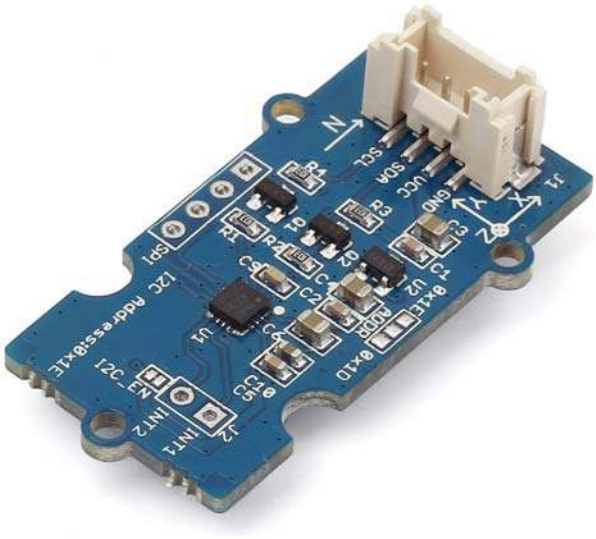
Grove - 6-Axis Accelerometer&Compass V2.0



The Grove –6-Axis Accelerometer&Compass V2.0 is a 3-axis accelerometer combined with a 3-axis magnetic sensor. It is an upgraded version of Grove - 6-Axis Accelerometer&Compass V1.0 and based on the sensor module LSM303D which has a selectable linear acceleration full scale range of ±2g / ±4g / ±8g / ±16g and a selectable magnetic field full scale range of ±2 /±4 / ±8 / ±12 gauss. Both the magnetic parts and the accelerometer parts can be powered down separately to reduce the power consumption. The Arduino can get these data via the I2C interface with the given library for this module.

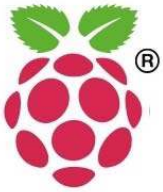
Specifications

- Input Voltage: 5V
- I2C Interface and selectable SPI Interface
- Measuring scale selectable
- 6D orientation detection
- 2 independent programmable interrupt generators
- Power-down mode
- I2C Address 0x1E(default), or 0x1D

Note
If you want to use multiplue I2C devices, please refer to Software I2C.

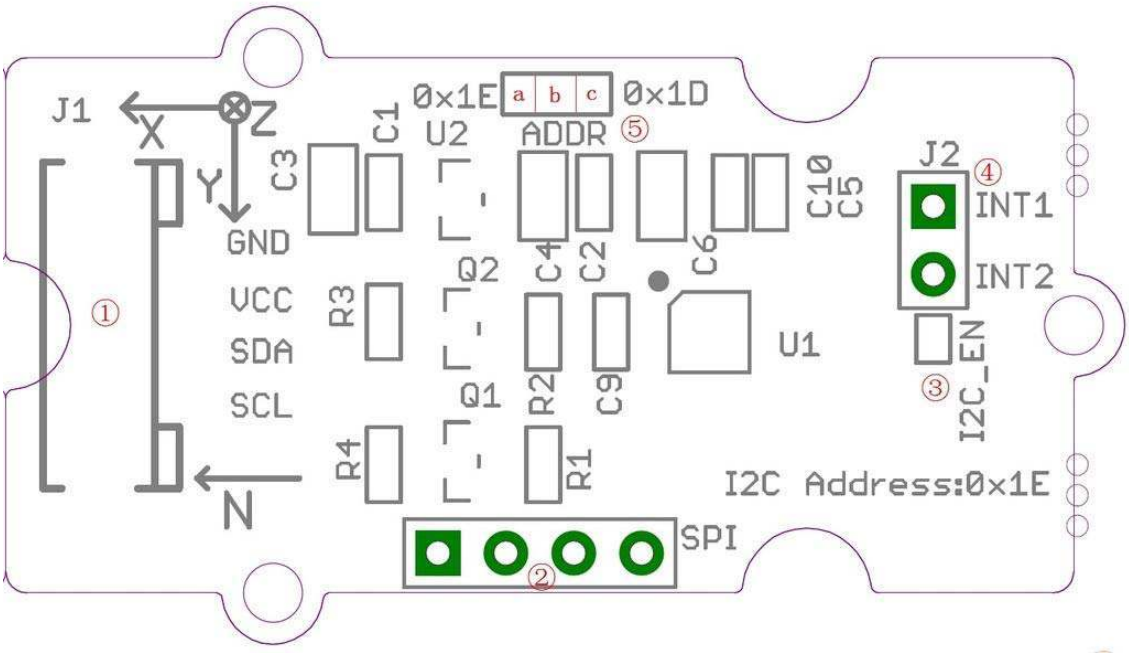
Tip
More details about Grove modules please refer to Grove System

Platforms Supported

Arduino	Raspberry Pi	BeagleBone	Wio	LinkIt ONE
				

Caution
The platforms mentioned above as supported is/are an indication of the module's software or theoritical compatibility. We only provide software library or code examples for Arduino platform in most cases. It is not possible to provide software library / demo code for all possible MCU platforms. Hence, users have to write their own software library.

Hardware Overview



- ①Grove interface, connect to I2C
- ②SPI Interface
- ③I2C or SPI select pad(default is I2C), if want to use SPI, disconnect this pad
- ④Interrupt digital output
- ⑤Address select pad, default connected b and a address is 0x1E, if connect b and c address is 0x1D, if want to use SPI, disconnect this pad to either side.

Getting started

The LSM303D is a 6D sensor module that contains a 3D accelerometer and a 3D magnetic sensor. It has an I2C digital interface so that the analog to digital converter is avoided.

The MCU can collect 6D sensor data directly through the I2C interface.OK, let's start on using this LSM303D 6D sensor module.

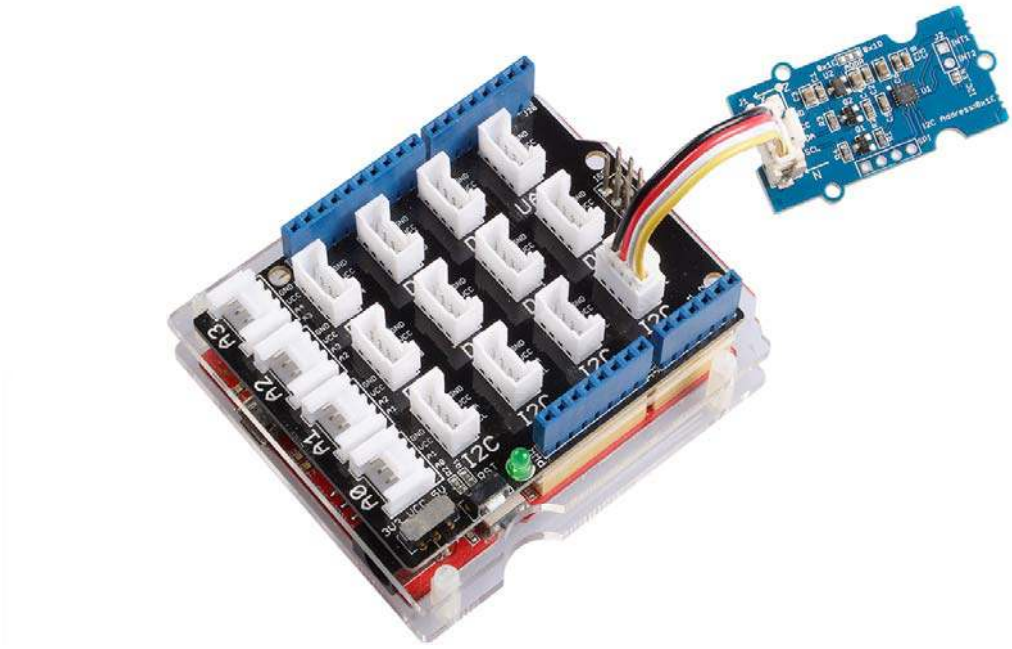
Play with Arduino

Hardware

- **Step 1.** Prepare the below stuffs:

Seeeduino V4.2	Base Shield	Grove-6-Axis_AccelerometerAndCompass_V2.0
		

- **Step 2.** Connect Grove-6-Axis_AccelerometerAndCompass_V2 to port **I2C** of Grove-Base Shield.
- **Step 3.** Plug Grove - Base Shield into Seeeduino.
- **Step 4.** Connect Seeeduino to PC via a USB cable.



Note
If we don't have Grove Base Shield, We also can directly connect this module to Seeeduino as below.

Seeeduino_v4	Grove-6-Axis_AccelerometerAndCompass_V2
5V	VCC
GND	GND
SDA	SDA
SCL	SCL

Software

Step 1. Download the library from Github.

Step 2. Refer How to install library to install library for Arduino.

Step 3. Create a new Arduino sketch and paste the codes below to it or open the code directly by the path:File -> Example ->Accelerometer_Compass->Accelerometer_Compass.

Step 4. Upload the code. If you do not know how to upload the code, please check how to upload code.

Here is the code

```
 /* LSM303DLM Example Code base on LSM303DLH example code by Jim Lindblom
1SparkFun Electronics

2   date: 9/6/11
    license: Creative commons share-alike v3.0
3
    Modified by:Frankie.Chu
4   Modified by:Jacky.Zhang 2014-12-11: Ported to 6-Axis
 Accelerometer&Compass of Seeed Studio
5   Modified by:Jacky.Zhang 2015-1-6: added SPI driver

6   Summary:
    Show how to calculate level and tilt-compensated heading using
7   the snazzy LSM303DLH 3-axis magnetometer/3-axis accelerometer.

8   Firmware:
    You can set the accelerometer's full-scale range by setting
9   the SCALE constant to either 2, 4, or 8. This value is used
    in the initLSM303() function. For the most part, all other
10  registers in the LSM303 will be at their default value.

11  Use the write() and read() functions to write
    to and read from the LSM303's internal registers.
12
    Use getLSM303_accel() and getLSM303_mag() to get the acceleration
13  and magneto values from the LSM303. You'll need to pass each of
    those functions an array, where the data will be stored upon
14  return from the void.

15  getHeading() calculates a heading assuming the sensor is level.
    A float between 0 and 360 is returned. You need to pass it a
16  array with magneto values.

17  getTiltHeading() calculates a tilt-compensated heading.
    A float between 0 and 360 degrees is returned. You need
18  to pass this function both a magneto and acceleration array.

19  Headings are calculated as specified in AN3192:

20http://www.sparkfun.com/datasheets/Sensors/Magneto/Tilt%20Compensated%20Com
 pass.pdf
21*/

22/*
 hardware & software comment
23I2C mode:
 1, solder the jumper "I2C EN" and the jumper of ADDR to 0x1E
24 2, use Lsm303d.initI2C() function to initialize the Grove by I2C
 SPI mode:
25 1, break the jumper "I2C_EN" and the jumper ADDR to any side
 2, define a pin as chip select for SPI protocol.
26 3, use Lsm303d.initSPI(SPI_CS) function to initialize the Grove by SPI
 SPI.h sets these for us in arduino
27const int SDI = 11;
```

```
  const int SDO = 12;
28const int SCL = 13;
  */
29
  #include <LSM303D.h>
30#include <Wire.h>
  #include <SPI.h>
31
  /* Global variables */
32int accel[3];  // we'll store the raw acceleration values here
  int mag[3];  // raw magnetometer values stored here
33float realAccel[3];  // calculated acceleration values here
  float heading, titleHeading;
34
  #define SPI_CS 10
35
  void setup()
36{
      char rtn = 0;
37    Serial.begin(9600);  // Serial is used for debugging
      Serial.println("\r\npower on");
38    rtn = Lsm303d.initI2C();
      //rtn = Lsm303d.initSPI(SPI_CS);
39    if(rtn != 0)  // Initialize the LSM303, using a SCALE full-scale range
      {
40        Serial.println("\r\nLSM303D is not found");
          while(1);
41    }
      else
42    {
          Serial.println("\r\nLSM303D is found");
43    }
  }
44
  void loop()
45{
      Serial.println("\r\n**************");
46    //getLSM303_accel(accel);  // get the acceleration values and store
  them in the accel array
47    Lsm303d.getAccel(accel);
      while(!Lsm303d.isMagReady());// wait for the magnetometer readings to
48be ready
      Lsm303d.getMag(mag);  // get the magnetometer values, store them in mag
49
      for (int i=0; i<3; i++)
50    {
          realAccel[i] = accel[i] / pow(2, 15) * ACCELE_SCALE;  // calculate
51real acceleration values, in units of g
      }
52    heading = Lsm303d.getHeading(mag);
      titleHeading = Lsm303d.getTiltHeading(mag, realAccel);
53
      printValues();
54
      delay(200);  // delay for serial readability
55}
```

```
void printValues()
  {
    Serial.println("Acceleration of X,Y,Z is");
    for (int i=0; i<3; i++)
    {
        Serial.print(realAccel[i]);
        Serial.println("g");
    }
    //print both the level, and tilt-compensated headings below to compare
    Serial.println("The clockwise angle between the magnetic north and x-
axis: ");
    Serial.print(heading, 3); // this only works if the sensor is level
    Serial.println(" degrees");
    Serial.print("The clockwise angle between the magnetic north and the
projection");
    Serial.println(" of the positive x-axis in the horizontal plane: ");
    Serial.print(titleHeading, 3);  // see how awesome tilt compensation
  is?!
    Serial.println(" degrees");
  }
```

```
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```

```
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 0
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```
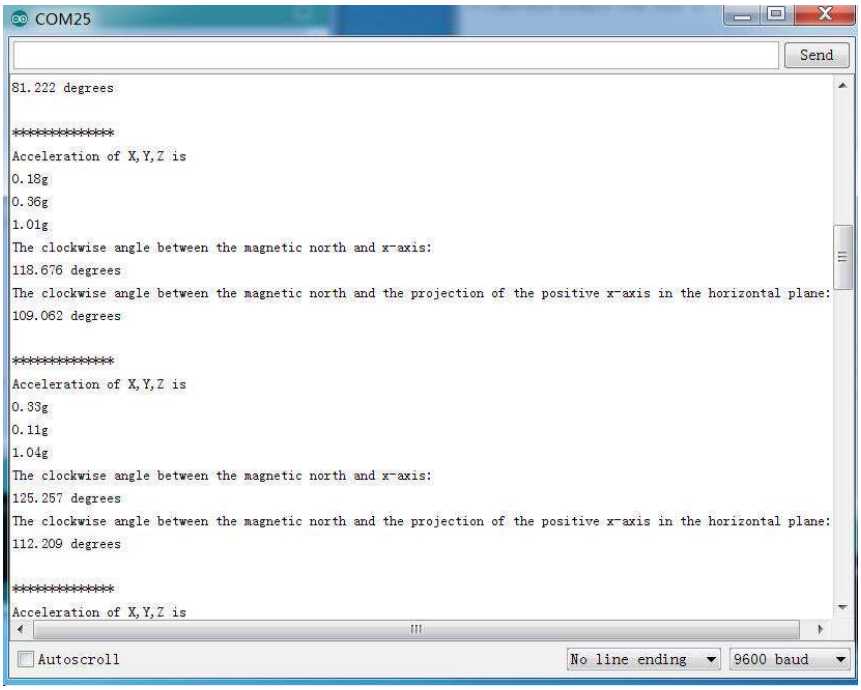

Step 5. Open the serial monitor, you will see the output result of Color Sensor as shown below:



Step 6. You can see the acceleration values and the clockwise angle between the magnetic north and x-axis.

The X/Y/Z shows the 3 axis acceleration; and then the angle between the magnetic north and x-axis calculated.

And also the the angle between the magnetic north and the projection of positive x-axis calculated.

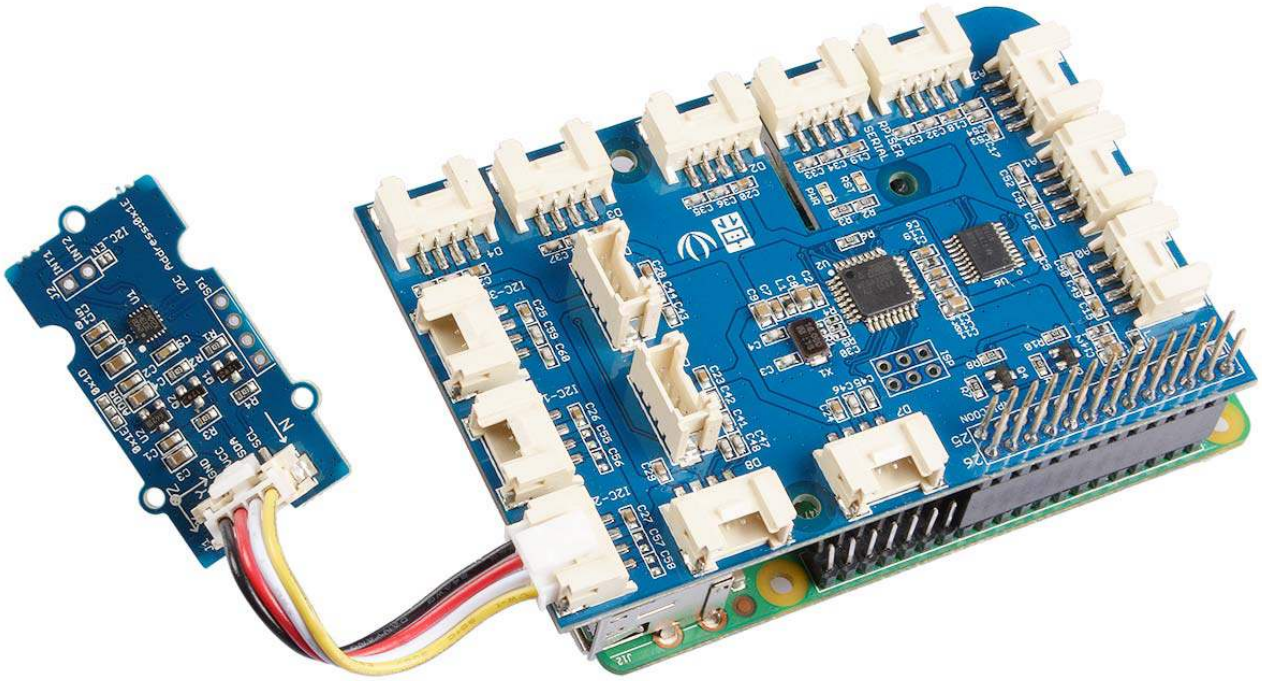
Play With Raspberry Pi

Hardware

- **Step 1.** Prepare the below stuffs:

Raspberry pi	GrovePi_Plus	Grove-6-Axis_AccelerometerAndCompass_V2.0
		

- **Step 2.** Plug the GrovePi_Plus into Raspberry.
- **Step 3.** Connect Grove-6-Axis_AccelerometerAndCompass_V2.0 to **I2C** port of GrovePi_Plus.
- **Step 4.** Connect the Raspberry to PC through USB cable.



Software

- **Step 1.** Follow Setting Software to configure the development environment.
- **Step 2.** Git clone the Github repository.

```
cd ~
git clone https://github.com/DexterInd/GrovePi.git
```

- **Step 3.** Excute below commands to use this sensor

```
cd ~/GrovePi/Software/Python/grove_6axis_acc_compass
python grove_6axis_accel_compass_example.py
```

Here is the code of example:

```
#!/usr/bin/env python
#
# GrovePi example for using the Grove - 6-Axis Accelerometer&Compass
v2.0(http://www.seeedstudio.com/depot/Grove-6Axis-AccelerometerCompass-v20-
p-2476.html)
#
# The GrovePi connects the Raspberry Pi and Grove sensors.  You can learn
more about GrovePi here:  http://www.dexterindustries.com/GrovePi
#
# Have a question about this library?  Ask on the forums here:
http://forum.dexterindustries.com/c/grovepi
#
'''
## License
The MIT License (MIT)
GrovePi for the Raspberry Pi: an open source platform for connecting Grove
Sensors to the Raspberry Pi.
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LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING
FROM,
OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN
THE SOFTWARE.
```
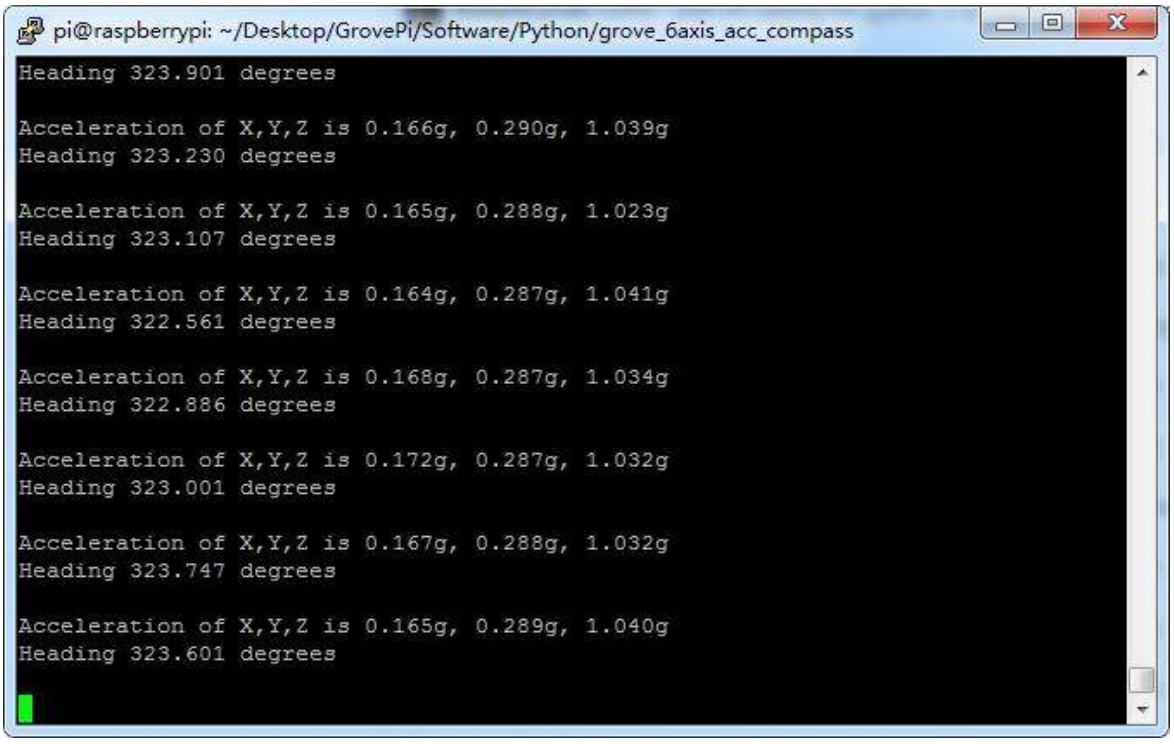
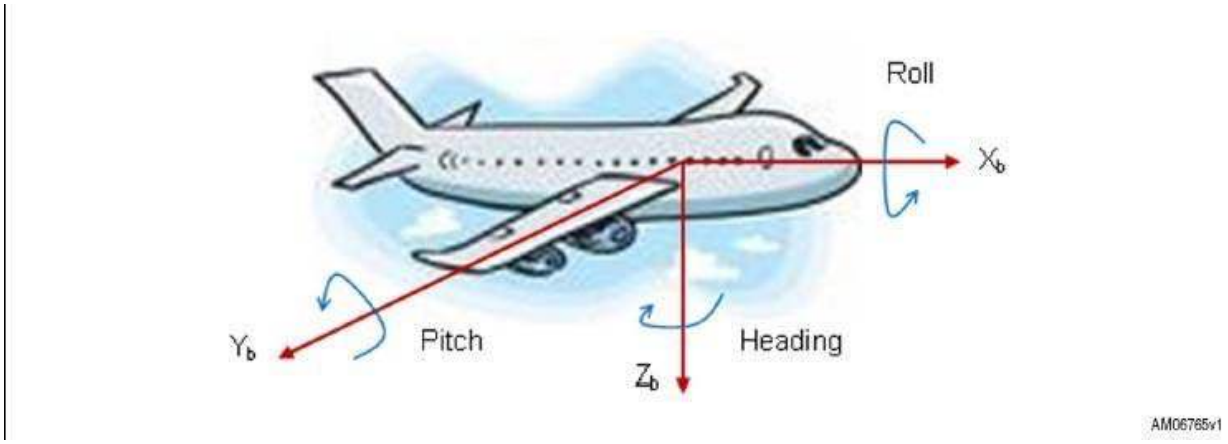

```
'''
import lsm303d

try:
    acc_mag=lsm303d.lsm303d()

    while True:

        # Get accelerometer values
        acc=acc_mag.getRealAccel()

        # Wait for compass to get ready
        while True:
            if acc_mag.isMagReady():
                break

        # Read the heading
        heading= acc_mag.getHeading()

        print("Acceleration of X,Y,Z is %.3fg, %.3fg, %.3fg"
%(acc[0],acc[1],acc[2]))
        print("Heading %.3f degrees\n" %(heading))

except IOError:
    print("Unable to read from accelerometer, check the sensor and try
again")
```

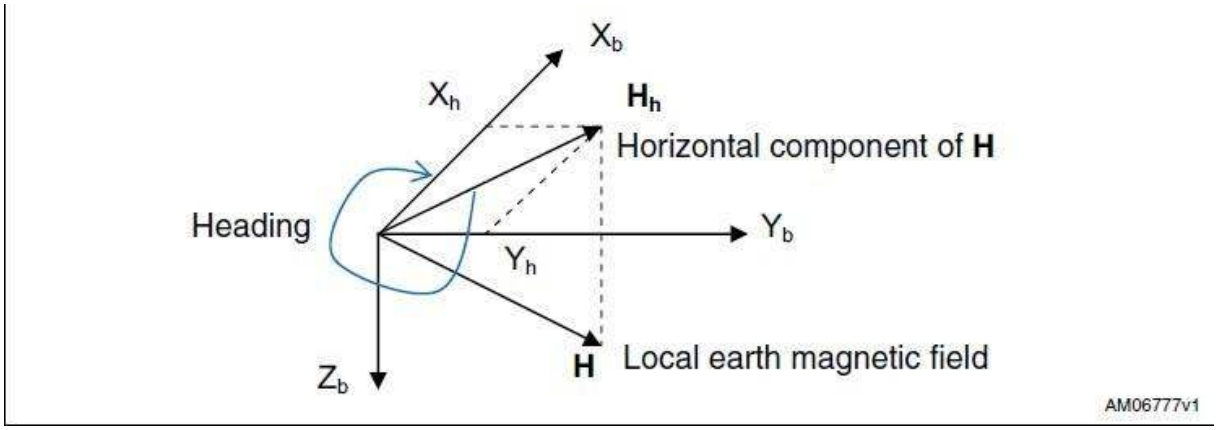
Here is the result:



References

Click here to know more about this parameter.

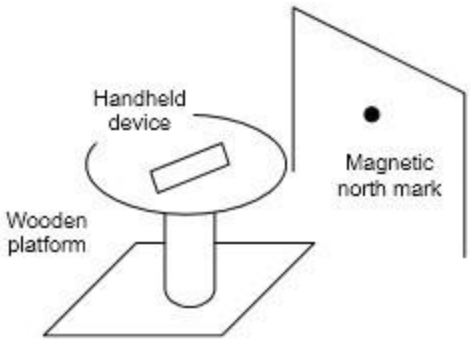




Notes

1. All ST MEMS accelerometers are factory calibrated, allowing the user to avoid any further calibration for most of the applications. However, to reach a heading accuracy of below 2°, an easy calibration procedure is needed.

2. When test The clockwise angle between the magnetic north and x-axis, you can align the device Xa axis to any direction, but do not make it face down. Refer to the below picture:



Resources

- **[Library]** 6-Axis Accelerometer&Compass v2.0 Library for arduino
- **[Library]** 6-Axis Accelerometer&Compass v2.0 Library for raspberry pi
- **[Datasheet]** LSM303D_datashet
- **[Eagle]** 6-Axis Accelerometer&Compass v2.0 eagle file

Tech Support

Please submit any technical issue into our forum.