



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 4, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

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Design and Development of Smart Glass for Visually Impaired

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ABSTRACT: Smart glass represents a potential help for those with a visual impairment that could lead to an improvement in quality of life. Smart glass is for people who need to know what barrier is there in front of them independently and feel socially comfortable and safe while they are doing it. It is based on the simple idea that blind people do not want to set themselves apart by using help tools. The project focuses on the important work carried out in the field of portable electronics and the characteristics resulting from it. The smart device consists of an ultrasound sensor to detect the forward object in real time and powers the raspberry for object detection analysis. It can also help the person about the name of the item.

KEYWORDS: smart glass, embedded system, Ultrasonic sensor, Audio feedback, web camera, Visually impaired.

I. INTRODUCTION

Visually impaired people report numerous difficulties with accessing printed text using existing technology, including problems with alignment, focus, accuracy, mobility, and efficiency. We present a smart device that assists the visually impaired which effectively and efficiently reads the paper-printed text. The proposed project uses the methodology of a camera based assistive device that can be used by people to know the object name. The structure is for implementing image capturing technique in an embedded system based on Raspberry Pi board. The design is motivated by preliminary studies with visually impaired people, and it is small-scale, which enables a more manageable operation with little setup. In this project, we have proposed a text read out a system for the visually challenged. The proposed fully integrated system has a camera as an input device to feed the images for digitization and the scanned images is processed by a software module. A methodology is implemented to the recognition of images. As part of the software development, the Open CV (Open source Computer Vision) libraries are utilized to do image capture.

II. RELATED WORK

In this technology controlled world, where people strive to live independently, this project proposes an ultrasonic stick for blind people to help them gain personal independence. Since this is economical and not bulky, one can make use of it easily. In this paper, a Smart walking stick in the visually disabled persons research area, there have been different developments made on smart-glasses and ultrasonic sensors by Pooja Mind et.al. [1]. Some of the proposed systems either perform only object recognition or only help in reading the text. Almost all proposed systems did not help the visually impaired people to write or to have a hardcopy in the form of braille code which then helps them to read offline. To overcome the disadvantages mentioned above the paper discusses various techniques- Seeing mode, which can recognize 550 classes of objects along with object's position by G Sudharshan et.al. [2]. The Dark light project designed for visually impaired people using GPS and Arduino. Approximately, 285 million people are visually impaired and 39 million are blind according to World Health Organization. People who are visually impaired should depend on technological devices. Thus this project aims to develop 'Dark Light' for visually impaired to connect them to real time environment by M. Hariharan et.al. [3]. The "Helping Hand for Blind", is designed to help the blind to overcome the lack of visual sense, by using other senses like sound and touch. It uses audio and vibration signals to notify the user about upcoming hurdle. As the distance between glove and obstacle decreases, frequency of both audio and vibration signals increases. Thus, the system helps to ease the navigation process for the needy. A



study that helps those people to walk more confidently is proposed by B.Suneetha et.al. [4]. 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 by Roberto Neto et.al. [5]. This project is made on various platforms like python with its various packages which is programmed and run on Raspberry Pi 3B+ model. By implementing this system we are performing image to text to speech conversion, Google based personal assistant with home automation by Isha S.Dubey et.al. [6]. To extract text regions from advanced backgrounds, we've got projected a completely unique text localization formula supported models of stroke orientation and edge distributions. The corresponding feature maps estimate the worldwide structural feature of text at each component. Block patterns project the projected feature maps of a picture patch into a feature vector. Adjacent character grouping is performed to calculate candidates of text patches ready for text classification by Pavithra C A et.al.[7].

III. METHODOLOGY

This chapter includes the complete setup of the system, from the parts to the algorithms that will be used to create a wearable smart glass that is affordable for blind people. The conceptual framework, system process flow, simulation process, and testing process are all covered in great detail in the methodology. The smart glass's system flow diagram, which illustrates the system's constituent parts, is shown in Figure 1. The camera will initialise for connectivity after pressing the power bank's button to activate the system. The object or text will then be found by scanning the current Raspberry Pi camera frame. The system will analyse the data after detecting an object or piece of text. The transformed version of the processed image if the analysis of the data is successful, into an audio output. If, however, the data analysis was unsuccessful, the system will start over by scanning the current Raspberry Pi camera frame. The user will choose whether to press the power bank's button to turn the power off when the system operation is finished or to keep using it.

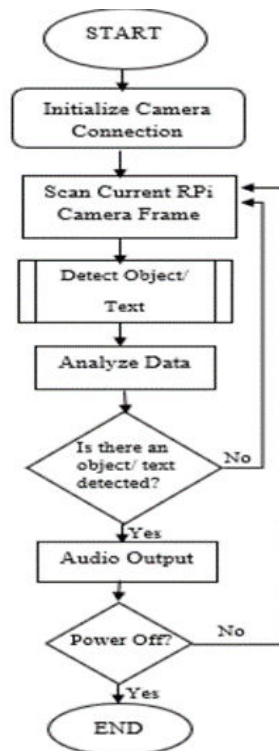


Figure 3.1 System Flow Chart

IV. EXPERIMENTAL RESULTS



Figure 4.1 Working model

Dataset creation:

In the beginning, we're going to build the dataset using a unique custom dataset. Having the appropriate set of data is extremely crucial because it enables us to produce the desired results. When working on a custom dataset, data selection is extremely important. We are mostly using 4 things in this project as barriers shown in below figure 4.1. Most of us are focusing on the datasets for cars, dogs, people, and bicycles. Data is collected at random by snapping pictures of cars, dogs, bicycles, and people. Some internet images were also used in the data collection process. Once photos are taken, we must only keep the portions of the photo that contain our object in order to accurately capture the features of that object. We would benefit more from having a large number of datasets when we are later predicting the outcomes.

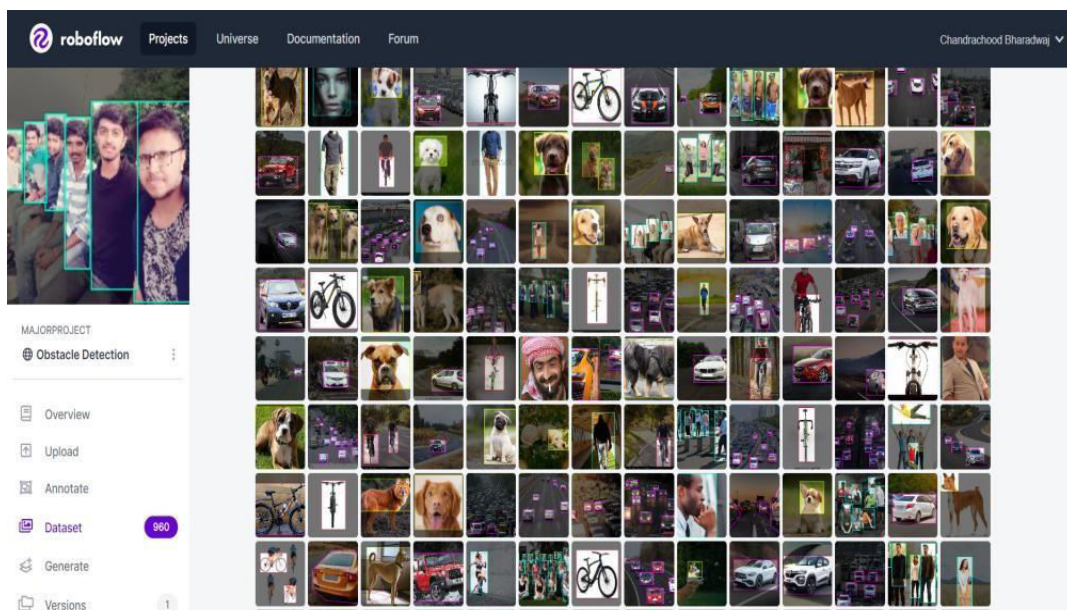


Figure 4.2 Dataset of objects



V. CONCLUSION

The Smart Aid for Blind project A system using Ultrasonic sensors, a camera, and voice commands delivered through headphones is created using a Raspberry Pi computer. It would make it easier for someone who is blind to get around on their own in a public setting. The suggested solution makes an effort to fix the shortcomings of the existing system. It tries to address the issues that blind people deal with on a daily basis. Additionally, the system employs safeguards to protect them.

Utilising deep learning models that have been successfully trained using a customised dataset that includes dog, cat, car, and person datasets.

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