

REPORT AND TUTORIEL ARDUINO CONNECT

Tangible interface using an Arduino board, an IMU 9 Degree of Freedom inertial unit and 3D Slicer Internship CAMBA 2021

Tangible interface for interacting with Slicer's 3D view, done in 2021 for ICM and ISIR Sorbonne by Marine CAMBA, thanks to the already existing [Arduino plugin](#).

- **What this plugin does:**

Make the **3D view moves** using a [IMU 9DoF](#) (accelerometer, magnetometer and gyroscope). It is connected to an **Arduino UNO** which **return the angle made by the IMU** and send it to Slicer to make the 3D view moves depending on the angle given.

- **How the plugin works:**

This program creates a **node** to **store the data** coming from the Arduino device.

To get the data we need to:

```
- get the node : self.ArduinoNode = slicer.mrmlScene.GetFirstNodeByName("arduinoNode")
- add an observer :
sceneModifiedObserverTag=self.ArduinoNode.AddObserver(vtk.vtkCommand.ModifiedEvent,
self.name_of_the_method)
- get the data : data= self.ArduinoNode.GetParameter("Data")
```

Knowing that the data that is read is only **what is printed in the arduino code** `Serial.println(Data_to_be_seen)`, there can be as many prints as one wants, just remind that you'll get them one at a time using `data= self.ArduinoNode.GetParameter("Data")`.

Indeed, if you want to print an array for example you'll print `(array[0], array[1])` and only `array[0]` will be taken into account in the code. That is why we separated it in multiple lines (see below).

This code makes pair with **arduino_accelerometer_slicer.ino**, the arduino code part. It works with **IMU 9DoF Groove from Seeed**, and one needs to install its library, see here : https://github.com/Seeed-Studio/Seeed_ICM20600_AK09918.

The arduino part send (print) 6 datas :

- 3 ints : 0 1 and 2 to know **what axis the data belongs to** (0 for x, 1 for y and 2 for z),
- 3 floats : **roll pitch and yaw** which corresponds to the angle made by the IMU, these are absolute angles, they do not depends from the previous one.

The IMU works like a compass so we can get all 3 angles, and the **calibration is mandatory**.

- **How to make it work:**

(See also Tutoriel Arduino Slicer in French in the file Tutoriels)

Upload **arduino_accelerometer_slicer.ino** to the arduino

Add this plugin to Slicer

Go to modules>developper tools> Arduino Move It

Click on Detect device

Click on Connect

Click on Move Three D View

Do a 8-shape movement for 10seconds to callibrate it

When the view starts to move, hold the IMU flat and go on the three d view, click on the pin and select the

view A

You can now start to move the IMU to see the 3D move, be careful, the slower you move the better Slicer will display the model (around 3FPS instead of 6 when using the mouse)

- **Beware :**

Due to the **drift** on the IMU, after quite sometime, the view is not really align with the IMU, disconnect it using the button on slicer, and re do this tutorial.

Also, **decreasing the delay** on `arduino_accelerometer_slicer.ino` **won't give you more FPS** but would make slicer bug (too many informations to be treated), just try to move slowly or put the IMU down on a table and make the moves on only one axis to get used to it (move only along z, than x...).

- **Connecting the IMU to arduino**

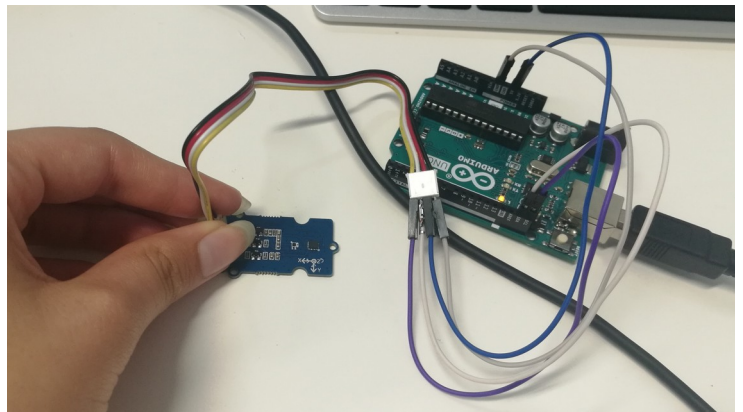
On the IMU it written which wire is what so :

Black = Ground

Red = CC = 5V

White = SDA

Yellow = SCL



- **Examples**

Go to ISIR's or ICM cloud > stage Marine > Arduino Move It > Videos