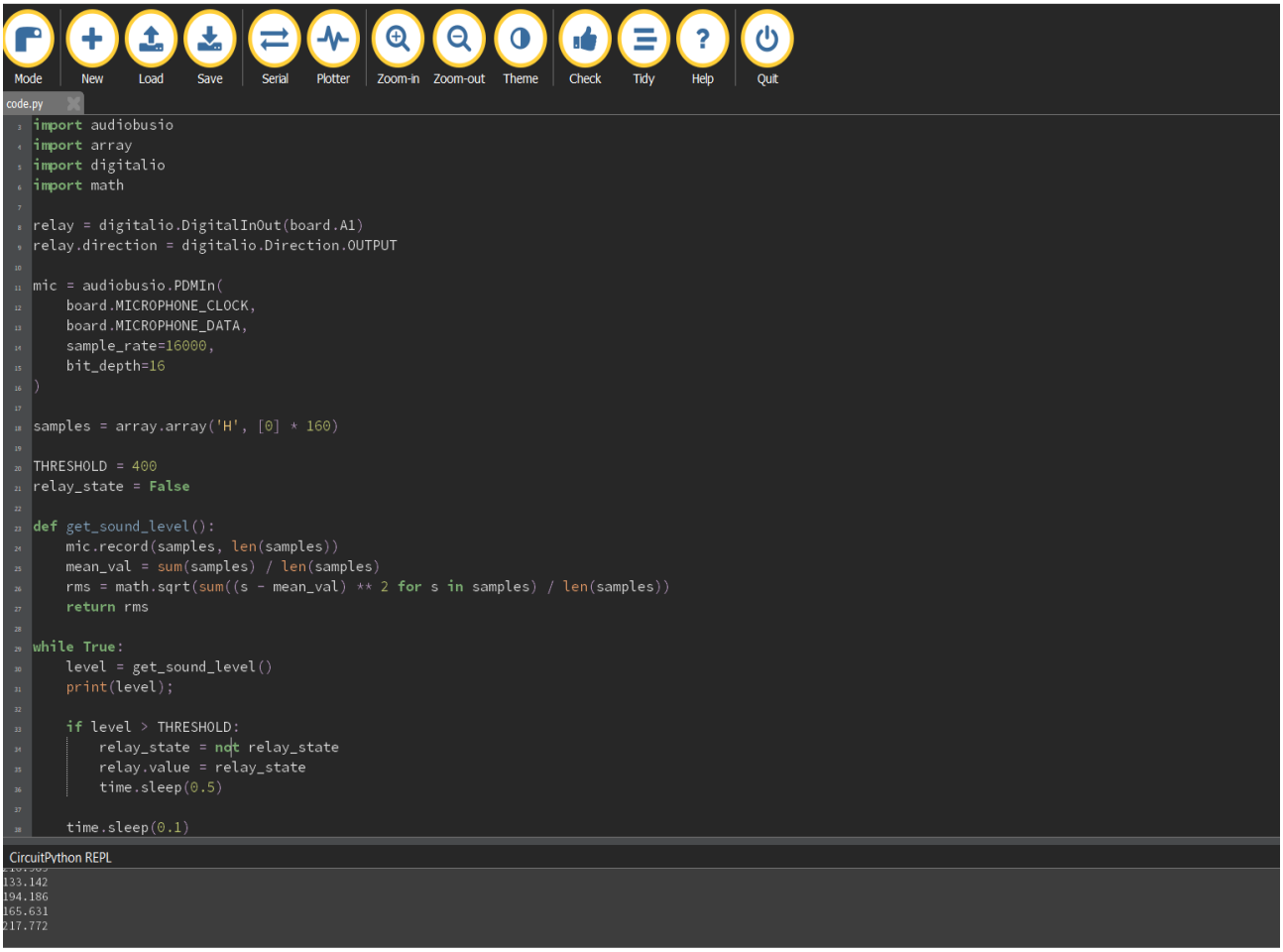
Clap-Controlled Relay – Simple Explanation
What This Program Does

This program turns an external light ON or OFF using a relay when a loud sound (like a clap) is detected by the CPX.

- The microphone keeps recording audio.
- It measures how loud the sound is using RMS.
- If sound level is greater than **400**, it treats it as a clap.
- If relay is OFF → turns ON
- If relay is ON → turns OFF
- Prevents multiple triggers from one clap.



Step 1: Importing Required Libraries

Used to **read sound from the microphone**.
Used to **store multiple sound samples** in a list-like structure.
Used to **control digital pins** (like turning the relay ON/OFF).
Used for **calculations**, especially to find sound intensity (RMS).

Used to **add delays** (like `sleep`) to control timing.
Used to **identify hardware pins** (like A1, MIC pins).

Step 2: Setting Up the Relay

- Connects the relay to **pin A1** of the board.
- This pin will control the relay.
- Sets the pin as an **OUTPUT**.
- This allows the program to **send signals** (ON/OFF) to the relay.

This step is used to **initialize and control the relay module**

Step 3: Setting a Sound Limit (Threshold)

THRESHOLD = 400

`THRESHOLD` is a fixed value (limit).

- The program compares the **sound level** with this value.
- Sound level **> 400** → Clap detected ✓
- Sound level **< 400** → Ignore ✗

Step 4: Running the Program Continuously

while True:

- Creates an **infinite loop**.
- The program runs continuously (never stops).
- **level = get_sound_level()**
- Calls the function to **measure current sound level**.
- **print(level)**
- Displays the sound level in the console (for testing/debugging).

Step 5: Checking the Sound Level

- Captures sound from the microphone
- Stores it in the `samples` array
- Calculates the **average value of sound samples**
- **Measures actual sound intensity**
- Higher RMS → louder sound
- Lower RMS → softer sound
- Sends the sound level back to the main program

Step 6: Detecting a Clap

`level` → Current sound level (from microphone)
`THRESHOLD` → Predefined limit (e.g., 400)
The program compares both values:
If **sound level > threshold** → Clap detected ✓

If **sound level ≤ threshold** → No clap ✗

Step 7: Toggling the Relay

`if level > THRESHOLD:`

Checks if the sound is **loud enough (clap)**

`relay_state = not relay_state`

Changes the state:

- If OFF → becomes ON
- If ON → becomes OFF

`relay.value = relay_state`

Sends signal to relay:

- `True` → Relay ON
- `False` → Relay OFF

- **`time.sleep(0.5)`**
- Waits for 0.5 seconds
- Prevents one clap from triggering multiple times