CSE 155

CLOSE CALL

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GOALS & MOTIVATION

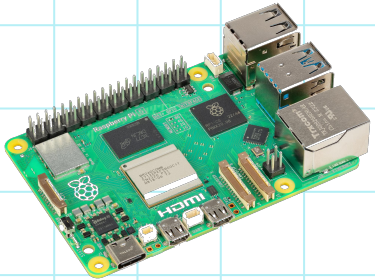
- Enhance spatial awareness for visually impaired users
- Design a “discreet” wearable computer with real-time detection
- Provide different feedback modes
- Improve accessibility daily independence

DESIGN

Sensor Module

TeraRanger Evo 15m

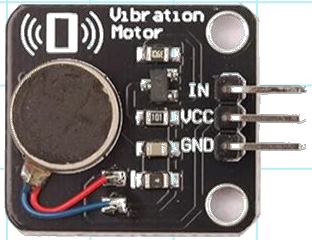
For sensing the distance from itself



Micro Computer

Raspberry Pi 5

Computes velocity and bridges sensor and motor

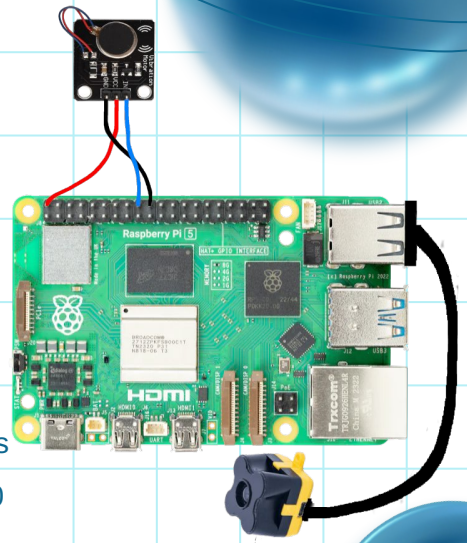


Vibration Motor Module

Vibrates on command, can be used along sensor module

IMPLEMENTATION

- Python, included/default libraries (serial, time)
  - Read & write to serial/USB connection (sensor)
  - Easy to use and lightweight scripting language
  - Best with streaming data and quick calculation
- Raspberry Pi (RPi.GPIO)
  - Command GPIO (motor)
  - IN - Pin 1 (5V), VCC - Pin 18 (GPIO), GND - PIN 20 (GND)
  - Simpler & more efficient computation than a microcontroller
- Testing
  - Created a large text file of mock distances, initial script tested by reading these values
  - Created simple test Python script for motor function, increase vibration intensity by 10
  - Trial and Error when device was built



Use Case - Implementation

- Raspberry Pi turns on - Autostarts program
  - Constantly sensing
    - If distance does NOT reach ‘-Inf’ (arms length, given by sensor),
      - If distance < 1000 (user defined distance)
        - Calculate vibration intensity (1000 - distance) / 8)
        - Vibrate to calculated vibration intensity
      - Calculate velocity_time (amount of time you are approaching object)
      - If velocity_time >= 0.5 (if object is approaching fast for more than 0.5 a sec
        - Max buzzing (Will replace distance < 1000)
    - Else (distance reaches ‘-Inf’)
      - then instantly turn buzz to max (alert the user no matter what)

CHALLENGES

- Hardware
  - A lot of testing
    - Physical device with wiring to work around
  - Waiting for parts
  - Figuring out wiring
    - Good amount of research
    - Transistor initially thought required (on-board)
- Software
  - A lot of testing
    - Physical device with wiring to work around
    - Promising results with text file read; scary results with real device tests
  - Figuring out a method to detect fast approaching objects without false alarms

Demonstration

SUMMARY

- Device is used to calculate velocity from a sonar distance sensor, depending on the distance AND velocity, vibration increases
- Physical: power source (no bulky portable power bank); better enclosure
- Initially opted for auditory feedback but scrapped the idea. If it would be better for the user, then that should be added in the future
- Best to approach development process with every aspect, down to smallest detail, already considered prior (plan for the worst)
- CloseCall was a fun experience to get handsy and create something physical, regardless of success or failures.
- We see this as a win!