PROJECT ABSTRACT

Course: EEE G512   **Date**: 5th Dec 2022

Students involved: **Group No. 5**

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Title: Visually Impaired aiding device to interpret signs and alarm in emergency situation.

Proposal:
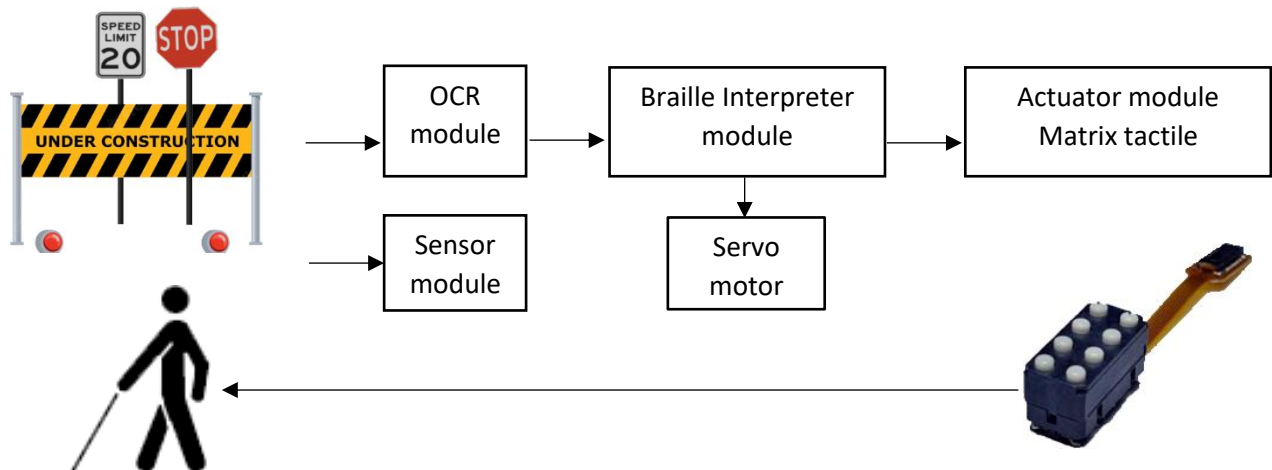
Proposal to develop a system that would aid visually impaired personal to interpret day-to-day sign (i.e., traffic sign board, shop boards etc.,) and also alert/warn in case of situations (i.e., any obstacle ahead). Nitty-gritty, it basically reads the sign image, recognises sign via OCR, which then processed by Braille module that actuates matrix tactile to standard Braille Grade-I representation of dot-space matrix. The challenged person can touch the tactile and comprehend the sign/warning ahead. In case of emergency the tactile can be vibrated. The personal can be directed direction via servo.

Learning outcomes expected:

1. Learn about the OCR fundamentals. Use Serial **USART** protocol to communicate this recognised data to another module (here Braille interpreter module).
2. Interfacing of sensors
   - Obstacle detection: Ultrasonic range sensor. Using **TIMER** peripheral in Input capture mode. Its duration between trigger and echo yielding measurement.
   - Guiding direction: Servo Motor interfacing using **TIMER** as Pulse Width Modulation/ output compare mode.
   - Learn **interrupt** procedure to service events i.e., UART reception, input capture.
3. Interfacing of Actuator. Since we have matrix of digital output pins, multi-port GPIO accessing and modifying would also be covered.

Functional Requirement to be achieved:

1. Read OCR recognised characters from an external OCR module via USART serial communication.
2. Interpret the character received into Braille grade-I standard.
3. Read Ultrasonic senor, check events i.e., nearby-obstacle, and warn using warning LED lit.
4. Emergency messages/events to be given highest priority and constrained to hard-deadline. The events generated by sensors are such emergency.
5. Actuator would punch the tactile in Braille grade-I standard.

Prototype:

Braille Interpreter module: STM32 based microcontroller (as part of the course work coverage) used to work out the interpretation. This would be responsible to read the character from OCR module and convert to braille matrix, finally actuate the tactile.

OCR module: We would use Laptop/Arduino to simulate as OCR module and give recognised characters as output of system, which can be communicated to Braille interpreter via serial USART.

Sensor module:

1. Ultrasonic sensor: HC-SR04 is used. Using STM32 the distance of obstacle is computed and qualitative information is served upon emergency to Actuator module.

Actuator module:

1. Tactile: We would use a simple LED matrix arranged in 3x2 fashion to show output of interpreter in Braille Grade-I standard. This illustrates the similar functionality with tactile as well.
2. Servo: We added servo to help in directing the direction to turn (left/right/keep straight).
3. Warning LED: Emergency obstacle nearby is alarmed by a vibration in tactile
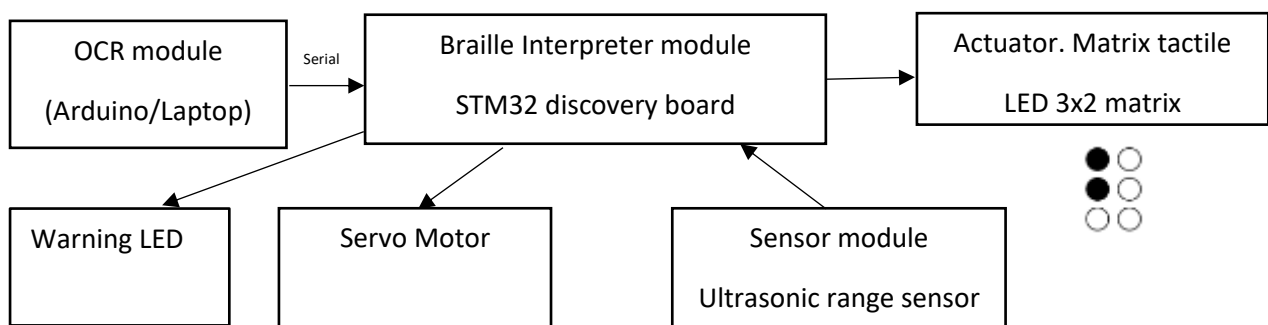
Components list-

1. Controller: STM32F407 Discovery Board
2. OCR module: Arduino UNO / Laptop
3. Servo Motor
4. Ultrasonic sensor
5. LED matrix = 6 LEDs.
6. Breadboard
7. Resistors as required (220ohms x 6)
8. Connecting wires as required

PIN CONNECTION -

STM32F407

ARDUINO

SERVO

TX

UART

RX (PC10)

RX

TX (PC11)

PB06

PA07(TRIGGER)

PA15(ECHO)

ULTRASONIC

PD9 PD10 PD11 PD12 PD13 PD14

LED CONNECTIONS