Oxygen Concentrator Monitoring Device

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In collaboration with OVSI

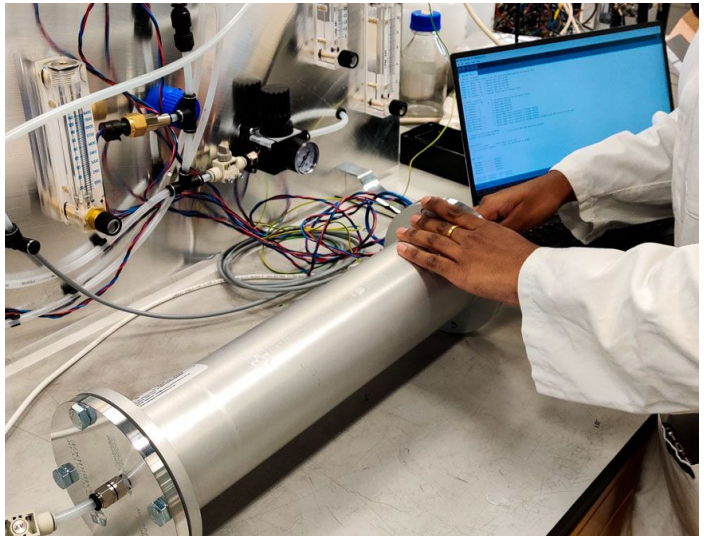
The Problem

- Pneumonia kills more children every year than any other infectious disease.
- UNICEF believe that almost all of these deaths are preventable.
- Having access to robust medical oxygen supplies is key.
- However, oxygen concentrators often fail to operate reliably in regions where pneumonia is most prevalent.
- Also, Ministries of Health have very little data relating to the usage of their concentrators.

https://www.unicef.org/innovation/resilient-oxygen-concentrators

Our Partner: OVSI

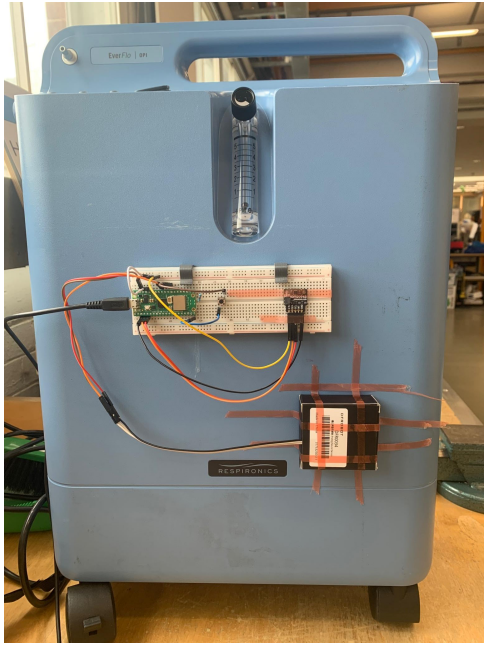
- OVSI aim to ensure every individual has reliable access to essential medical oxygen.
- One of their four innovation domains is to develop a non-intrusive monitoring device.
- Our project looks at early stage testing of potential monitoring solutions.



https://www.ovsi.org/

Our Solution

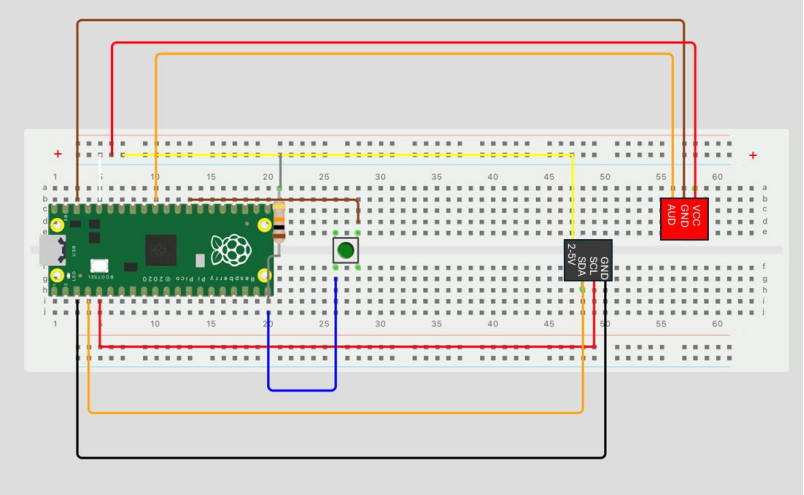
- Dual sensor monitoring device that accurately reports the operational status.
- Syncing function allows for long-term accuracy and compatibility with all oxygen concentrators.
- Scope to perform predictive maintenance.



Sensors and Circuitry

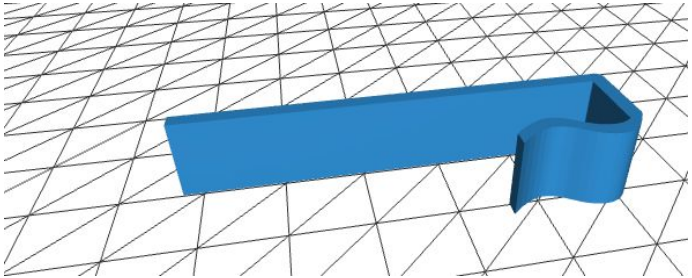
- Breadboard setup for reading sensor outputs

- Key Components:
  - Raspberry Pi Pico WH
  - Accelerometer
  - Microphone



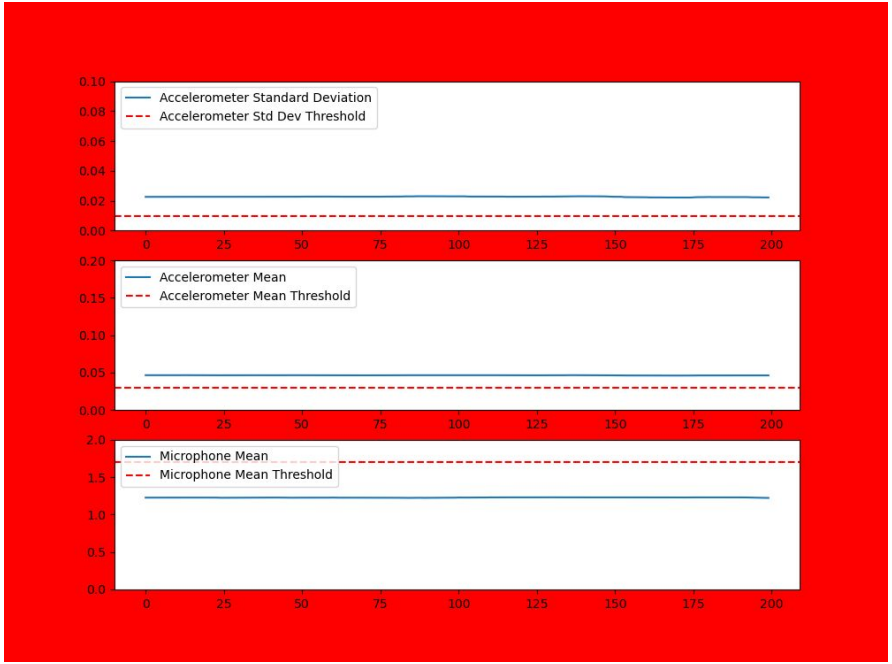
Hardware

- A solution for removing the effect of external noise on the microphone.
- A clip for mounting the sensors on the oxygen concentrator’s outer casing.



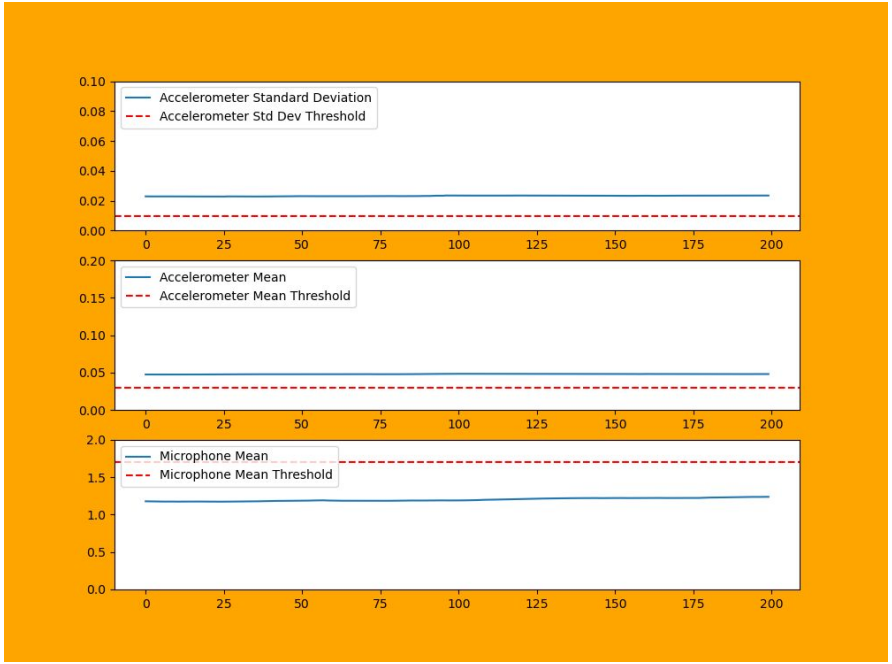
Prototype Demonstration

- The photo on the right shows the output of the monitoring device.
- In this test the monitoring device had just been placed on a new concentrator.
- The concentrator was on and running.
- However, the red screen shows it was incorrectly monitoring the concentrator as ‘off’.



The Prototype Interface

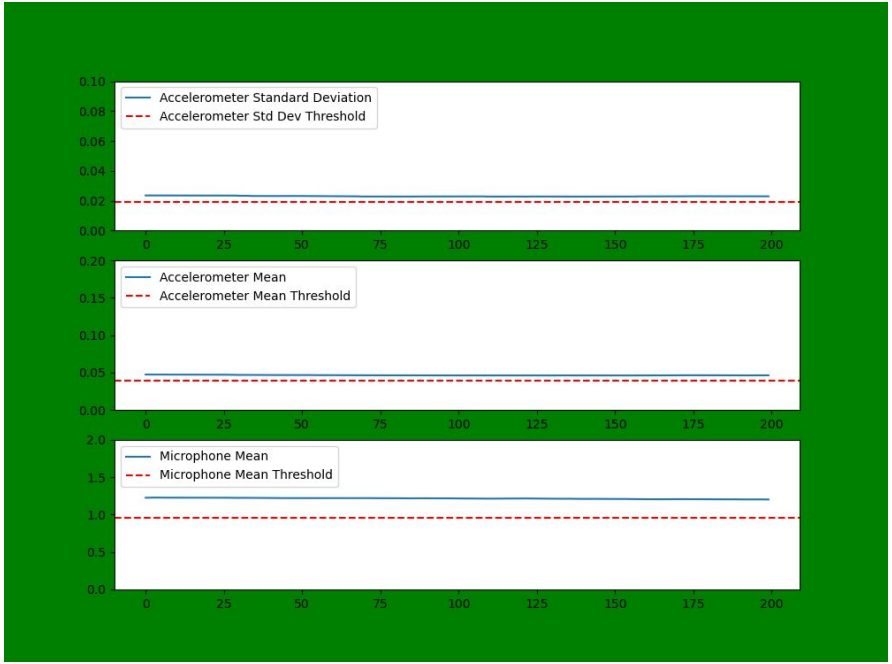
- A simple button press puts the device into calibration mode.
- This is shown by the orange screen.
- Calibration takes 10 seconds to perform.



The Prototype Interface

- Calibration is now complete and the thresholds have been adjusted.
- The device is now correctly determining the concentrator as ‘on’.
- This is shown by the green display.

- When the concentrator is now turned off, the signals drop and the screen turns red.



The Results

- When the concentrator was turned on, the device correctly displayed this 100% of the time during testing.
- When testing the robustness of the device against noise, the device proved accurate in all situations apart from when the concentrator was being wheeled around.
- Future work will involve adding machine learning algorithms and a GPS to eliminate this problem.

Sustainable Development and Inclusive Innovation

- Our project aligns well with the United Nations' Sustainable Development Goals:
  - SDG 3: Good Health and Well-being
  - SDG 9: Industry, Innovation, and Infrastructure

- Our project also follows the principles of Inclusive Innovation:
  - Impact focused
  - Enhances agency
  - Responds to a genuine need

Image from:
https://international-partnerships.ec.europa.eu/policies/sustainable-development-goals_en

What's next?

- We have documented our work in a reproducible format allowing OVSI to understand the prototype and carry it forwards.
- OVSI may choose to pursue the recommendations we have given for future work.
- After many iterations and field studies, a refined version of the monitoring device will be implemented in LEDCs.