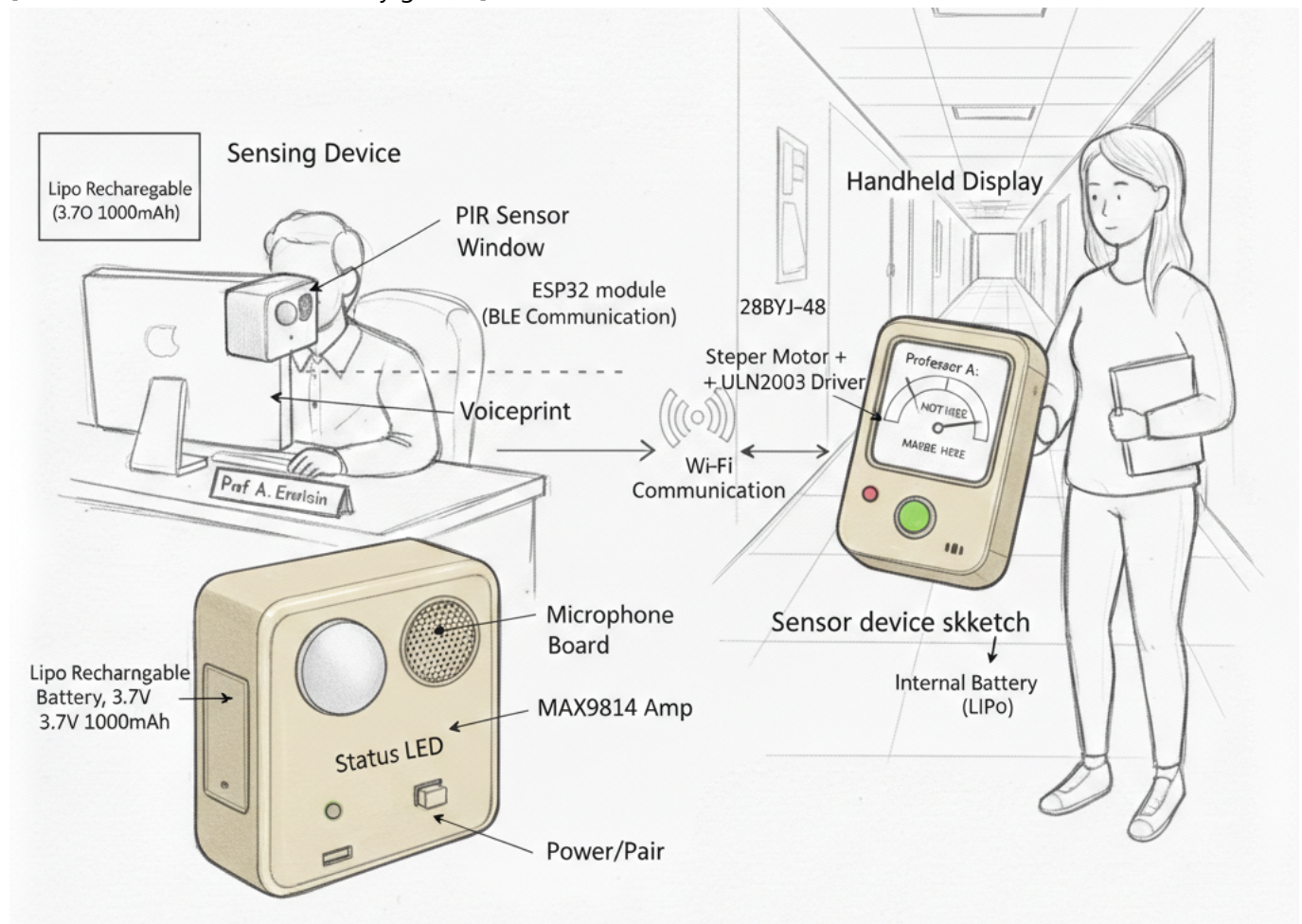# Where is Professor?

Title Slide

Where is Professor is a two-device system that helps students know whether Professor A is likely at a specific location (office/desk) within the last 5 minutes. A sensing device stays at the location and detects human motion plus identifies Professor A using voiceprint matching. A handheld display device shows a 3-state gauge: NOT HERE, MAYBE HERE, HERE.
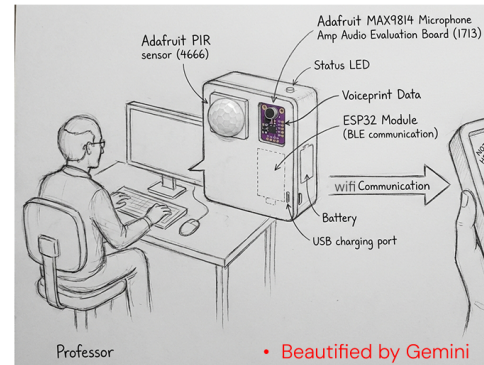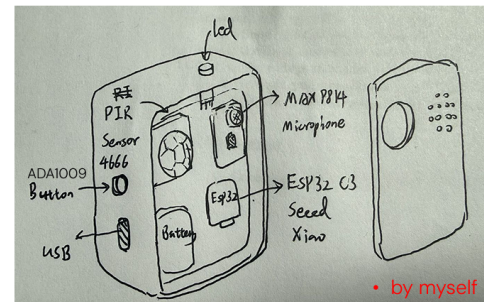
[note: this sketch is beautified by gemini]

Slide 1: Sensing Device (Professor-side)

Sensing Device - Professor

Short description

- Detect if someone is present near the professor's office or desk area, then verify whether the person is Professor X using a short voice sample. Broadcast a 3-state result wirelessly to the display device.

- How it works
  A. Presence trigger: the PIR module outputs a digital signal when motion is detected.
  B. Audio capture: when PIR triggers, the ESP32C3 records a short audio sample through the MAX9814 microphone amplifier board.
  C. DSP/ML: the audio goes through preprocessing (filtering, framing, feature extraction such as MFCC or log-mel). A voiceprint matching classifier estimates whether the voice matches Professor A.
  D. Sensor fusion to 3-state output:
  NOT HERE: no recent PIR motion in the last 5 minutes
  MAYBE HERE: motion detected but voice match is uncertain or insufficient audio
  HERE: motion detected and voiceprint confidence is high
  E. Wireless broadcast: the sensing device sends the current state to the student device over Wifi.
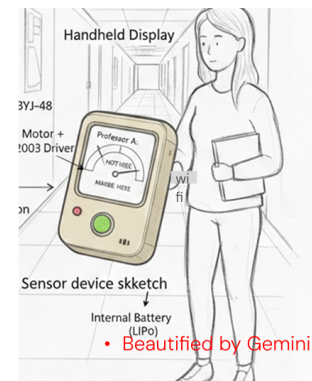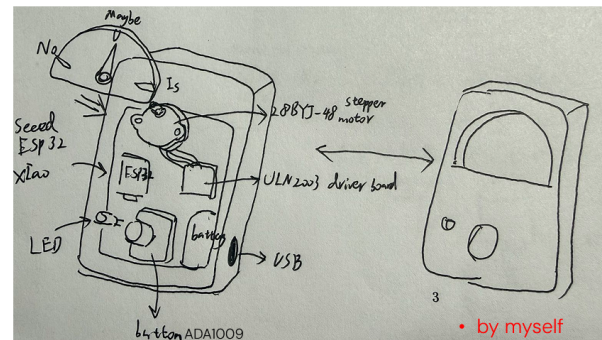

- by myself

- Beautified by Gemini

Slide 2: Display Device (Student-side)

Display Device - Student

Short description

- Receive the professor-side Wifi status and show it quickly through a physical stepper-motor gauge needle with three positions. Include one LED indicator and one button for interaction and calibration.

- How it works
  A. Wifi reception: the display device scans for the sensing device broadcasts and updates its stored "last seen" status.
  B. 5-minute window: it keeps a rolling 5-minute window of status packets to avoid flicker.
  C. Gauge mapping: it maps NOT HERE, MAYBE HERE, HERE into three fixed needle angles and drives the stepper motor through the ULN2003 board to move the needle.
  D. LED and button: the LED shows connection or state change. The button triggers refresh, mode switching, or needle calibration (home position).

- by myself

- Beautified by Gemini

Slide 3: Communication + System Diagram (two figures)

Two diagrams

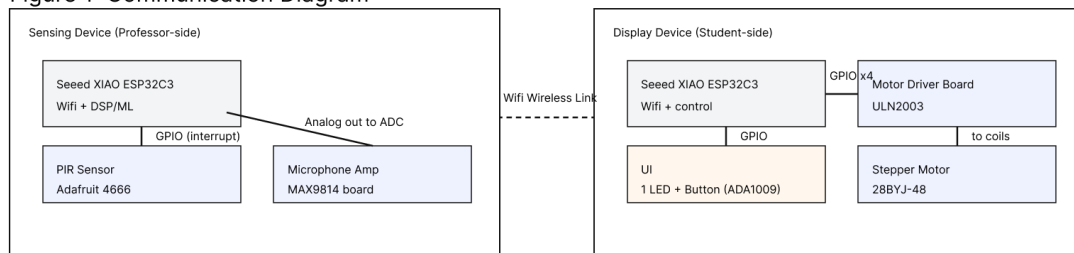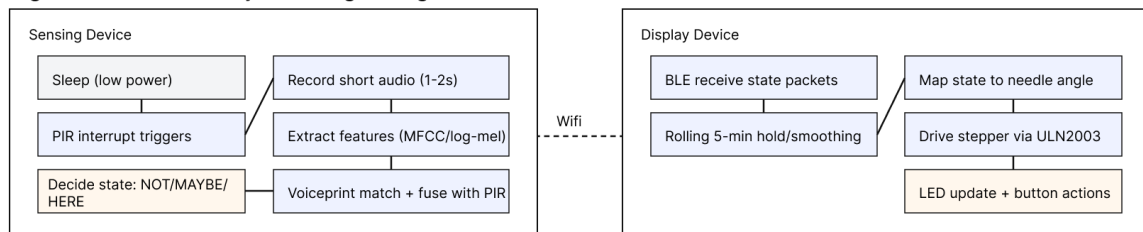Figure 1: Communication Diagram

Figure 2: Workflow / System Logic Diagram

Datasheets

1. ESP32 Module (Seeed XIAO ESP32C3): from class https://files.seeedstudio.com/wiki/XIAO/Seeed-Studio-XIAO-Series-SOM-Datasheet.pdf

2. PIR sensor (Adafruit 4666, DigiKey): Adafruit module from DigiKey https://www.digikey.com/en/products/detail/adafruit-industries-llc/4666/13175534

3. microphone (MAX9814 microphone amp evaluation board): Adafruit module from DigiKey https://www.digikey.com/en/products/detail/adafruit-industries-llc/1713/4990777?gclsrc=aw.ds&gad_source=1&gad_campaignid=20243136172&gbraid=0AAAAADrbLlifQ3WohBJYpeQPLt0Fqqw0w&gclid=CjwKCAiA7LzLBhAgEiwAjMWzCKGb48V-fHbg-tHP8dPdj8i1tnmkpwBae637Edh4C863_Cud1uMRPhoCOdYQAvD_BwE

4. stepper motor (28BYJ-48): Amazon https://www.amazon.com/28BYJ-48-ULN2003-Stepper-Driver-Arduino/dp/B07YRHX73L

5. motor driver board (ULN2003): Amazon (as above)

6. Battery (LiPo Rechargeable Battery, 3.7 V 1000 mAh, JST-PH 2.0 connector): DigiKey https://www.digikey.com/en/products/detail/tinycircuits/ASR00012/9808769?gclsrc=aw.ds&gad_source=1&gad_campaignid=20243136172&gbraid=0AAAAADrbLlifQ3WohBJYpeQPLt0Fqqw0w&gclid=CjwKCAiA7LzLBhAgEiwAjMWzCEJZiL6raQ9E_O6gIfG3adi9dCUatPesKBRWgfPOojsjpn4AEaeL2hoCfmUQAvD_BwE

7. Button (Adafruit Colorful Round Tactile Button Switch Assortment 15 Pack (ADA1009)): DigiKey https://www.digikey.com/en/products/detail/adafruit-industries-llc/1009/7241401?utm_source=chatgpt.com