

Project #3: Open-source acoustics-based computer interface

Idea: Build a 1D open-source computer interface using two cheap vibration sensors placed at the ends of, for example, a steel beam or a wooden plank. Experiment with creative applications (for example, turn any surface into a piano or build a Touch Bar).

Could involve physical modelling of sound/wave propagation and/or machine learning.

See, for example: <https://www.hypersurfaces.com/>

Goal:

- Design, implement, and release open-source hardware and control software.
- Document all outcomes and make them publicly available and under suitable license.
- Learn about signal processing.

Difficulty: Easy

Subjects: open software, open hardware

Deliverables:

- Github repository with source code.
- Documentation, manuals, and results (e.g. as PDF or Github page).

Requirements and costs:

- Hardware
 - Arduino/Raspberry Pi
 - Ceramic Piezo vibration sensors
 - Steel rod or wooden beam
 - Laptop/Desktop PC
- Python, Jupyter Notebooks, conda/pip, Git

Milestones:

1. Think about technical realisation (e.g. ratio of measured signal amplitudes at the ends)
2. Build setup, record and inspect/analyse data
3. Experiment with creative applications
4. Document and release

Estimation:

Bonus:

- Optimize for real-time
- Extend to 2D (e.g. table surface)

Hint: find out if sensors can be read quickly enough to differentiate signals on both ends for the chosen material.

References:

193.067 Free and Open Technologies

TU Wien, winter term 2019/2020.

Lecturers: Christoph Derndorfer and Lukas F. Lang

- Raspberry Pi vibration analysis of a steel beam

<https://makersportal.com/blog/2019/2/26/raspberry-pi-vibration-analysis-experiment-with-free-free-bar>



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