


Poster de présentation

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Piezoelectric Seismometer





Introduction

The given task was to use 3 piezoelectric sensors to create a cheap and easy to build 3-component seismometer. A 3-component seismometer has 3 sensors along 3 orthogonal axes: x, y, and z. Those sensors are able to detect vibrations in the ground. A 3-component seismometer also needs to be able to record the vibrations.

I/ Materials

- 3 mikro-e-355 Vibration 2 sensors; Arduino Uno board
- 3 100 megaOhms resistors, wire, screws, nuts, various tools
- 3D-printed cubic mount to secure the sensors and hold the electronic circuit
- Computer to upload the code and display the results



II/ Operation


The sensors convert vibrations to voltage. The code uploaded to the Arduino board allows for interpretation of the variations in voltage. Each sensor is wired to a pin on the board, which must be introduced [1]. The information about the vibrations is not in the voltage produced by the sensor, but the variations in voltage, i.e. a difference, so the previous value must be stored in a variable [2].

The program starts by reading the voltage value in each sensor [3], then calculating the difference with the previous value [4]. To prepare for the next iteration, the previous value stored in the variable is replaced by the new one [5].


The results are then plotted [6]. 2 constant lines must be added to prevent the graph from auto-scaling, which would make reading it very difficult [7].

```
1 // Define pins for sensors
2 // Define pins for sensors
3 // Define pins for sensors
4 // Define pins for sensors
5 // Define pins for sensors
6 // Define pins for sensors
7 // Define pins for sensors
```

III/ Results




Graph showing the voltage differences depending on time (in 5 ms increments) without any disturbance



Graph showing the voltage differences depending on time (in 5 ms increments) with a vertical disturbance

There is a visible spike on the blue curve, which is the response of the sensor set along the x axis, which is consistent with the vertical disturbance



IV/ Conclusion

This seismometer allows the user to detect vibrations, thanks to the graph obtained as a result. However, it is difficult to quantify or measure the magnitude of a potential seism. Also, identifying the orientation of the vibrations, which allows for analysis of the tremors and identifying the P and S waves is also difficult. This can be the object of further experimentation and development.

Bibliography

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