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Smart Vision Based Technology for Blind and Impaired People

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ABSTRACT: The Smart Vision based technology for blind and visually impaired people is a developing area. The assistive technology helps the visually impaired by providing them with a greater independence. By enabling them with a day – to-day activities like indoor navigations, obstacle detections, locating the door and lost objects etc. The extension in this project is to detect the indoor objects and provide the specific object name through speech. Even though different assistive technologies are available for the blind, most of them have complex designs which are developed for specific purpose and are expensive for the commercial production.

Key words - Assistive technology, Visually impaired people, Obstacle Detection.

I. INTRODUCTION:

Machine Learning is an application of artificial intelligence that provides a systems the ability to automatically learn and improve from the experience without being explicitly programmed. We use an efficient and assistive device for the blind and visually impaired people. Smart vision is a field that deals with acquiring, processing, examining and understanding the image. The smart vision is an area of duplicating the abilities of human vision. Which also known as Image analysis, Image understanding, Artificial Intelligence. As a scientific discipline, Smart vision is concerned with the theory behind the artificial systems that extract information from image. The image data can take in many forms, such as video sequence, multi – dimensional data etc. As a technology discipline, Smart vision seeks to apply its theories and models to the construction of smart vision systems.

II. EXISTING SYSTEM:

The Existing system incorporates text recognition, object identification, door detection and security system. The architecture constitutes an image capturing system which is used to capture images for the real time applications. A processing system which is a raspberry pi system running GNU-Linux operating system. The user activates different modules through an input device. The output is provided to the user through stereo headset as a beep sound or it sends an electric pulse through the TENS- Transcutaneous Electrical Nerve Stimulator unit to the TENS glove to vibrate.

Fig: Computer vision system for blind

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III. PROPOSED SYSTEM:

In the proposed system, A raspberry pi can help the blind people using the user defined voice instructions. Here with the help of the ultrasonic sensor input to measure the distance and also voice guide the blind people to recognise the specific objects. The model is trained with multiple images of objects that are highly relevant to the visually impaired person. Trained images are augmented to bring more robustness to the trained model. This auditory output of mentioning the specific object name to the user gives somewhat idea about the surrounding environment.

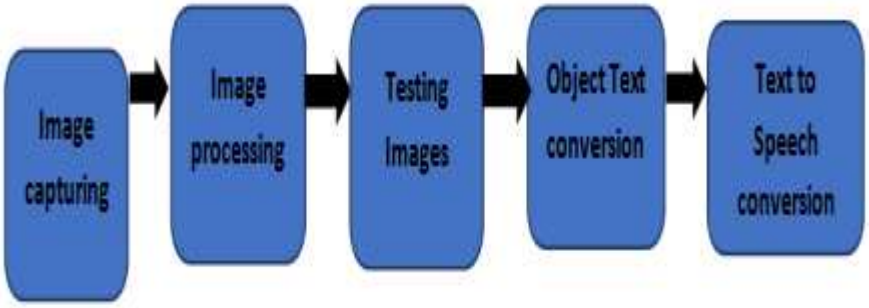
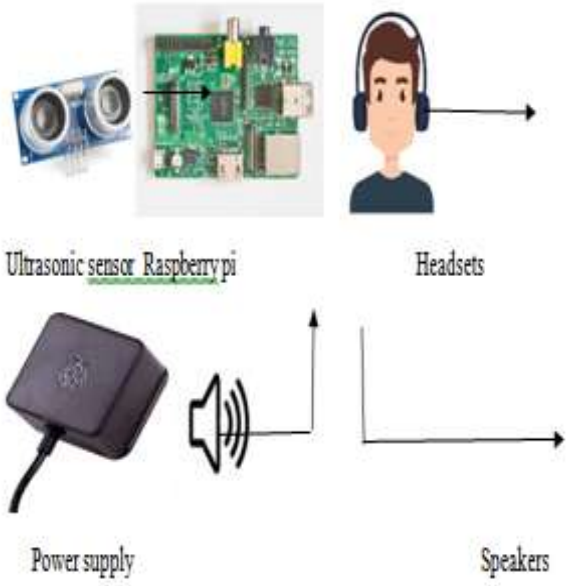


Fig: Process flow of proposed smart vision system

IV. IMPLEMENTATION:

First, Setup the raspberry pi by downloading and installing the raspberry pi OS. By using the display device, setup the Ip address of the raspberry pi and install VNC (Virtual Network Computing) server in the raspberry pi and then train the dataset by collecting different images of objects, A code is written in python to train the dataset. The ultrasonic sensor detects and measures the distance of the object, which is connected to the raspberry pi as an input. This raspberry pi requires power supply. The image of the object is then analysed by a python program and the output is placed as a string and this string is given to gTTs module. The gTTs module converts the text to speech and produces an output as an auditory information through speakers/headsets to guide the visually impaired people.

V. ARCHITECTURE:



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VI. CONNECTIONS:

Smart vision technology mainly comprised of the raspberry pi 3 module, that connects with ultrasonic sensor (captures the objects by measuring the distance) as a input and the output through speakers. To run this, we need a power supply. The supply is run through two SMPS's(Switch Mode Power Supply). Oneis connected to raspberry pi (5v) and another is connected to Audio amplifier (12v). The audio output from the raspberry pi is connected to audio amplifier to amplify the signal. Amplifier is connected to speaker to get audio output.

Fig: Connections for the proposed system

VII. HARDWAREREQUIREMENTS:

1. RASPBERRY PI 3 Module:

The raspberry pi board comprises a program memory (RAM), processor and graphics chip, CPU, GPU, Ethernet port, GPIO pins, X bee socket, UART, power source connector. It also requires mass storage, for that we use an SD flash memory card. The pi 3 has a processor speed of 1.2GHz and runs at roughly 10 times the speed of the pi 1 due to its quad-core CPU.

Fig: Raspberry pi 3 module

2.SMPS-230V(SWITCH MODE POWER SUPPLY):

SMPS is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently.Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power, see AC adapter) to DC loads, such as a personal computer, while converting voltage and current characteristics.

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Unlike a linear power supply, the pass transistor of a switching-mode supply continually switches between low-dissipation, full-on and full-off states.

Fig: Switch Mode Power Supply(230v)

3. ULTRA SONIC SENSOR:An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electricalsignal. Ultrasonic waves travel faster than the speed of audible sound. Ultrasonic sensors have two main components. The transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target.

Fig:Ultrasonicsensor

4. L293D MOTOR DRIVER MODULE:

The MotorDriver is a module for motors that allows you to control the working speed and direction of two motors simultaneously. The L293D IC receives signals from the microprocessor and transmits the relative signal to the motors. It has two voltage pins, one of which is used to draw current for the working of the L293D and the others is used to apply voltage to the motors.

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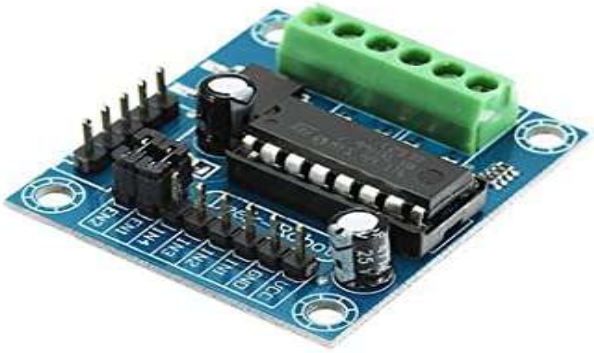

Fig: L293D Motor Driver

4. TDA 2030A AUDIO AMPLIFIER:

TDA2030 is an audio amplifier which provides an output power of 14 watts. TDA2030 audio amplifier amplifies the audible signals from any audio device for example microphone by enhancing its volume when that sound is played on a speaker. The power amplifier works on the basic principle of converting the DC power drawn from the power supply into an AC voltage signal delivered to the load. Although the amplification is high the efficiency of the conversion from the DC power supply input to the AC voltage signal output is usually poor.

Fig: TDA 2030 Audio amplifier

5. DC Motor:

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft. In other words, DC motor is any of a class of rotary electrical motors that converts direct current electrical energy in to mechanical energy. Small DC motors are used in Toys, Tools appliances.

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Fig: DC Motor

VIII. SOFTWARE REQUIREMENTS:

1.RASPBERRY OS (VNC):

VNC Connect from Real VNC is included with Raspberry Pi OS. It consists of both VNC Server, which allows you to control your Raspberry Pi remotely, and VNC Viewer, which allows you to control desktop computers remotely from your Raspberry Pi should you want toYou must enable VNC Server before you can use it: instructions for this are given below. By default, VNC Server gives you remote access to the graphical desktop that is running on your Raspberry Pi, as though you were sitting in front of it.

2. open cv:

It is an opensource computer vision and machine learning software library. Open CV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. The library has more than 2500 optimized algorithms,which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, etc.

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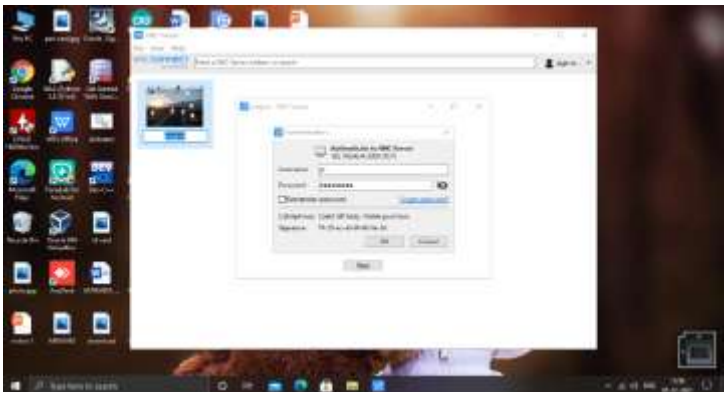
IX. RESULTS:

FOR AUTHENTICATION:



CASE 1: IF NO OBSTACLE :

If there is no object detected then, It will gives the output as "NO OBJECT IN FRONT OF YOU" as a speech then, the blind person can move freely.

CASE 2: IF OBJECT DETECTED:

A) If there is an object, then introducing the voice alert to the blind person as " RIGHT SIDE OBJECT IS DETECTED, PERSON".

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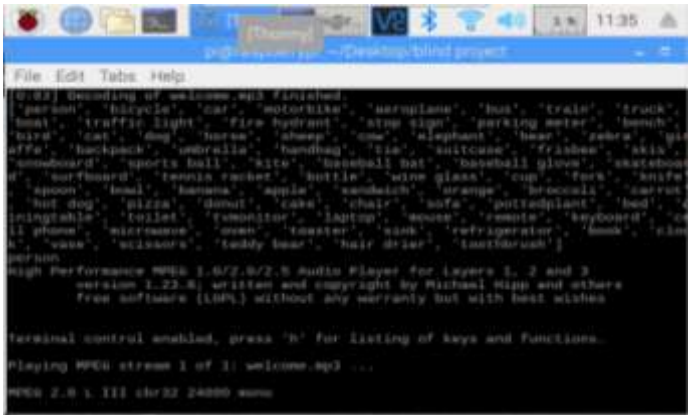
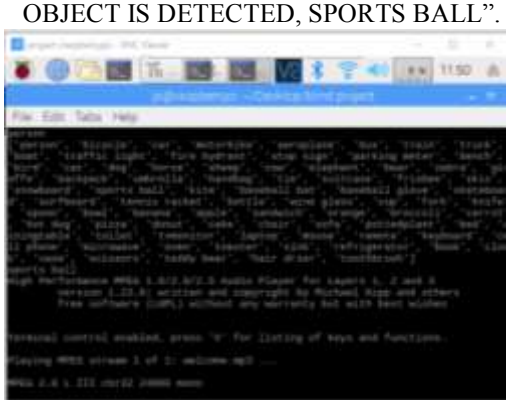
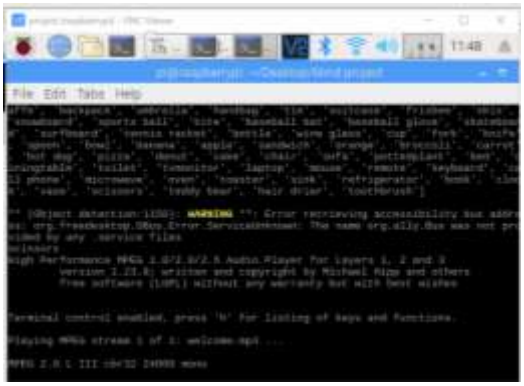


B) If there is an object, then introducing the voice alert to the blind person as "LEFT SIDE OBJECT IS DETECTED, SPORTS BALL".



C) If there is an object, then introducing the voice alert to the blind person as "RIGHT SIDE OBJECT IS DETECTED ,SCISSORS".



X. CONCLUSION/ FUTURE SCOPE:

The smart vision based technology for blind and visually impaired people is a developing area. The assistive technology helps the visually impaired by providing them with a greater independence. For future enhancements, more sensors can be integrated in the projects to provide the detection of obstacles in a wider range. Technologies available for blind navigation are insufficiently developed, adopted and marketed. This project could be enhanced by using the techniques, that can help for indoor navigation and to make life easier for the blind to recognize objects facing by them.

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