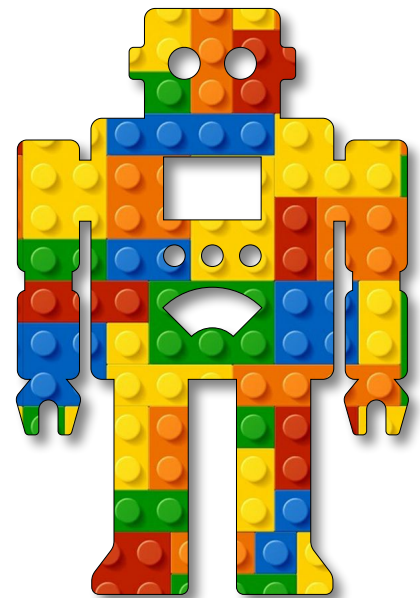


Intelligent
Machines
Module A
Unit #12
magnetometer





Content

Module A Unit #12 Magnetometer

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The Magnetometer

A **magnetometer** is a device that measures **magnetism**, that is, the direction, strength, or relative change of a **magnetic field** at a particular location. This works with the Earth's magnetic field as well as a strong electrical magnetic field.

It is possible to use it as a compass, but there is quite a bit of calibrating to do, and we will give it a miss in this unit. Although I would be interested to see if you use AI to figure it out if you have the raw data and the accurate angle of the Arduino. Maybe.

Figure 1: moving the Arduino over an electric cable

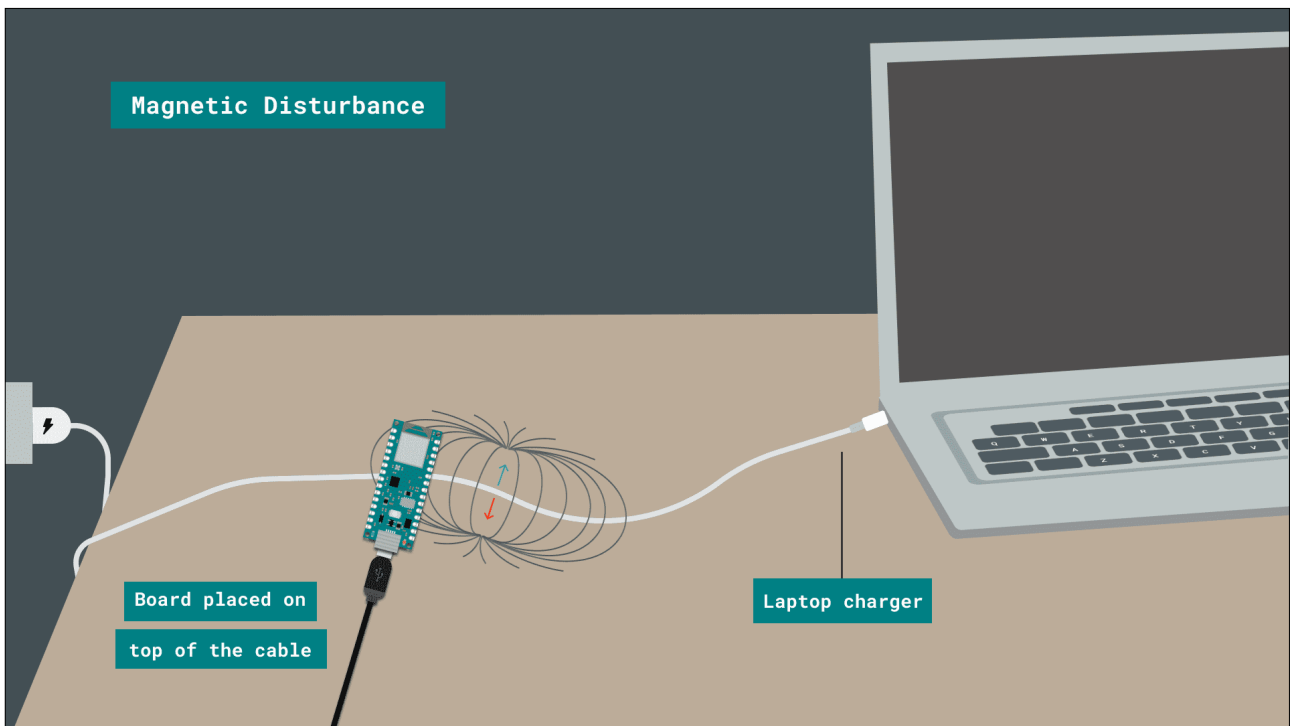
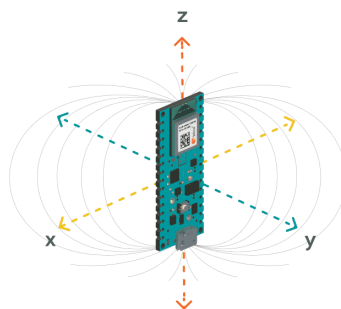


Figure 2: The x, y and z axes





Sketch A12.1 magnetometer values

Gives you the raw data.

Arduino sketch

```
#include "Arduino_BMI270_BMM150.h"

float x;
float y;
float z;

void setup()
{
  Serial.begin(9600);
  while (!Serial);
  Serial.println("Started");
  if (!IMU.begin())
  {
    Serial.println("Failed to initialize IMU!");
    while (1);
  }
  Serial.print("Magnetic field sample rate = ");
  Serial.print(IMU.magneticFieldSampleRate());
  Serial.println(" Hz");
  Serial.println();
  Serial.println("Magnetic Field in uT");
  Serial.println("X\tY\tZ");
}

void loop()
{
  if (IMU.magneticFieldAvailable())
  {
    IMU.readMagneticField(x, y, z);
    Serial.print(x);
    Serial.print('\t');
    Serial.print(y);
    Serial.print('\t');
```

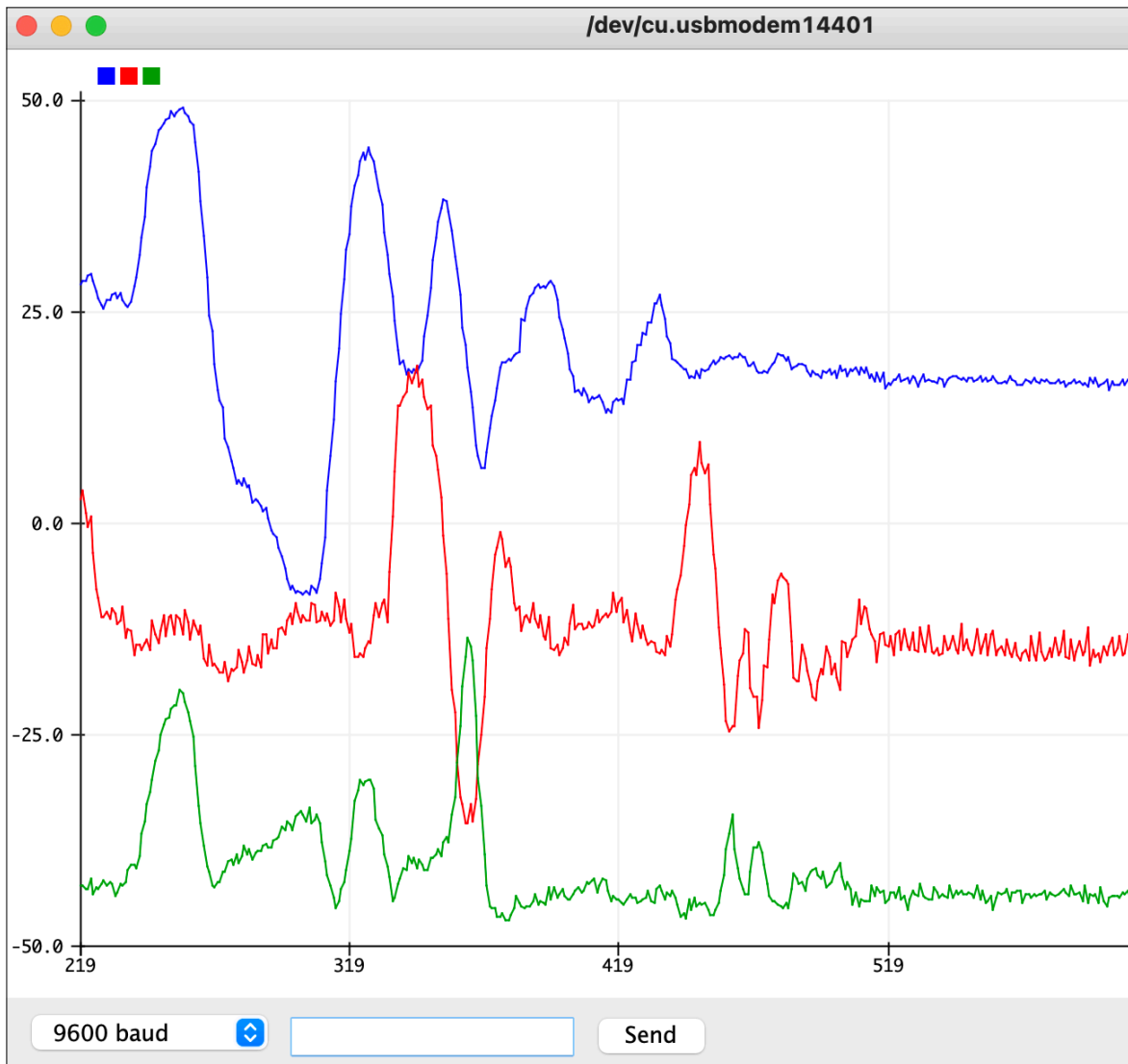
```
Serial.println(z);  
}  
}
```



Notes

Very similar to the **accelerometer** and the **gyroscope**. Also, we can see the data in the serial monitor and plotter.

Figure A12.1





Sketch A12.2 magnetometer detection

Using the **built-in LED**, this is not as effective as I would like, but it is still a demonstration. Notice that it is a slimmed-down version. I used a fridge magnet to get a better effect.

Arduino sketch

```
#include "Arduino_BMI270_BMM150.h"

float x;
float y;
float z;
float ledValue;

void setup()
{
  IMU.begin();
}

void loop()
{
  IMU.readMagneticField(x, y, z);
  ledValue = map(x, 0, 100, 0, 256);
  analogWrite(LED_BUILTIN, ledValue);
  delay(500);
}
```



Notes

You get something from the LED, but it's a bit underwhelming.



Challenges

1. See if you can improve it.
2. Can you get it to work as a compass?