Title: The mobile heart box - personal monitoring solution on the move

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Motivation:

Nowadays, you can have multiple sensors in the environment around you. You can monitor your activity and heart rate with the help of smartphones, smartwatches and other small sensors.

- WHY not use this information to help you live?
- WHY not explore these options to aid you when you are on the move, like driving, hiking

Last year a group of PECI used this motivation to propose and deploy a system for monitoring person when doing exercises is a fixed bike - although the initial objectiv was to “monitor person” on the move.

Objective

This project aims to migrate the previous project to a bike rider/hiker scenario. The work can/should depart from previous work and propose a “mobile solution” to monitoring human. This can use or extend the sensors and devices previously used to provide a modular and mobile solution -mobile heart box - that can monitor you and your surroundings while you are on the move,

- while driving and want to be warned when you are sleepy or your environment is “heavy” (e.g. inside a car)
- while hiking or hiking, the “box” warns you when you are physically stressed (heart rate high).

Scenarios?

Challenge

integrate a simple sensor to monitor heart rate and other physiological measures (smartwatch, off-the-shelf breakouts) and the environment within a solution that fits a box that you can place in a car or in a backpack and, depending on the scenario,

give helpful “feedback” - either to ensure comfort or avoid risky situations. The autonomy and size will be critical

Starting point

The main starting point is the previous work on PECI where the solution was supported on ESP32 for local / person nodes to collect, process and relay monitoring information. As in the previous work, smartwatches and mobile phones will be part of the user interface (visible part of the system).

Some motivations for the initial project:

- The previous project poster on Studens@DETI(reports are available)
- Heart Rate Detection using a Piezoelectric Ceramic Sensor: Preliminary results
    - https://revistabionatura.com/files/2022.07.03.30.pdf
- PPG2ABP: Translating Photoplethysmogram (PPG) Signals to Arterial Blood Pressure (ABP) Waveforms
    - https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9687508/
- ThermoDroid: Android based solution for temperature physiological assessment
    - https://ria.ua.pt/handle/10773/29642

Some sensors

Pulse Heartbeat Heart Rate Sensor Bluetooth Compatible Module https://www.elecbee.com/en-25287-Pulse-Heartbeat-Heart-Rate-Sensor-bluetooth-Compatible-Module	
SGP41 (SGP41-D-R4) | SENSIRION Volatile Organic Compounds (VOC) + NOx sensor https://www.soselectronic.com/en/products/sensirion/sgp41-sgp41-d-r4-359695?gad_source=1&gclid=CjwKCAjw6c63BhAiEiwAF0EH1FkzJAurc7sKymzo0Qs3_sefasGot5BEFkfQR0T33iPBpKkF3ojAlBoC_GQQAvD_BwE	

S8 - Senseair S88, CO_2 sensing compliance made easy https://senseair.com/product/s8/	
Multi-Sensor module with 133MHz Raspberry Pi RP2040 MCU https://www.electronicspecifier.com/products/multi-sensor-module-with-133mhz-raspberry-pi-rp2040-mcu • Sensirion SHT40 temperature and humidity sensor • Sensirion SGP40 air quality (VOC) sensor	
SparkFun 6DoF IMU Breakout - BMI270 https://thepihut.com/products/sparkfun-6dof-imu-breakout-bmi270	
Far infrared thermal sensor array (32x24 RES) MLX90640 (some models) https://www.melexis.com/en/product/mlx90640/far-infrared-thermal-sensor-array