

# Training the Smart motors

## Training a motor?

Jimmy is a wonderful dog. He sits when told to sit, responds when his name is called, knows where he is supposed to urinate and poop, and can fetch balls and bring them back to Anish, his companion. How do you think Jimmy learnt to do all these things?



It is because Jimmy is a **trained** dog.

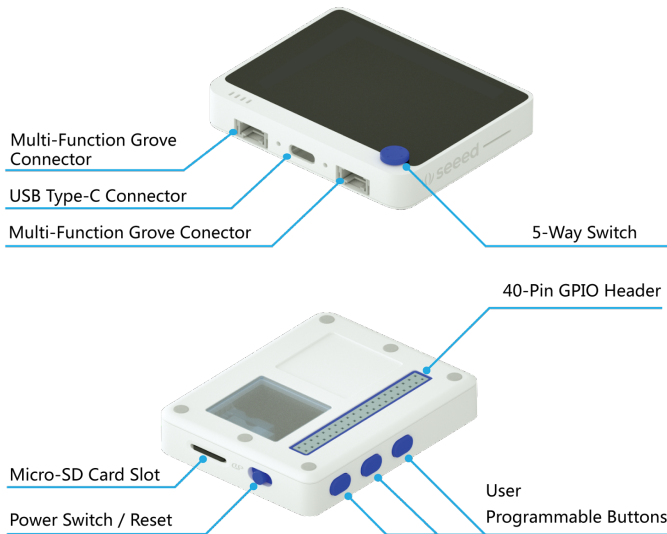
### *Did you know that even machines can be trained?*

In this lesson we shall interact with a device known as a smart motor. It's smart because it can remember the movements you teach it, and can repeat them later.

Before we start working on smart motors, we need to get familiar with some devices we will be using to train.

## Intro to devices

**WIO terminal:** This is a small computer. We use it to train the smart motor.



**Servo motor:** This is a special type of motor that can rotate to a specific position and stop.



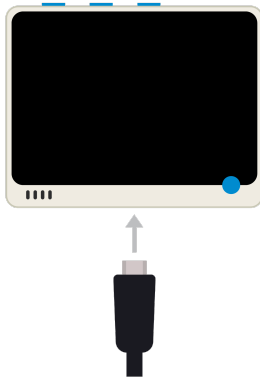
**The WIO terminal and the Servo motor together form the Smartmotor.**

## THINGS TO BE CAREFUL ABOUT

Before we learn further explore Smartmotors, let's keep the following things in mind:

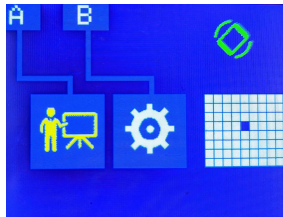
- Handle the device with care. **Press the buttons gently and don't drop it.**
- When disconnecting the servo from WIO terminal, **don't pull on the wire.** Grab the white connector head and pull it.
- Servo motors make a really cool sound when they rotate. That makes it very tempting to rotate the servo horn using our hands

## TRAINING THE SMART MOTOR



**Supplying power to WIO terminal**

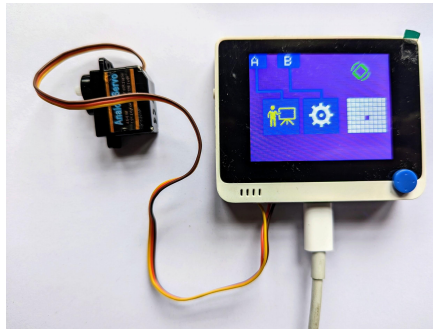
The WIO terminal is now powered on. What do you see on the screen?



**Image of Home Screen**

**What happens if you tilt the WIO terminal?**

Connect the Sseed servo to the left connector port as shown in the image below

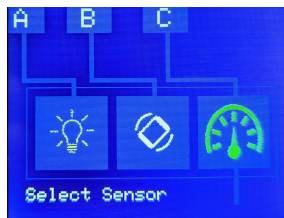


**WIO with servo motor connected to it**

### What happens if you move the 5 way switch left and right?

The WIO terminal has a built-in tilt sensor that senses the angle by which the device is tilted. WIO terminal has one more sensor - the light sensor. It's located at the back of the device, behind the transparent shield. The light sensor detects the intensity of light falling on the back of the device.

Let's learn how to switch between the two sensors. In the home screen, **press the B button**. You'll see the Select Sensor screen.



**Image of the Select Sensor Mode**

It shows three options and you can guess what they might be looking at the icons.

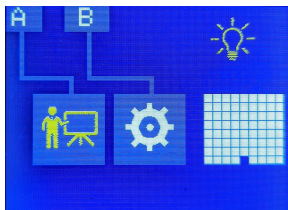
**A - Light sensor**

**B - Tilt sensor**

**C - Encoder (rotatory adjustment)**

In this lesson we'll explore only the light and tilt sensor. The encoder is an external sensor that needs to be connected to the device and we'll explore in a later lesson.

**To select the light sensor, press the A button.**



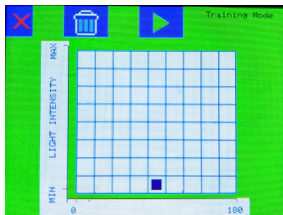
**Updated Home Screen**

**We're back to the home screen. But something has changed. Can you find out?**

***Hint:** what happens if you cover the back of the WIO terminal? What happens if you expose it to light?*

Now we are ready to train the smartmotor. **To enter the training mode, press the A button at the home screen.** Yes, the one with the icon of a teacher pointing at a board!

This is what the training mode looks like.



**Image of Training Mode**

Does it look familiar? If you have studied coordinate geometry, or graphs in math you should find it familiar. In case you don't know what it is, don't worry, you'll soon figure it out.

First, let's look at the screen and see what we can understand. **What is written on the screen? What might they mean?** Take 2 minutes to discuss with your team members.

Let's play around and see what you can figure out.

- **What happens if you tilt/ cover the back?**
- **What happens if you move the 5 way switch left or right**
- **What happens if you press on the 5-way switch?**

Take 5 minutes to talk to other groups and share what you have figured out.

This grid-like structure is called a graph, and by **pressing the 5 way switch** we are doing something known as plotting the graph. The smart motor will remember these points we have plotted and will recreate them later. **This is called training the smart motor.**

**Let's plot any 2 points a bit far away from each other.**

Did you make a mistake while plotting? No problem, there's an **undo button**. Do you see three icons at the top right to center? The middle one, that looks like a dustbin, is the undo button.



**Click on this undo button and see what happens**

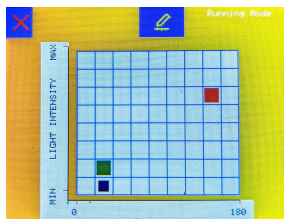
There are two other buttons on each side of the undo button. The one on the left that looks like a cross is the **cancel button**. The one on the right that looks like a play button is the **run button**.

The cancel button takes us back to the home screen. But **your smart motor also forgets all the training you had provided it**. The run button gets your Smartmotor to repeat the movements you had trained it to perform.

**Let's run the smart motor!**



**Click on this play button to run your trained smart motor**



**Image of Running Mode**

This is what the running mode looks like. Now let's vary the light exposure on the back of the WIO terminal and see what happens. What did you notice? If you are using the tilt sensor, tilt the device to the angles at which you trained the device.

**Well done! You've learnt to train your smartmotor.**

## Challenge

- Can you train your smartmotor using the Tilt sensor?

## Let's build something!

Now that you know how to train your smart motor, **what do you want to create using it?**

*Tip: Build things using easily available craft materials and use smart motors to make them interactive!*

## Reflection

- What was difficult about learning to use smart motors? Why was it so?
- How would you describe smartmotor to your parents? To a student from grade 2?