User Manual

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The following presents the noise pollution monitoring station, whose primary objective is to provide a reliable assessment method for autonomous and effective point monitoring by any user.

Key Features:

- L_{eq}, L_{max}, L_{min}, L_1, L_{10}, L_{50}, L_{90}, L_{99} measurements.
- Environmental parameter tracking (temperature/humidity).
- Power BI integration for visualization.

Hardware Components

The station consists of the following components (Figure 1):

1. **Raspberry Pi 4B**, single-board computer responsible for data processing and transmission.
2. **AudioInjector Sound Card**, Raspberry Pi-compatible audio interface for acoustic data acquisition.
3. **Microphone System**, electret microphone with a custom preamplifier for signal level and impedance adaptation.
4. **AM3203 Environmental Sensor**, measures temperature and humidity parameters.
5. **IP65 Waterproof Enclosure**, protective casing designed to prevent ac-

cidental ingress of liquids or dust that could damage the station.

6. **Power Supply**, 5.1 V/ 3 A USB-C adapter for the Raspberry Pi

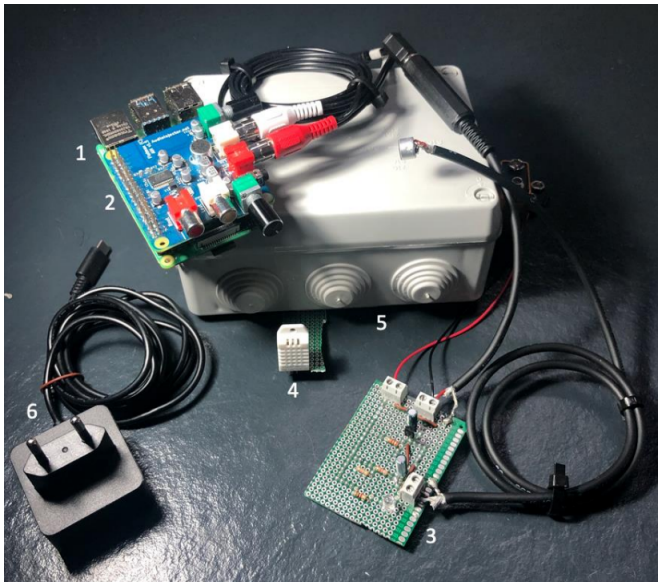

Figure 1: Hardware Components of the Acoustic Monitoring Station.

Software Setup

The Raspberry Pi acts as the central processing unit, handling all data computation and transmission. As a compact single-board computer without an integrated display, it requires the SSH protocol for remote control. To begin operation, simply connect the Raspberry Pi to a power supply using the provided adapter and wait approximately two minutes for the board to complete its initialization sequence.

To establish proper communication between the computer and the board, the Raspberry Pi must first be connected to the Internet. This requires temporarily connecting a monitor via HDMI to access its graphical interface. Once in the desktop environment, you will need to enter your WiFi network credentials using the wireless icon in the top-right corner, then obtain the board's assigned IP address either by running the `ifconfig` command in the terminal (Figure 2).

Once the Raspberry Pi's IP address is known, there are two methods to connect from a computer:

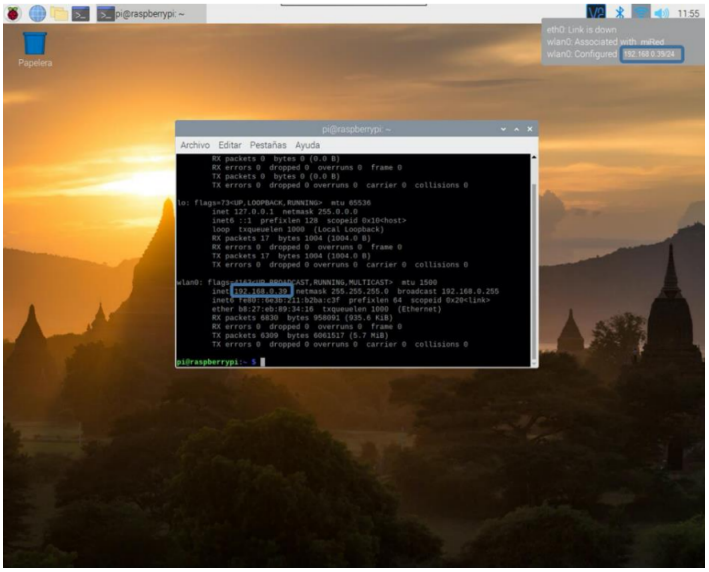

Figure 2: IP Configuration.

1. **SSH Connection**

   - Using PuTTY: Enter the Pi's IP address, username and password.
   - Via Terminal: Run:

     ```
     ssh pi@<Raspberry-Pi-IP>
     ```

   You'll be prompted for:

   - The local computer's password.
   - The Pi's password (`raspberry` by default).

2. **VNC Client (Graphical Interface)**

   - Use a portable VNC client (standalone version, no installation required) to access the Pi's desktop environment directory.

After accessing the Raspberry Pi, the target file (main.py) resides in the PFG directory. Directory navigation requires MS-DOS command line operations. Though this command language can be complex, the following fundamental

commands are all that is needed for this application.

- `pwd` (Print Working Directory): Displays the absolute path of the current directory.
- `ls` (List): Outputs the contents of the target directory.
- `cd <directory>`: Change to the specified directory.
- `sudo nano <filename>`: Edit the selected file using the Nano text editor.
- `sudo python3 <filename>`: Execute the selected Python script.

The implemented algorithm follows the structure shown in Figure 3.

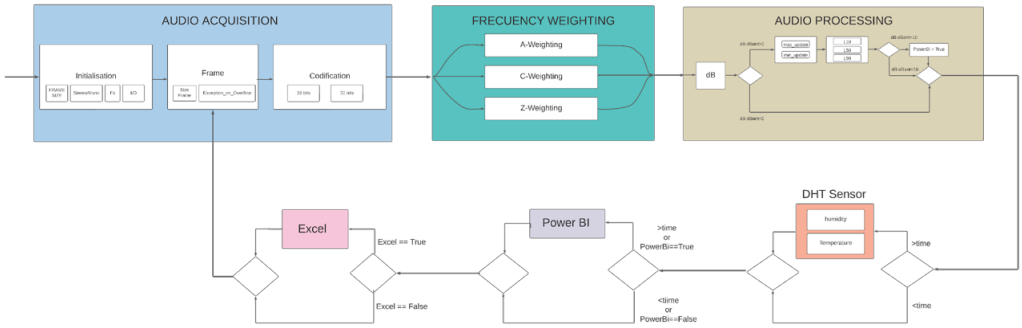

Figure 3: Code Block Diagram.

Parameter Customization

The code allows modification of key parameters located in the "Variable Definition" section. Adjustable variables include:

Audio Acquisition

- `CHANNEL`: Input channels (`1` for mono, `2` for stereo).
- `Fs`: Sampling frequency(`44100 Hz` or `48000 Hz`).
- `TEMP_PONDERATION`: Integration time:
  - `1s` (Slow)

  - `125ms` (Fast)
  - `35ns` (Impulsive)
- `FORMAT`: Bit depth (`16` or `32` bits).

Frequency Weighting

- `CURVE`: Selectable weighting curves (`A`, `B` or `Z`) for audible frequency ranges.

Excel Data Logging

- `send_excel`: Set to `True` to enable Excel logging, `False` to disable.