



Threat Detection for Visually Impaired Persons

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Abstract: One of the most important senses for living is vision. Many people living in this world deal with visual impairment. These people face many difficulties in navigating independently and safely, facing issues in getting information and communication. The objective of the proposed work is to change the visual world into an audio world by notifying blind people about the objects in their path. This will help visually impaired person to navigate independently without any external assistance only by using this real-time object detection system. The app uses image processing and machine learning techniques to identify objects in real time via camera and inform visually impaired people about the object and its location via audio output. The inability to differentiate between products leads to many limitations of current methods, including lower accuracy and poor results. The main objective of this proposed work is to provide effective accuracy, the best performance, and a viable option for visually impaired person to make the world a better place for them.

Keywords: Visually Impaired individual, Object Detection, Security, etc.

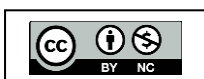
I. INTRODUCTION

Visually impaired individuals face unique challenges in navigating and interacting with their environment due to their visual limitations. One critical aspect of their daily lives is detecting potential threats in their surroundings to ensure their safety and well-being. Threats could include obstacles in their path, moving vehicles, open pits, or other hazards that may pose a risk to their mobility and safety. Real-time threat detection technologies can play a crucial role in empowering visually impaired individuals [1] by providing them with timely and accurate information about potential threats in their environment. These technologies utilize various sensory inputs, such as cameras, sensors, or audio cues, to detect and alert visually impaired individuals about potential dangers in real time, allowing them to take appropriate actions and navigate their surroundings more confidently. The aim is to empower visually impaired individuals with increased situational awareness, early warning systems, and the ability to make informed decisions to avoid potential dangers.

Overall, the project aims to promote inclusivity and accessibility by enabling visually impaired individuals to navigate and stay informed about current events. This solution will empower visually impaired individuals to navigate with ease and confidence, enhancing their quality of life and promoting their independence.

II. LITERATURE REVIEW

Blindness causes many public health, social and economic problems, especially in developing countries. The World Health Organization [9] reported that 37 million and 124 million people worldwide are blind and sighted, respectively. The increased portability and wide adoption of diverse web content and mobile technologies have resulted in the fact that computers are no anymore perceived as distinct technological objects, but as more integrated tools to support everyday activities [10].





A study found that accessibility to public spaces is essential for visually impaired individuals to participate in social activities. The study also found that lack of accessibility was a significant barrier to participation in social activities. Studies have shown that early intervention and specialized educational programs can improve the educational outcomes of visually impaired individuals.

There are many software's and products that are developed for visually impaired persons [10] like Smart Blind Sticks, NVDA, etc. This software provides ease of access to handling the environment and navigation. Smart sticks are widely used by these people that detects obstacles and alert the user with audio commands. These smart sticks use various types of sensors that detect the distance of the obstacle from the user and provide an alert.

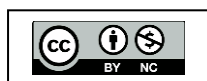
Object detection [2] is the process of identifying certain items in pictures or movies, such as faces, bicycles, and buildings. There are many software's like MATLAB, OpenCV using python, etc. for face detection and other well-researched object detection. OpenCV, sometimes referred to as open-source computer vision, is a software library for machine learning. Object detection, as proposed by Bhoomika Gupta (2017), is a well-known computer technique associated with computer vision and image processing that focuses on identifying items or instances of those things in digital photos and videos, such as people, flowers, and animals. Face identification, character recognition, and vehicle estimator are just a few of the well-researched object detection applications. A method for detecting items from the actual world that are present in digital images or videos was presented by Kartik Umesh Sharma (2017) [3]. These objects can be any type of objects, such as people, automobiles, or other objects.

The system requires a few components in order to detect an item in an image or video. A model database, a feature detector, a hypothesizer, and a hypothesizer verifier are among these elements. Text-to-speech (TTS) technology [5] reads aloud digital text. Converts text to audio on computers, smartphones, and tablets. Text to speech is a program where you enter text and the output you get is text to speech. It does not require an internet connection and is very easy to use. In India, many research institutes are trying to perform text-to-speech in Marathi, Hindi, Telugu, and other local languages. There are many improvements that can be made to the TSS mix to have a natural and emotional effect. Python is a multi-programming paradigm general-purpose programming language. a high-level programming language that uses a comparatively little number of lines of code as compared to other languages to complete a task. Because of its extremely user-friendly writing style, Python [6] is now regarded as one of the simplest programming languages to learn.

The language's standard library includes a sizable number of built-in methods. Python's key attributes include being straightforward and simple to learn, free to use and open source, a high-level programming language, platform agnostic, portable, dynamically typed, both procedure- and object-oriented, interpreted, extendable, embedded, and having a sizable library. Python was created by Guido van Rossum in the late 1980s, and it was originally made available in 1991 as Python 0.9.0. Because it is a dynamically-typed programming language, the user need not define the data type before storing values in the program. Python 2.0 was introduced in 2000, while Python 3.0, which is not entirely backward-compatible with prior versions, was released in 2008. A full travel solution for the blind is the Smart Stick [8].

The barrier is detected by this system using IR, ultrasound, and water sensors. However, the blind person is only alerted by a buzzer when any one of the sensors is activated by this system. No location identifiers or location indicators are used by this system. The items that are present at the visually impaired person's eye level cannot be detected by it. As a result, the visually impaired person may be at danger of losing their life if any dangerous things suddenly appear in front of them and strike them.

From the survey, we can say that the items that are present at the visually impaired person's eye level cannot be detected. As a result, the visually impaired person may be at danger of losing their life if any dangerous things





suddenly appear in front of them and strike them. There must be a provision that will assist the blind stick in detecting the environment threats.

III. PROBLEM STATEMENT

Persons with the visually impaired rely on alternative formats such as smart sticks, tape recordings, etc. The information provided to visually impaired persons may or may not be valid information and this is the part of concern. As the internet and World Wide Web increased and ease of access to information resources for them. So, to provide accessibility and useability an innovative solution is to provide alternate formats for detecting the threats. The major concern is while walking on road if any object (like rod, etc.) suddenly came in front of the person at the eye level then smart sticks are unable to detection those objects. This will create a life threat for the visually impaired person.

IV. PROPOSED SOLUTION

To overcome the odds, we have proposed a user-friendly solution of backend software. It will detect the objects that are present at the eye level of visually impaired person and will convert that object into audio. This includes the real time object detection and help the visually impaired person in navigation. This will decrease the injury and the life threat of visually impaired person. The object is converted to audio for alert. This will create a virtual image of real environment of the visually impaired person.

V. OBJECTIVES

1. To increase situational awareness.
2. Developing early warning systems that can alert visually impaired individuals to potential threats in their immediate environment.
3. Educating visually impaired individuals on threat detection techniques and skills.
4. Ensuring that threat detection solutions are usable and accessible to visually impaired individuals.
5. Regularly seeking feedback from visually impaired individuals and incorporating it into the development and improvement of threat detection solutions.
6. Customizing the solution for visually impaired individuals that are tailored to their specific requirements, improving their overall experience and effectiveness of threat detection.

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