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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sensor Based Smart Assistance System for Disabled Person

Batch Member & Reg. No.: 05

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Internal Guide

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Abstract

Sign Language is a medium used to communication feelings and emotions with normal person using expression and gestures. Physically challenged still prefer using sign language and our aim is to create a bridge that removes the communication gap between the disabled and normal people. Hence, our goal is to structure a modest, secure, and versatile framework for visually impaired to help them in their daily routines. The proposed methodology utilizes Raspberry-Pi 4B, Camera, Ultrasonic Sensor, mounted on the stick of the individual. The Stick is designed to retrieve the information about the obstacle detections and scenes classification. The pictures of the scene are captured with the help of faster R-CNN and Tensor Flow Object Detection algorithm.

Existing System and Disadvantages

Existing Technique

- OpenCV(Open Source Computer Vision Library)

Disadvantages

- Hardware Requirements
- Environmental Variability
- Privacy Concerns
- Limited Accessibility Features

Proposed System and Advantages

Proposed Technique

- YOLO Algorithm

Expected Advantages

- Handling Lighting Variations
- Parameter Tuning
- Handling Rotational Variations

Module Description

Module 1 : Computer Vision Unit

1. The heart of the system, comprising a Raspberry Pi-based setup and a USB camera.
2. Utilizes the YOLO (You Only Look Once) object detection algorithm to process live video streams.
3. Detects and identifies obstacles and objects in the user's path with high accuracy and speed.

Module 2 : Obstacle Detection and Orientation

1. Consists of an ultrasonic sensor and servo motor assembly.
2. Upon object detection, the servo motor adjusts the sensor's position towards the object.
3. Measures the distance to the object for precise assessment and navigation decisions.

Module Description

Module 3 : Audio Feedback System

1. Employs a speaker for real-time vocalization of detected obstacles and objects.
2. Provides immediate auditory alerts and guidance to the user, ensuring prompt response to obstacles.

Module 4 : Visual Feedback Display

1. Features an LCD display for supplementary visual information.

Module Description

2. Displays relevant data such as detected objects, system status, and navigation prompts.
3. Offers additional assistance and feedback to users with partial vision or those preferring visual cues.

Module 5 : Power Supply

1. Powered by a 6V lead-acid battery for portability and extended usage.
2. Ensures uninterrupted operation during mobility, enhancing user confidence and convenience.

Implementation

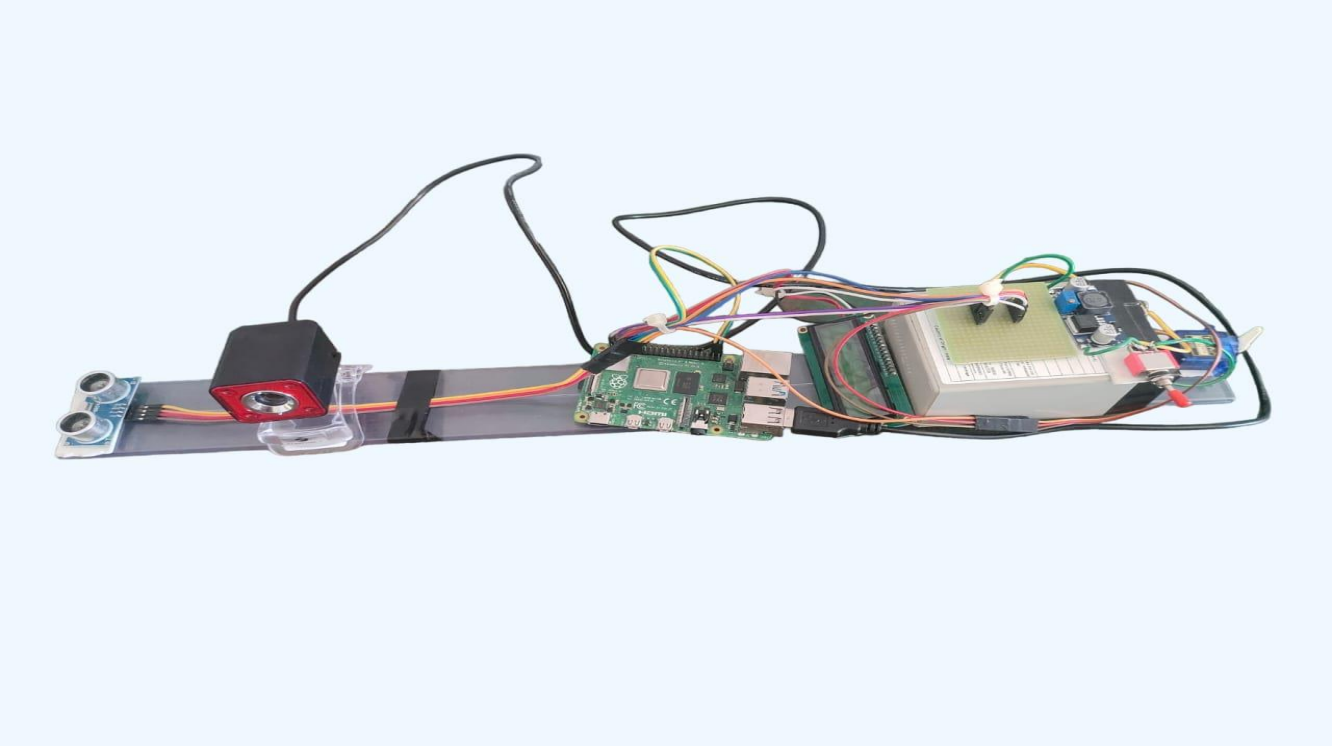
- The Raspberry Pi processes real-time video feeds from the USB camera, utilizing the YOLO algorithm to identify obstacles and objects in the user's path.
- Upon detection, the servo motor adjusts the ultrasonic sensor's orientation towards the object, enabling precise distance measurement.
- Simultaneously, the audio feedback system vocalizes alerts and guidance to the user, ensuring prompt response and enhanced safety.
- Supplementary visual feedback is provided through the LCD display, offering additional information and assistance.
- Power optimization techniques are implemented to maximize battery life, ensuring prolonged usage without frequent recharging.
- This comprehensive approach ensures that the Smart Assistive Walking Stick for the Visually Impaired provides not only obstacle detection and navigation assistance but also real-time feedback and guidance, empowering users to navigate their surroundings safely and independently.

References

We are, referring to the following publications for developing our project.

1. Jonathan Alvarez Ariza, " Low- Cost Assistive Technologies for Disabled people using Open- Source Hardware and Software: A Systematic Literature Review", IEEE Access, Vol. 10, pp. 124894- 124927, doi: 10.1109/ACCESS.2022.3221449.
2. S. K. Jarraya, W. S. Al-Shehri, and M. S. Ali, ''Deep multilayer perceptron-based obstacle classification method from partial visual information: Application to the assistance of visually impaired people,'' IEEE Access, vol. 8, pp. 26612–26622, 2020, doi: 10.1109/ACCESS.2020.2970979.
3. K. Naqvi, B. Helaaz, S. Mishra, and P. Asthana, ''Employing real-time object detection for visually impaired people,'' in Data Analytics and Management (Lecture Notes on Data Engineering and Communications Technologies), vol. 54, A. Khanna, D. Gupta, Z. Pólkowski, S. Bhattacharyya, and O. Castillo, Eds. Singapore: Springer, 2021, pp. 285–299, doi: 10.1007/978-981-15-8335-3_23.

Prototype Demonstration

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You