

## WEARABLE ASSISTIVE, ADAPTIVE AND REHABILITATIVE GADGET FOR VISUALLY IMPAIRED PEOPLE

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### ABSTRACT

Visually impaired are often latched on exterior aid which might be delivered by humans, tutored dogs, or different electronic appliances as backing techniques for the greater cognitive techniques. The main problem with blind people is the navigate their way to wherever they require to travel. They often require assistance from others. This project is meant to assist the blind to beat the shortage of sense modality, by using other senses like sound and touch. The sensor module is intended to live the space using the principle of ultrasonic waves to see the space of an object. The system also consists of a buzzer to get an alarm sound and a motor to come up with vibration signals. The system uses ultrasonic wave signals to notify the blind person about upcoming hurdles. As the distance between the band and obstacle decreases, the force of vibration signals increases. Hence the system makes the navigation process for the needy really easy. This system offers a cheap, reliable, portable, low power consuming, and robust solution for navigation with visible short intervals. The system also has another module in which it converts images into a speech format. This module will help visually impaired people in reading different images as they will be able to read them by listening to them. Optical Character Recognition (OCR) is used in order to do it. The imported libraries will convert the image in grayscale and then recognize the sentences and words and characters individually and then look for it in dictionaries for converting it into a text format. Once that is done then it will convert the text into an audio format.

**Keywords:** Visual Disabilities, Ultrasonic Waves, Optical Character Recognition.

### I. INTRODUCTION

The power of vision is one of the foremost significant parts of human physiology. Our eyes are the key to our surroundings. Unfortunately, approx. 285 million people are estimated to be visually disabled all over the world, of which 39 million are blind, in keeping with a report published by the World Health Organization (WHO) 82% of blind people are of the age of fifty and above. Moreover, 90% of visually impaired people belong to developing countries. The earliest kind of a navigation tool for the blind has been within the kind of a walking stick. But the drawbacks of using it are the dearth of necessary skills, Cost and training period. With the advances in technology, it has become possible to style and develop technological solutions which will help a visually impaired person navigate freely. Various research works are carried out for developing such smart blind sticks. An appliance for the visually undermined Is assembled that uses 8 ultrasonic sensors for impediment detection along with micro-vibration motors to provoke the vibrations. Along with that camera for transforming images into a dialogue layout. It tutors the individual utilizing the adhere for providing guidance. It utilizes a Raspberry-Pi processor which comprises more recollection and features a high operating velocity. Additional proposes navigation equipment using ultrasonic sensors, a camera as well as vibratory circuit. The camera can be clambered on a headband to warn about the peak of the subjects in the way. The ultrasonic sensor unit is for the detection of barriers. Distance information is conveyed to the user through vibratory patterns varying incrementally with changing impediment distance. It is problematic to stroll for sightless people as they do not know their surroundings. They usually use a white stick or a seeing-eye dog for his or their assistance. However, these modes are restricted because they do not entirely aid in protecting visually impaired people from numerous hazards. Formerly advanced assistance techniques for blind people include

infrared cane-based assistance, ultrasonic cane-based assistance, voice-assisted navigation cane, laser-based walker assistance. There are some benefits to those procedures but they also retain some restrictions. . As an example, in infrared cane-based assistance infrared, encompasses a short-range for perceiving impediments, produces unfavorable leads to the dark.

## II. METHODOLOGY

The system is meant to empower artificial vision which is able to facilitate them to browse and object detection. The planned system helps to notice Associate in the Nursing object around them Associate in Nursing transmits response within the type of vibration that's warning messages via wave motors and conjointly helps in text reading from a book or document in an audio kind. The general system aims to deliver an occasional price, economical text reading and obstacle detection aid for the blind which provides a way of artificial vision by providing info and proof regarding the situation of a static and dynamic object around them in order that they will walk severally.

- A. Supersonic Sensor:** High-frequency sound waves square measure generated by the supersonic detector. It evaluates the echo that is received back by the sensors. The time extent between causing the signal and receiving the echo is computed by the detector to work out the general system aims is like infrared wherever it'll replicate on a surface in any form, however supersonic contains a promising vary detection compared to infrared. within the robotic and automation trade, supersonic has been extremely accepted thanks to its usage. In our Project, the supersonic detector distance measuring Module deals with the gap measuring between the obstacle and therefore the blind man. This module starts the method once the user activates the device employing a power provide. Firstly, once the device activates, the supersonic detector can mechanically provide the gap measuring of the obstacle ahead of the blind, and so the gap measured is kept.
- B. Wave Motors:** Here, a vibration motor is employed to tell the user regarding the Associate in Nursing obstacle detected by the supersonic sensors. to make a tactile transmission with the user, vibration motors square measure used. A cylinder- type vibration motor (Taiwan Intelligent Sensing Technology, Tainan town, Taiwan) is employed. The motor is connected to the PI microcontroller in order that it may be programmed to control the motor speed. The vibration motors square measure electrical motors that are equipped with weights on their shafts. The weights have a non-uniform form, and therefore the asymmetrical load can produce an unsteady result throughout motor rotation that's felt through the casing as vibration. The voltage applied to the motor, the larger the wave impact.

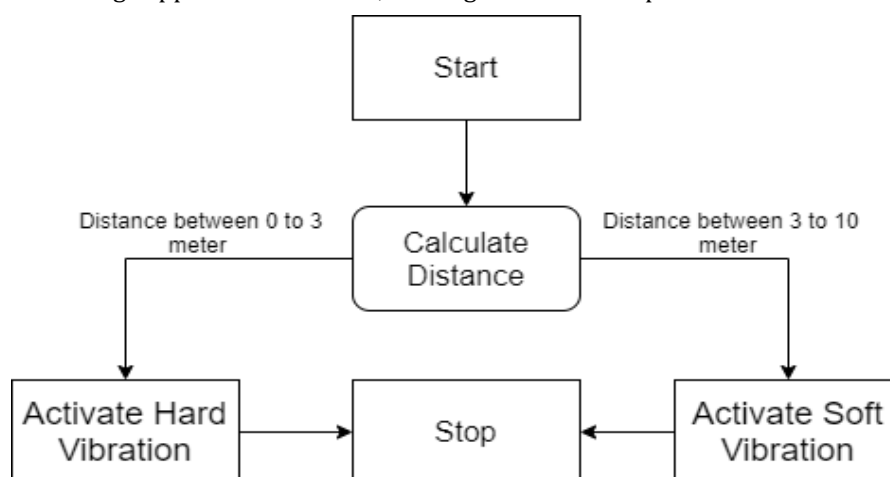
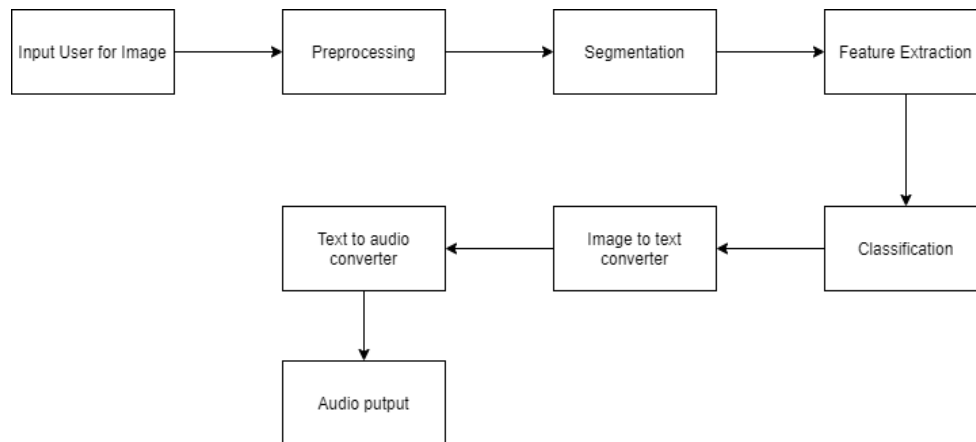


Fig 1: Wave Motor Work Flow

- C. Camera Module:** The Raspberry Pi contains a Camera Module with prime quality Associate in Nursing Associate in Nursing 8-megapixel Intex it-360 WC camera that designed and acts as an add-on board for Raspberry Pi, with a set focus lens. it's capable of feat 3280 x 2464-pixel static pictures, and conjointly supports 1080p30. The add- on board attaches to Pi via one amongst the little sockets gift on the board side and uses the dedicated USB interface, designed particularly for interfacing to cameras. the dimensions of the board are 25mm x 23mm x 9mm. It conjointly weighs simply over 3g, creating it good to wear wherever size

and weight aren't of importance.



**Fig 2: Image Scanning Module Flowchart**

### C.1: Image Correction Module:

**(a) Grey Scaling:** It is a method of reworking a digital or element image into a grayscale image. every worth of the element is outlined as one sample because it carries solely the data regarding intensity. These square measures composed solely of grey shades, deviating from the weakest intensity i.e., black to white the strongest intensity starting from zero to 255.

**(b) Binarization:** It is a method of creating a grayscale image into a binary image. It consists of black and white. Binarization comes with thresholding. each element with a worth larger than one hundred seventy turns white (gets the worth of 255) and each element with a worth lesser than one hundred seventy becomes black (gets the worth of 0).

**C.2: Image process module victimization Optical Character Recognition:** This methodology contains the Optical Character Recognition methodology. It targets written text, one glyptic art or character at a time. OCR utilizes an Associate in Nursing optical mechanism to mechanically determine the characters, this technology imitates the flexibility of the human sight, wherever the camera replaces the attention and process of the image square measure worn out the pc as a substitute for the human brain. OCR engine planned state and first steps to urge the most effective input of OCR to cut back the incapacity of this OCR engine. The setup state is well custom-made to the specifications of the specified initial device. In order that the specified output of this process contains a minimum error rate is additionally a brief interval. This module doesn't amendment the OCR rule, however, provides a supplementary state to urge the most effective input of OCR. It's the nearly associate in Nursing "offline" method, that analyses a static document.

**C.3: Tesseract OCR Implementation:** The input image captured by the camera contains a size of eight MP or 215 per inch). As per the specifications of the Tesseract OCR engine, twenty pixels majuscule letters square measure the minimum character size that may be browsing. Tesseract OCR accuracy can decrease with the font size of 8pt. The computer code refines the input image and converts it into text format. The image is taken by the user via a GPIO pin that's connected to the tactile key by creating use of the interrupt operate. moreover, the image is captured by employing a rasp still program with sharpness mode to sharpen the image. The resultant image contains a .jpg format with a resolution of 3280\*2464 pixels.

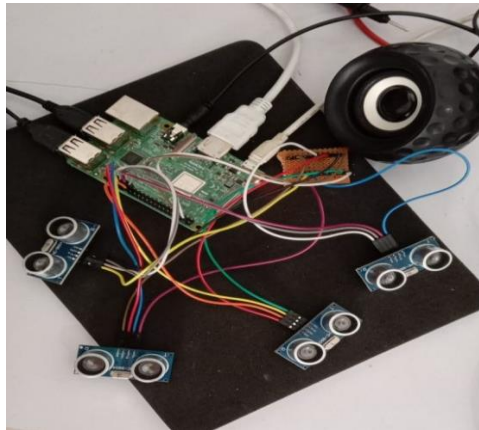
**D. TTS Correction and Voice Module:** In the Text to Speech module, the text gets transformed into the voice as an outcome. The outcome of OCR is the script, which gets stocked in a file (speechfile.txt). Here, Flite and ESpeak software's are used to convert the text to wave format. Eventually, text.wav can be heard. Flite and ESpeak are open-source software's that can be implemented to Raspberry pi, which is available in numerous languages. Text to Speech is a technique that can renovate intake from the script into speech. Text to Speech comprises two sub-systems those are:

**a) Text to Phoneme converter** is used to convert the sentence input in a specific language in the form of text into a series of codes that exemplified by the tone of the phoneme code, its interval and pitch. This section is language dependents.

b) Phoneme to Speech converter will approve intake in the form of codes as well as the tone and interval of phonemes produced.

### III. MODELING AND ANALYSIS

The normal gadget developed for visually impaired people consists of only incoming object detection. The proposed module not only detects the incoming objects from a 360-degree view but also capable of scanning the incoming images to convert the extracted keywords to the audio output form. The following is the pictorial view of the hardware module of the project.



**Figure 3:** Hardware model of Proposed System.

### IV. CONCLUSION

The project successfully counsels the insights of upcoming objects/persons. Intakes from the 360-degree encircling are obtained from the multiple 360-degree positioning of Ultrasonic sensors. Vibrational variation will help in the calibration of objects as per the distance gap between the person and the object/another person. Also, the additional Camera Module of the project scans the images and extract text from them efficiently. The extracted text is finally converted to the Audio form so that the blind person will understand the same. The comprehensive cost has been cut down and the energy consumed in comprehending them. It is a less expensive outcome, as all the elements used in the appliance are cost-effective and efficient. The latest and vastly trending technology renders this device portable, adjustable and beneficial. The apparatus pursued in this paper can be a crucial aid in unraveling an infrequent of the numerous challenges struggled by visually uncomprehending people. To additional enlarge the proposal, the appliance can be rendered additional lightweight and capable to be worn make it gullible for the user to operate.

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