Auto-Directional Bicycle Notification

Embedded System Capstone Final

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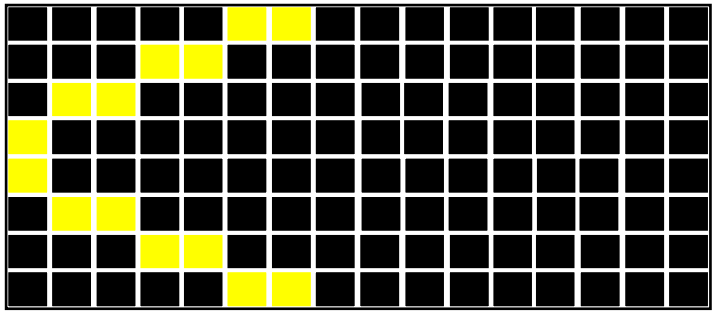
Motivation

In streets crowded with bicycles, motorcycles, cars, and pedestrians, we believe our product, automated turn signals for bicycles, can prevent rider distraction and help other vehicles judge traffic conditions, enhancing road safety and creating a bicycle-friendly traffic environment.

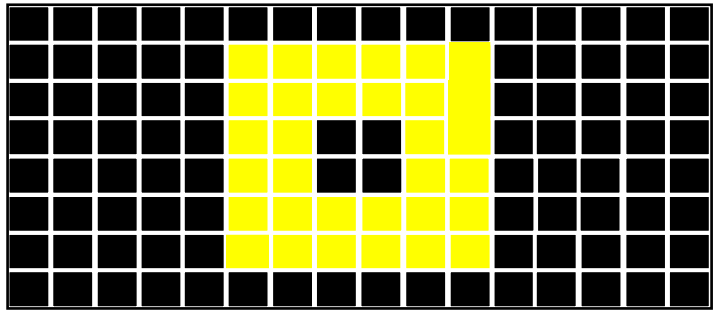
Features & Functions

- **Left / Right turn**: Show dynamic arrow (LED)
- **Emergency Braking**: Flash
- **Proximity Warning**: Beep (when someone is too close from behind)

All functions start and stop automatically without user intervention !



Left turn



Brake

Architecture Diagram

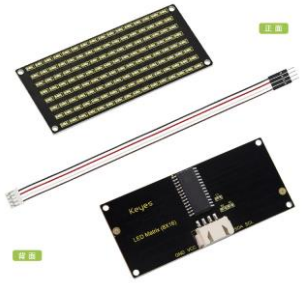
GY801

MPU9250

Ultrasonic Sensor

ROLL, PITCH

DISTANCE

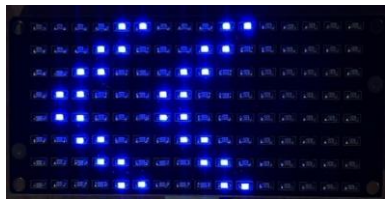


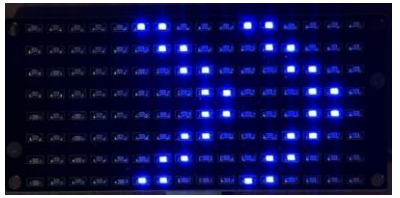
8x16 LED Matrix

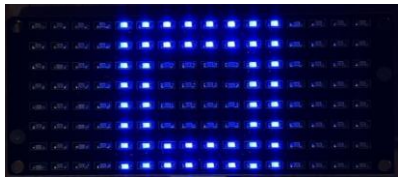
Right Turn

Left Turn

Brake







Buzzer

Short-distance Message

(<0.8m)

Short-distance Warning

(<0.5m)

Hardware & Software

Evaluation Board

Raspberry Pi 4

For Sensing

Ultrasonic Sensor

MPU9250

GY801

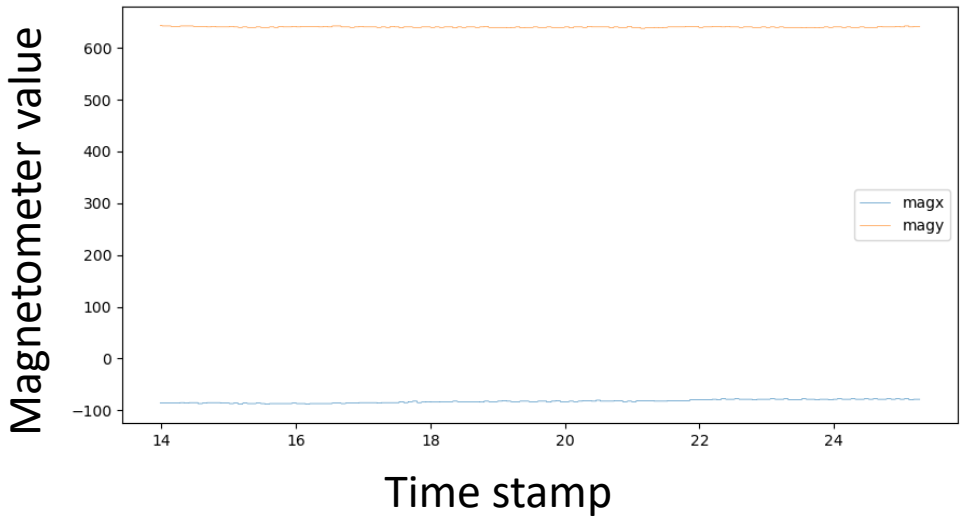
For Feedback

Buzzer

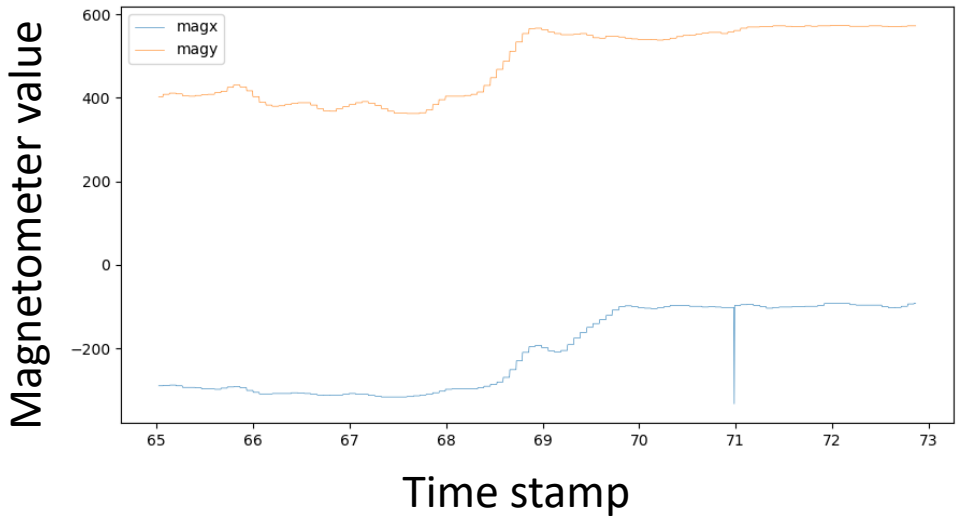
8x16 LED Matrix

Observation

Go straight



Turn left



I2C Device Connection Issues

MPU9250, GY801 and LED Matrix are all I2C devices.

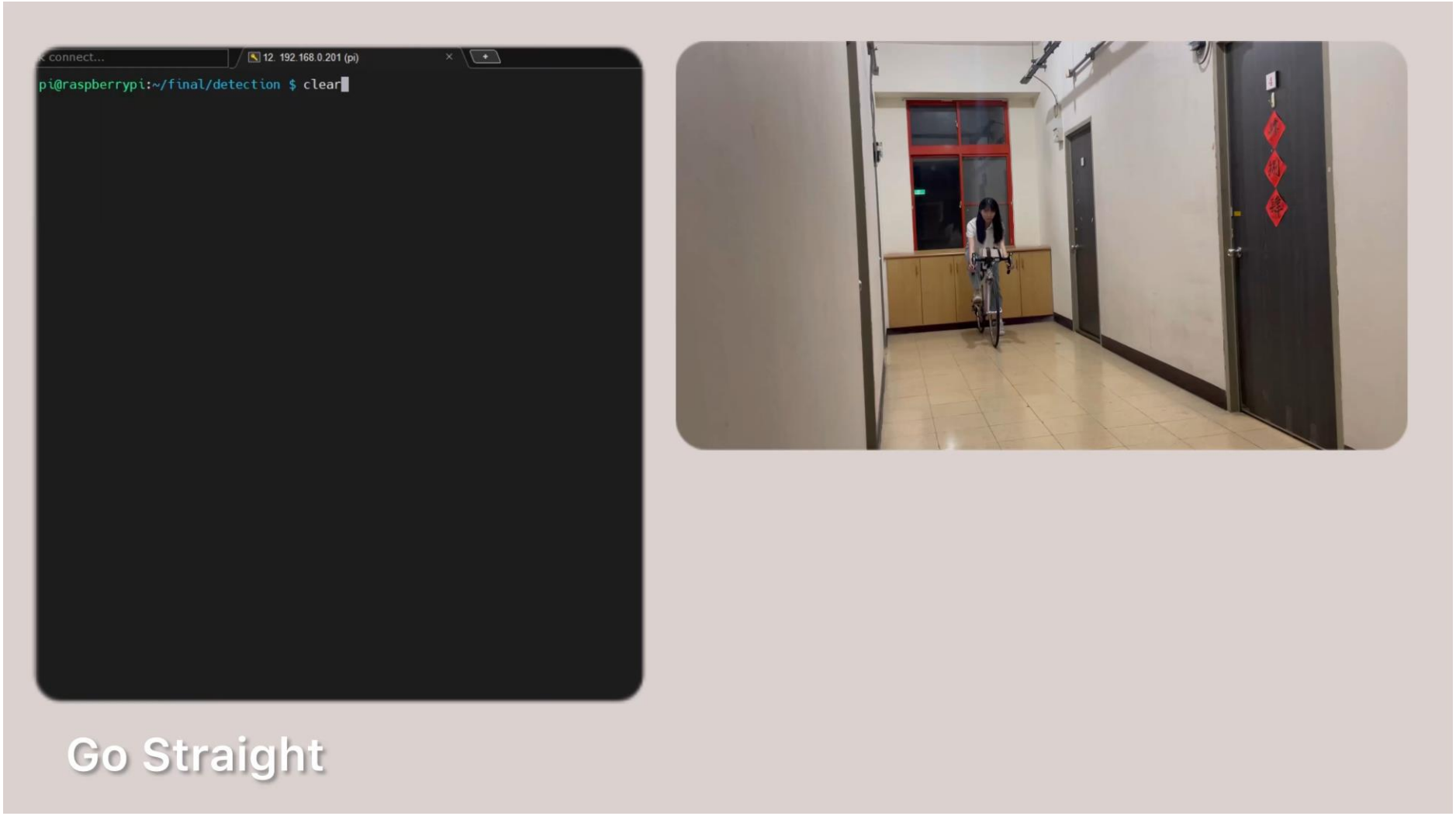
They can't work simutaneously on a single board.

Solution:

Sense the data &
Save as log files

Read the log files &
Produce output signal

Demo Video


connect...
12. 192.168.0.201 (pi)
pi@raspberrypi:~/final/detection $ clear
Go Straight

Solutions for Connecting I2C Devices

Solution 1: Work on the same bus with different addresses

a. Connect devices physically on the same ports (GPIO 3/ GPIO 5)
b. Check if i2c addresses are mutually different

>> Address of LED Matrix cannot be detected (still working)

Solution 2: Enable multiple i2c ports (busses)

a. Edit the configuration file to enable multiple i2c ports
b. Connect devices to different ports
c. Modify devices' bus parameter

>> Raspberry Pi 4B can only use i2c0 and i2c1(default)

>> We have enabled i2c0, but the connected device can't be detected