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Design Of Smart Goggle For Visually Impaired With Audio Features

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Abstract: Visually challenged people frequently have difficulty with simple daily task like walking and travelling. They always require some help. Most of them use wooden sticks for assistance. However it has its own drawback. With the evolution of technology, Smart devices such as watch, eye wear and other items has made daily like easier. This application discusses about the smart goggle for people who visually impaired. Smart goggle provides support by assisting with object detection. We employ the deep learning algorithm YOLO V3 to identify the type of obstacle which uses the environment's obstacle as a type of data set where environment obstacle is detected through beep sound. V oice assistance is available so that the user can comprehend the type of difficulty. The purpose of this application to provide the user speech based interface that allows them to transmit through headphones, earphones etc.

Keywords: SmartGoggle, DeepLearning, YOLO V3,wooden stick, object detection.

I. INTRODUCTION

More than 1 billion people, or roughly 15% of the world's population, currently live with a disability, with 80% of them living in developing nations. Today's global population is over 8 billion. Approximately 2.41 percent of male Indians and 2.01 percent of female Indians report having a disability. Up to 18 million impaired people—or 69% of the country's crippled population—live in rural areas, and roughly 8 million—or 31%—do so in cities. Due to widespread extremist violence and birth deformities brought on by contaminated water and food, India is a country where eyesight impairment is a major worry. However, in order to assist persons who live in challenging environments, technological advancements are needed. Overall, visually impaired people are increasingly able to carry out daily tasks in their own way, including being able to drive on roads and move about their homes on their own. It is well recognized that those with impairments require assistance from others in order to identify objects. Even yet, the most recent research has offered a range of solutions to help visually impaired people

(VIPs) overcome their challenges and gain more mobility, but these solutions have not fully addressed safety precautions when VIPs travel on their own. Additionally, there are numerous other systems available, but none of them help disabled individuals stay in touch with their family and friends and are often difficult and expensive. The major difficulties that blind individuals encounter are handling indoor and outdoor environments, which include a variety of impediments and the awareness of the person in front of them. It is challenging to recognize objects or people using simply perceptual and aural knowledge.

This work utilizes the EPSON BT-300 smart goggles as an input and output medium. To perform picture recognition from the viewpoint of those who are visually challenged, it is based on the Android system. People who are blind or visually handicapped can use the built-in camera to capture photographs and send them to a deep learning object detection system and if the found object's distance is less than 300 cm then it sense and create a beep sound. The system then downloads the detection findings and employs Android's built-in TTS capability to translate the text to voice to tell those who are blind so they can grasp the immediate surroundings.

II RELATED WORKS

Android EPSON BT-300

Our wearable development tool is a set of smart goggles from EPSON, model number BT-300. The EPSON BT-300 runs 5.1 Android OS and has an Intel Atom X5 1.44GHz CPU. It supports still picture format, audio format, and even 3D image presentation, and it supports Wi-Fi for wireless Internet access and data upload. Application is aided by a handheld controller and a 5-million-pixel lens. The EPSON BT-300 also provides Bluetooth, display control, UI control, camera control, and sensor control in addition to the standard Android and EPSON APIs.

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In this work, our wearable development tool is a pair of EPSON BT-300 smart goggles. The cameramodule and speech output module of the smart goggles will be described in turn in the paragraphs that follows :

- Camcorder Module
- Obtain read/write access to data and camera permissions.
- The EPSON BT-300's screen and controller buttons can be configured to capture images.
- Save the photographs that were taken to the SD card.
- The system will call the YOLO v3 deep learning module to perform object detection after uploading the photos taken by the smart glasses to the back- end server.

The results will then be downloaded to the smart glasses, which will then produce the final speech output for those who are visually impaired.

YOLO

A brand-new and efficient object detection method is called YOLO (You Only Look Once) v3 [4-6]. The complete image is fed directly into the neural network in order to anticipate the position of the bounding box and the probability of the associated category when employing the detection as a Single Regression Problem. The following are some of YOLO v3's benefits:
- YOLO v3 finds things really quickly.
- YOLO v3 can induce False Positives and prevent background errors.

The visually handicapped individuals utilize smart glasses to capture images of the environment, which are then promptly saved on an SD card and uploaded to a server in the background. The YOLO v3 deep learning model will output the results in a format that TTS can understand after conducting object recognition. The detection result is then communicated via TTS in a verbal manner so that people with vision impairments can understand the objects in front of them and their placements with clarity.

TTS(Text to speech)
This section goes into great detail about the TTS system's conversion of text into speech. 1. Verify that TTS is set up and accessible; if not, install it and change the language to preferred language.

Detection of the obstacle
For the visually impaired, there are smart ultrasonic glasses available. includes a set of wearable glasses, ultrasonic sensors, a buzzer to indicate the direction of an obstacle from the user, and an Arduino NANO as the central processing unit.

The Arduino NANO receives data from the sensor about the obstacle's distance, processes it in accordance with the coding, and outputs the buzzer- based signal. The central device is powered, and it then sends information to the buzzer and wearable glasses. The sensor is mounted to the optical glasses between the top bar and bridge, as shown in the image. Each component is connected to the central unit using a single-strand USB cable.

The sensors' sent distance to the central unit will decrease as the blind guy gets closer to the obstruction. Because of this, the buzzer will beep more frequently and at shorter intervals. However, the beeping will become less frequent as the man moves farther away.

This protocol uses a sensor to locate objects at a distance. If the object is located within 300 meters, the sensor will sound an alert to the user. Additionally, if it is closer, the sound effect increases.

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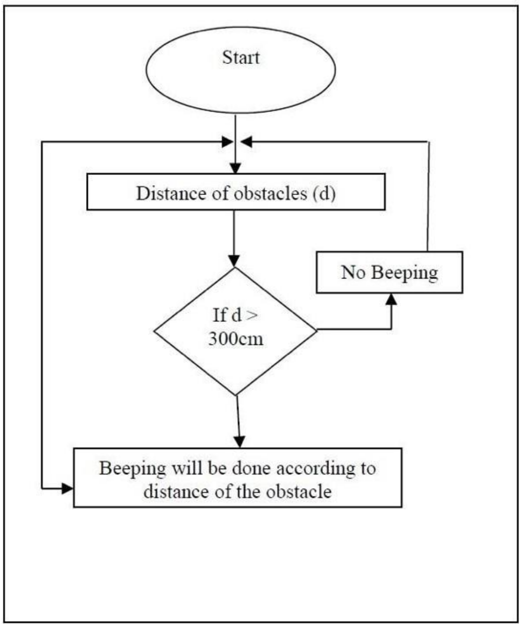

SD Card, SMS, Headphones

Three ultrasonic sensors, an SD card module, a headphone module, a switch, a GPRS SIM900A module, and an atmega328p microprocessor are all included in the system. For perfect detection, the wearable device has three ultrasonic sensors located on the left side, the front side, and the right side. The Atmega328p microcontroller and the SD card module can communicate with each other. To train visually challenged users, voices are stored in the SD card module and played through headphones in accordance with the ultrasonic data. When a subject is in danger, the system features a switch that can be used in an emergency to carry out actions like sending an SMS to the subject's guardian. The GPRS SIM900A module collects data from the internet, including time, temperature, and position. The microcontroller processes all of the data from the GPRS SIM900A module. The guardian of the subject can receive an SMS with the time, temperature, and location when the switch is pressed. The GPRS module requires a +12V source, whereas other components only require a +5V source. We used a +12V lithium polymer battery as a consequence, adjusting the source to the system's specifications.

The pin of the microcontroller's 15-number pin that is connected to the headphones The PWM (Pulse Width Modulation) pin with the 25-number is used to control the headphones.

III CONCLUSION

This smart goggles is meant to warn a person who is blind and cannot see anything about an accident. Future applications could include picture recognition systems where a sensor alerts the user to an object's presence. With the help of TTS and deep learning, this work develops an application system that enables people with visual impairments to alter their surroundings while wearing EPSON BT-300 smart goggles. According to the experimental results, the overall recognition rate is 96.3%, and the typical delay between the smart goggles and speech output is 3.788 seconds. The application system is made to help people with visual impairments acquire more living things so they may interact with the outside world and better understand the foreign environment.

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