direction. Repeat the steps until the object reaches the goal.

Look at the maze on the right. The maze starts with a red arrow and ends with a green arrow. Here is an example of how to complete the maze:

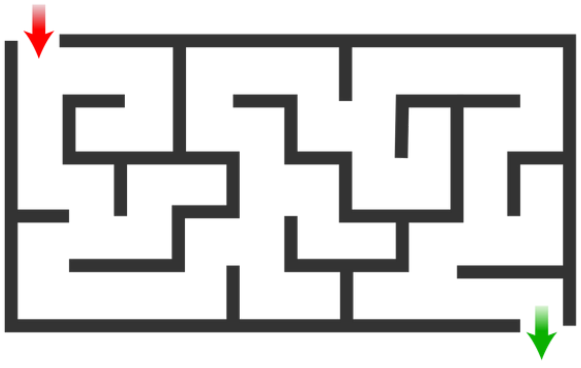


Step 1 - down.
Step 2 - to the right.
Step 3 - down.
Step 4 - left.
Step 5 - down.
Step 6 - to the right.
Step 7 - down.

This is the order in which you should display values on databot. If you feel confused, restart the process. Let's try!

- Open the Vizeey App on your smart device
- Turn on databot.
- Tap on **"Gesture"** in Vizeey™ to load the experiment.
- Use these icons to start and pause the experiment:
- Go through the maze below pointing in the right direction. Try to complete it as quickly as possible.

Start



Finish

- If multiple teams participate, you may want to organize a competition: the team that completes the maze fastest will win.

Check for Understanding

1. What does the **gesture** sensor detect?
2. In your own words, explain how the gesture sensor works.

Standards & Alignment

NGSS Standards

- Waves and Their Applications in Technologies for Information Transfer (4-PS4-3) (MS-PS4-2)(HS-PS4-5)

Science and Engineering Practices

- 2nd Practice: Developing and Using Models
- 3rd Practice: Planning and Carrying Out Investigations
- 4th Practice: Analyzing and Interpreting Data

Disciplinary Core Ideas

- Electromagnetic Radiation (PS4.B)
- ETS1.B: Developing Possible Solutions

Crosscutting Concepts

- Patterns
- Cause and Effect
- Systems and System Models

ISTE Standards

- 1.1 Empowered Learner (1a, 1d)
- 1.3 Knowledge Constructor (3a, 3b)
- 1.4 Innovative Designer (4a, 4c)
- 1.5 Computational Thinker (5a, 5c)

TEKS -Texas Essential Knowledge and Skills

- Science TEKS:

Grade 6 (112.18):
  - (b)(8)(C) Investigate wave properties, including reflection and absorption of light.
  - (b)(9)(A) Identify advantages and limitations of different digital devices used for data collection.

Grade 7 (112.19):
  - (b)(8)(C): Explore wave properties, including infrared radiation, and how it interacts with objects.

- Mathematics TEKS:

Grade 6 (111.18):
  - (b)(6)(C): Represent and interpret patterns in data (e.g., detecting gesture distances).

Grade 7 (111.19):
  - (b)(7)(A): Use patterns and data to solve real-world problems related to movement detection.

- Technology Applications TEKS:

Grades 6–8 (126.14–16):
  - (c)(3)(C): Collect and analyze gesture sensor data to improve detection systems.
  - (c)(5)(A): Use data-driven experiments to evaluate sensor functionality.