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Trinal Optics for Blind People Using Smart Object Recognition for Navigation Through Voice Assistant

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Abstract: The project Trinal Optics is a wearable device, it will be able to make blind people to live their lives more independently. The device is combination of hardware, software and Technologies such as Camera, Arduino Uno, Voice Assistant, Bluetooth Headset/Earphone, Ultrasonic Sensor, Object Detection, and Distance Analysis. These components help user to understand the environment better. The Camera is used to capture the image for object detection and then Voice assistant is conveying audio message to the user along with the Distance analysis of object, Arduino Uno is used to integrate hardware and software, navigation is used to guide the users to its destination Ultrasonic sensor is used to make the beep sound if there is any object in front of the user. Trinal Optics looks forward to help blind individuals to have a bit easy life with the help of technology.

Keywords: Arduino Uno, Camera, Bluetooth Earphone, Voice Assistant, Object Detection, Distances Analysis, Ultrasonic Sensor.

I.INTRODUCTION

The blind individuals in 21st century should not face abundant of problems. As we normal human-beings are using the latest technology for making our life easier and hassle free, Blind people also should get the advantage of the new trends. By using Trinal Optics Device the user can do many small and big things in his/her daily life. This is an Arduino based device, which have Voice assistant which assists the user via audio message through Bluetooth earphones/headphones in order to make the user alert about the object in front of the user. Camera which captures the image of the object. Object detector which detects the object in the range of 1-2 meters by using the algorithm of Distances analysis. The Ultrasonic sensor are used in case of any breakdown of Voice assistant the beep sound of the ultrasonic sensor will be used as an alert system. Trinal Optics will give the user better mobility and independency in their daily routine.

II.PROPOSED ALGORITHM

- YOLO (You Only Look Once) Algorithm is used for real time object detection.
- AI natural language processing technology to hear human and respond it.
- Power on the device.
- Continuously capture images of the surroundings using Camera.
- Identify objects in the images and measure their distance with the ultrasonic sensor.
- Activate the buzzer and communicate via earphones if an object is too close, providing information on the object type and distance.
- Allow user responses and movements based on the provided guidance.
- Provide a user-friendly way to turn off the device.

III.PROPOSED SYSTEM

We are creating a Voice assistant based wearable device for blind people. This is very easy to use and work as a navigator to the user. The programming part is done by Python programming language along with its free libraries TensorFlow, OpenCV etc. Database for working with the object detection and reorganization process. The project includes a bunch of software and hardware which are needed for building up the project such as:

➢ **Software:**

- Operating System for programming
- Voice Assistant Technique
- Object Detection Technique
- Distances Measurement Technique

➢ **Hardware:**

- Arduino Uno
- Camera
- Bluetooth Headset/Earphone
- Ultrasonic Sensor
- Jumper Wires
- Power Bank
- Resistors

➢ **Overview of Trinal Optics:**

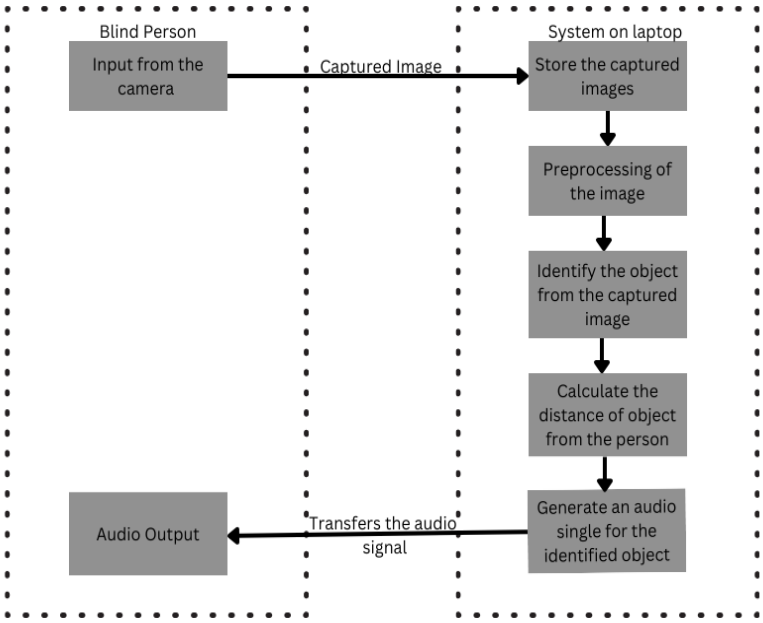

Fig 1: Overview of device

➢ **Components and Methodology:**

- **Voice Assistant:** It is an Artificial Intelligence (AI) that can understand natural language of us humans and can answer them. This is the easier way to give the real time feedback to a blind user by just hearing to the assistant the user will be guided properly.

Fig 2: Voice Assistant

- **Camera:** Camera is used to capture the image in front of the user for the object detection/ reorganization process. This Camera suits for Iot application, thus we have used in our project

Fig 3: ESP-32 Camera

- **Bluetooth Earphone:** These earphones will be get linked via Bluetooth which is inbuilt in Arduino Uno. That will help user to hear the audio messages/ commands

Fig 4: Bluetooth Earphones

- **Arduino UNO:** This is used for its variety of features in one place such as Bluetooth for earphone in this project, USB port, GPIO pins; it's a special type of microcontroller. It has both software and hardware work to make a device, and its cost efficient too.

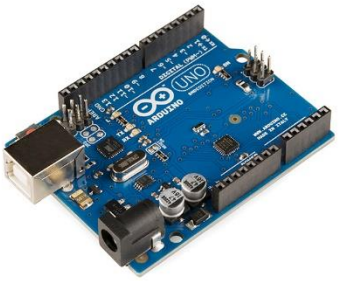

Fig 5: Arduino UNO

- **Ultrasonic Sensor:** This sensor is used for Distance Measurement. The user will get the alert within the specified distances. It converts the electrical signals to sound waves. In Trinal Optics the after camera has detected the object this sensor will come into light and measure the distance.

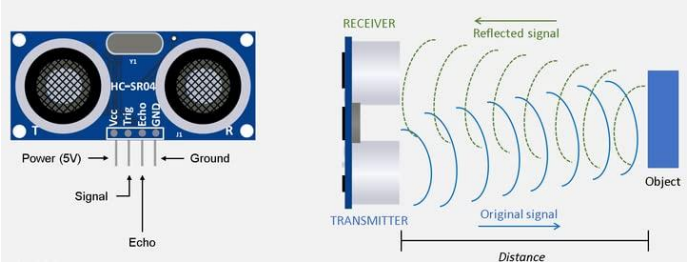

Fig 6: Ultrasonic Sensor

- **Objection Detection:** This is a Technique which detects the object captured by camera and identifies the object and its location. In Trinal Optics this is useful for the user to understand the his/her surrounding better even in the places which are new for them.

Fig 7: Object Detection

IV.CONCLUSION

The Trinal Optics for blind people is an great technology for blind people and as the device is wearable device and even easy to use, along with wide range of components used such as Camera, Arduino, Voice Assistant, Ultrasonic sensors and other to make this device an real time device and make the lives of blind people better and easy. This device is a cost efficient device in order to reach out all the needy people. Trinal Optics is a remarkable device for serving the society.

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