**MINOR PROJECT**

TITLE: WEARABLE IOT DEVICE FOR VISUAL IMPARED INDIVIDUALS

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**ABSTRACT**: Our project explores using a small but powerful esp32 chip along with the ov2640 camera module to capture images. We can send these images to a server for complex image processing tasks. This setup helps us achieve realtime image analysis using the servers computational abilities. We dive into understanding how the esp32 and ov2640 work together explaining the technical details and how they communicate with the server. We also implement various image processing techniques like detecting objects, people etc. our project aims to improve its capabilities and pave the way for more efficient image processing systems using similar technology

**INTRODUCTION**: in our pursuit to enhance accessibility for visually impared individuals, our project introduces a holistic system utilizing ESP32 microcontroller, ov2640 camera module and an earpiece. This comprehensive setup aims to capture visual data efficiently while providing realtime audio feedback empowering users with both visual and auditory feedback, by managing image capture capabilities with conextial audio descriptions we aim to create a unified solution that offeres an immersive and informative experience, ultimately contributing to more inclusive technology for the visually impared community

**ADVANTAGES AND DISADVANTAGES**

**ADVANTAGES**: This device has many advantages over conventional devices that deal with the same issues.

* Cost Effective: the cost of the device itself is cheap that most of the people can afford it without hesitation.
* User Friendly: This device is purpose built specifically for the blind community, so that they can experience the world like we do
* Open source: This project itself is opensource, many people can openly contribute to this project and make it better

**DISADVANTAGES**: this project has some disadvantages, those are related with the

* EXPENSIVE SERVERS: While the device itself is cheap, the cost of back end operations requires expensive and power hungry servers
* SENSITIVE COMPONENTS: While the device is cheap, the quality of the device is moderate. Means the device is fragile and can be brocken easily
* NIGHT TIME USAGE: While the device has inbuilt flash, Night time usage is heavily reduced because the camera may not detect anything while the light is off
* ALWAYS ONLINE: The device requires internet to work. The complex image processing is being done somewhere around the world and the only way to get back the data is by connecting to a strong internet.
* WIFI ONLY: The device does not have a SIM support, but has wifi to connect .

**HOW WE ARE GOING TO FIX IT**

In future we hope to contribute more into this project and make this project better. We hope to make the device better itself by, improving the designs, improving the voice assistant and improving the face recognisation

**COMPONENTS USED**

**ESP32 MICRO CONTROLLER**: the ESP32 Serves as the core processing unit offering a single/dual core processing power upto 160mhz over 600 DIMPS computing power, WIFI, BLUETOOTH and veriety of peripherals. It handles the overall coordination aspects of the system.

**OV2640 CAMERA MODULE**: This camera module is employed for capturing visual data. It intergrates a cmos sensor and is capable of capturing high resolution images This esp32 interracts with the module to capture images for further processing

**SERVER**: The system incorporates a server for handling intensive image processing tasks. The ESP32 Communicates with this server to transmit captured images and receive processed data

**EARPIECE**: An added component in the system. The earpiece provides real-time audio feedback. It deliveres audio descriptions or information based on the processed visual data offering a holistic understanding of their environment.

**SERVER**

We are using a Python based web-server that is utilizing open-cv for image processing,

**PYTHON**: It is a popular high level programming language, that allows us to work with the hardware efficiently.

**OPENCV**: Open cv is a powerful open-source computer vision and machine learning software library. It provides a comprehensive set of tools and functionality primarly aimed at real-time computer vision tasks. In our project open cv is used for image processing.

**MORE FEATURES**

**ACCESSIBLITY FEATURES**: users can customize their interaction preferences these settings include speech rate volume adjustment and sensitivity controls. Ensuring a comfortable user earpiece tailored to the individuals

**HAPTIC FEEDBACK INTEGRATION**: This device incorporates haptic feedback mechanisms to provide tactile responses for notifications and interaction feedback. Users can receive subtle vibrations enhancing their understanding of the devices responses and alerts

**TTS AND AUDIO FEEDBACK**: Using specific libraries that work with Python. The device converts descriptive information into clear articulate speech output. This features offeres audio descriptions that guide users through captured images providing essential context and information

**SPEECH RECOGNITION**: this device is able to provide speech recognition

**WORKING**

The device Captures Images and audio from the mic then sends the images to a server. Then the server processes the images**,** collects data from the images and return the data for further usage.