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Navigation and Camera Reading System for Visually Impaired

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Abstract - *Today, many of the aid systems deployed for visually impaired people are mostly made for a single purpose. Be it navigation, object detection, or distance perceiving. Also, most of the deployed aid systems use indoor navigation which requires a pre-knowledge of the environment. These aid systems often fail to help visually impaired people in the unfamiliar scenario. In this paper, we propose an aid system developed using object detection and depth perceivement to navigate a person without dashing into an object. The prototype developed detects different types of objects and compute their distances from the user. We also, implemented a navigation feature to get input from the user about the target destination and hence, navigate the impaired person to his/her object destination. With this system, we built a multi-feature, high accuracy navigational aid system by processing the image and performing computation using image processing to help the visually impaired people in their daily life by navigating them effortlessly to their desired destination and to read the data from the image with the help of image processing.*

Key Words: **Optical Character Recognition (OCR), Text to Speech Synthesis (TTS) and Digital Image Processing (DIP)**

1.INTRODUCTION

Computer vision (CV) is one of the many branches of computer science which is thriving to resemble human vision. It is not confined to capture an image from the camera as it also encapsulates an intelligent software module which is used for analyzing the image based on various algorithms for specific applications. These algorithms incorporate processing of image/s to determine the features and attributes which can describe the image at an abstract level. These features and attributes of an image provide meaningful inferences with respect to specific applications. This involvement of intelligent software module classifies CV as a category of science and it is growing to become a perfect artificial vision. However, computer vision is also trying to teach a system to pick what should be a zone of interest, how to understand the objects and how the machine should be thinking. Some of the applications of computer vision are monitoring the industrial equipment, monitoring biological cells and some real-life applications like parking systems. The technological implementation of CV system is better than biological in many ways like a camera can detect movements faster than the human eye. Due to this reason, CV has also found its deployment in the area of healthcare for visually impaired people. Navigation systems are one type of aid systems which help a person navigate in an unfamiliar environment smoothly without being lost or getting hurt. In an indoor navigation system, the system helps to navigate a person in an indoor controlled environment where the environment is usually fully observable. The main problem which an indoor navigation system faces is of the lack of precision which is due to the localization method used.[2][3]

1.1 Problem Statement

- About 90% of world's visually impaired live in developing countries
- Without vision it can be challenging for a visually impaired person to navigate.
- The blind traveller should depend on any other guide like blind cane, People information etc.

1.2 Aim

Aim of our project is to develop a concept of Navigation and Camera Reading System for people who in need, this concept is achieving by digital image processing and web camera. This mainly helps to the people who are visually impaired.

2. EXISTING SYSTEM

Blind people are unable to perform visual tasks and navigate to the location of objects. For instance, text reading requires the use of a braille reading system or a digital speech synthesizer (if the text is available in digital format). The majority of published printed works does not include braille or audio versions, and digital versions are still a minority. On the other hand, blind people are not able to read the simple warnings in walls or signals that surround us. Thus, the development of a mobile application that can perform the image to speech conversion, whether it's a text written on a wall, a sheet of writing paper or in another support, has a great potential and utility. Going and fetching the objects near to them is a difficult task and it needs precise identification of sense of objects.

2.1 Limitations of Existing System

- Blind Cane: Recognition of obstacles up to knee level.
- Going and fetching the objects near to them is a difficult task and it needs precise identification of sense of objects.

3. PROPOSED SYSTEM

Blindness makes life rather difficult for people who suffer from this health problem, but the use of technology can help in some day-to-day tasks. In this context, the present work focuses the development of a photo-to-speech application for the blind. The project is called Camera Reading for Blind People, and its ultimate purpose is the development of a mobile application that allows a blind user to "read" text (a sheet of paper, a signal, etc.). To achieve that, a set of frameworks of Optical Character Recognition (OCR) and Text to Speech Synthesis (TTS) are integrated, which enables the user, using a smartphone, to take a picture and hear the text that exists in the picture. Since Going and fetching the objects near to them is a difficult task and it needs precise identification of sense of objects, we are creating a prototype of system to help the visually impaired people to identify the objects and compute the distance and direction on that basis and guide them.

3.1 Advantages of proposed system

- It helps the visually impaired people to identify the objects.
- It also computes the distance and direction and guide them.
- It navigates a person by localizing its location every time the user makes a step.
- Cost effective.

4. OBJECTIVES

- Image capturing through streaming
- Process the image and detect object
- Compute the size
- Distance and direction calculation
- Image capture of text
- predicting characters
- TTS creation

5. METHODOLOGY

5.1 Optical Character Recognition (OCR)

Optical character recognition is the electronic device. It converts the images of typed and printed text into machine encoded text. It reads the text from scanned document, photos, subtitle text on the image. In early versions of optical character recognition, we need to train each character and it was capable to work only on one font. In advanced versions of optical character recognition, it takes most of the fonts and it also takes the digital image file format inputs. It is one of the major tools for blinds or visually impaired people to access the printed information. First, it scans the image then it starts to recognize the characters in the text and it converts that recognized information into an electronic file which can be used to speak the text.

5.2 Text to Speech Synthesis (TTS)

Visually impaired people are unable to see the text in the images, newspapers, textbooks and etc. This makes them unable to learn the information that in those things this kills their learning skills. Therefore, we need a device to help them out of this problem. So TTS helps the visually impaired people by converting the text into speech so that then can get the information clearly which is printed in the images, newspaper, notes etc.

5.3 Digital Image Processing (DIP)

Image refers to two-dimensional intensity function f (x, y), where x and y denotes spatial coordinates and the value of f at any point (x, y) is proportional to the brightness of the image at that point.

A digital image is a representation of two-dimensional image as a finite set of digital vales, called picture elements or pixels.

Digital image processing focuses on two major tasks

1. Improvement of pictorial information for human interpretation.
2. Processing of image data for storage, transmission and representation for autonomous mission perception.

There are mainly three levels of processing images as shown in below figure;

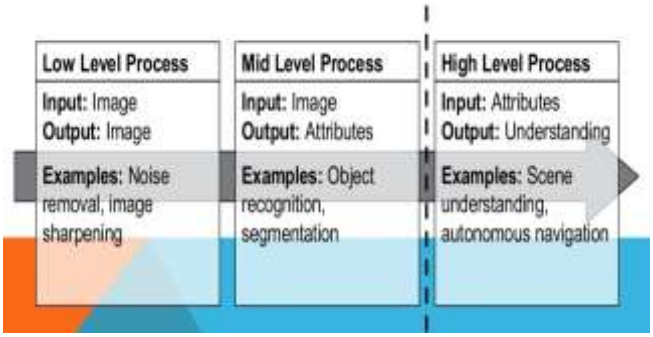

Fig-1: Digital image processing [7]

6. BLOCK DIAGRAM

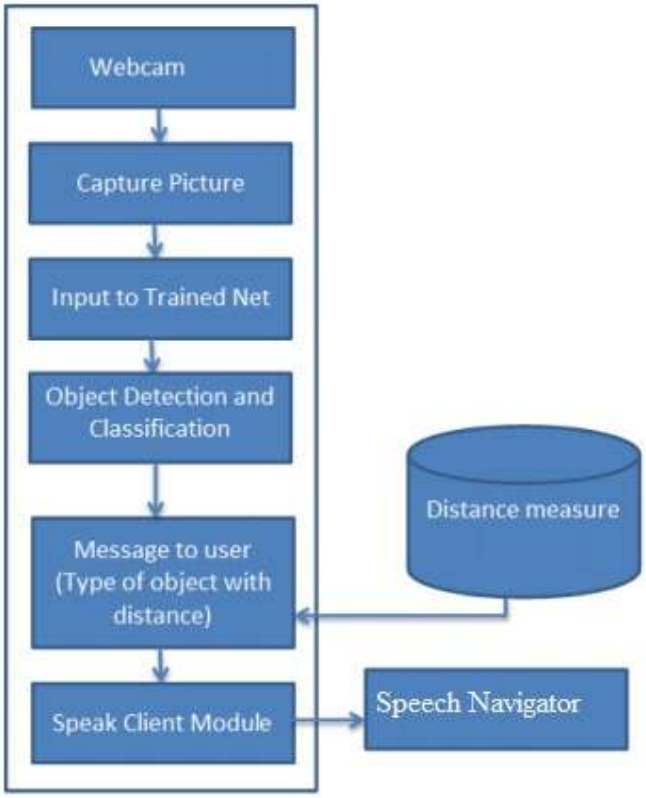

Fig_2: Block Diagram

Web cam capture the picture and take it as input... Before that we train the system based on daily obligations and pass the message to the user about the distance and type of the object. Here we include the audio system to hear the message called speech navigation. And here it detects the objects and obstacles and classify them according to trained system and it sends the information to the user as type of the object and the distance of the object from the visually impaired person from the distance measure module and gives the output in the form of speech.

7. LITERATURE SURVEY

- A sensing approach to describe indoor scenes with the help of a portable camera. The major limitation of the prototype was scalability to adapt for more objects and high processing power which makes the system bulky and high-power consuming.[4]
- An indoor navigation system with the object identification feature using the colour of the objects. It makes use of enhanced processing power of mobile devices to allow real-time processing of 3D models and local sensors of orientation and object identification. The major flaw of the prototype was inaccurate depth measurement which can cause fatal results if deployed in the real world.[5]
- RFID and GPS integrated navigation system for visually impaired which required a pre-developed infrastructure of RFID tags. It also used sensors such as ultrasonic and infrared to identify the objects works in the very close vicinity and will require the user to be physically near the object in order to detect it which makes it infeasible in the real-life navigation systems as the visually impaired person can dash into the object before detecting it.[6]
- A wearable navigation system for the visually impaired which uses the SLAM approach for navigation in the indoor environment and requires infrastructure to work in an open indoor environment. The purpose of the system was to navigate a person by localizing its location every time the user makes a step. Another notable limitation of the indoor navigation system is, they require either developed infrastructure or sensor fusion which drastically increases the cost of the navigation system. Also, these systems are specialized for the specific indoor environment and therefore, cannot be readily used in an unfamiliar environment.

7. CONCLUSION

It can be used for indoor navigation of people with visual disabilities , high accuracy navigational aid system by processing the image and performing computation using image processing to help the visually impaired people in their daily life by navigating them effortlessly to their desired destination and to read the data from the image with the help of image processing.

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