IDEASTUDIO
THE MAKERSPACE @ WEST HOUSTON INSTITUTE

Module 4 - micro:bit Accelerometer Data Analysis

Overview

This intermediate module builds on your micro:bit experience by exploring how accelerometer data can be collected, logged, andanalyzed. You will set up a two-micro:bit system with radio communication(one as transmitter, one as data logger), export raw acceleration readings, and process them in Google Colab. Using Python, you will learn how to clean, transform, and visualize accelerometer signals, and apply mathematical functions to interpret motion. This project introduces real-world IoT data streaming and analysis workflows.

Outcomes

After completing this training, you should be able to:

a. Configure two micro:bits for radio communication(transmitter+logger).
b. Collect raw accelerometer data and save it as a .txt file.
c. Perform basic preprocessing(cleaning, normalization) on raw data.
d. Create visualizations of accelerometer signals(line plots, scatter plots, histograms).
e. Apply mathematical functions to interpret motion data.

Assessment

To successfully complete this training, you will need to demonstrate competency and earn at least 20 points on the assessment. The following are the individualized criteria on which you will be assessed.

CRITERIA	Needs Work (0 points)	Competent (5 points)	Exceptional (10 Points)
Configure transmitter & logger micro:bits			
Export accelerometer data as .txt			
Analyze & visualize signals			
Interpret motion with math functions			
TOTAL SCORE:			

IoT with micro:bit - Motion Data Insights

The accelerometer project demonstrates how the micro:bit can be used to measure movement and orientation and connect those signals to cloud-based analysis. By capturing acceleration across x, y, and z axes, storing it, and analyzing patterns, students gain insight into how IoT devices can support motion tracking, wearable technology, and activity recognition.

This project highlights:

- Radio sensing & logging: Configuring two micro:bits to work as a transmitter and logger.
- Data export & integration: Saving raw accelerometer signals into .txt file for analysis.
- Motion interpretation: Using Python and mathematical functions to translate raw numbers into meaningful patterns.

Step-by-Step Instructions

1. Set Up Your Hardware

   You will need:

   a. 2 x BBC micro:bit(V2 for extended features)
   b. 1 x micro:bit battery pack(2 x AAA)
   c. 1 x USB cable (micro-USB)
   d. A computer with internet access

2. Software Setup

   In this step, we will configure two micro:bits with two different codes.

   a. Get the transmitter and logger:
   Introduction-to-Electronics-on-microbit/4-Microbit-Accelerator_Data-Analysis/Microbit_Setup at main · WestHoustonInstitute/Introduction-to-Electronics-on-microbit Download both the data-logger and data-transmitter.

   b. Flash in Makecode:
   Open https://makecode.microbit.org → Import → Import File → select microbit-data-logger.hex. After you open the file, confirm the frequency, if other people are with you doing the project, make sure that you have a unique frequency value(e.g. The value is set to 99, you can change it to 42). Now open another tab of MakeCode and do the same for the data-transmitter.

   c. Flash the micro:bit:

- Connect the micro:Bit over USB; a MICROBIT drive appears. Click on "Download" in MakeCode and pair the device with your computer. After that it should automatically start downloading. Do the same process for two micro:bits(Flash one as transmitter, the other as data-logger).

3. Data Logging & Export
   In this step, we will log our data by moving the transmitter in the 3D space, and export the file to Google Colab.
   a. Now you need to go to the micro:bit data-logger MakeCode tab. Click on "Show Data Device". Start moving the transmitter, like shaking it, and analyze the change in x, y, and z dimensions. Note that data is being recorded. After you record enough data for around 3 minutes, click on "Save Raw Text" in the top right corner.
   b. Example filename: microbit-console-2024-10-15T20-25-42-764Z.txt

4. Data Analysis & ML (Google Colab)
   You'll use our starter notebook to keep things simple and reproducible.
   a. Open the notebook:
   - Go to Google Colab → https://colab.research.google.com
   - Go to our GitHub repo and download Introduction-to-Electronics-on-microbit/4-Microbit-Accelerator_Data-Analysis/Accelerometer_Data-Analysis at main · WestHoustonInstitute/Introduction-to-Electronics-on-microbit Upload it to → Google Colab.

   b. Upload your .txt file:
   - In Colab left sidebar → Files → Upload files → select your exported .csv. This step is also shown in the notebook.

   c. Run the notebook

Troubleshooting

- No data received? Ensure both micro:bits are on the same radio group/channel. Re-flash the .hex files if needed.
- Logger not saving data? Once everything is flashed, the logger should be attached via USB and the transmitter should be attached to the battery.
- Flat/unchanging values in the "Show Data Device" section in the data-logger MakeCode tab? Confirm you are moving the transmitter micro:bit. Try strong shakes to see variation across x,y,z. Also try refreshing the page.
- File import error in Colab? Double-check that you updated the filename in the notebook to match your .txt.
- Colab libraries not working?

  !pip install numpy pandas matplotlib seaborn

Run the above code in an empty cell in Colab → Restart runtime and run everything again.