

A Survey Report on the Emerging Technologies on Assistive Device for Visually Challenged People for Analyzing Traffic Rules

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Abstract—Typically, visually impaired community facing difficulties in reading and cannot able to analyze the traffic rules as be fond of a common person. They are using the traditional technique i.e. Braille script for reading purpose which is an easy technique for them to study and to understand. In the year 2018 A survey taken by CAGR which announced that the people around 3.9 crore have 90% percent vision loss and people who are facing moderate and complete vision loss problem is around 21.7 crore people. Nearly 25.3 crore people have completely lost their vision. Around, 110 crore people with near vision loss. The popularity of blind people had gradually decreased. Nearly 89% blind people lived in less and moderate economical countries and among that, 55% of vision loss were woman. Because of various difficulties faced by blind community, numerous hospitals were opened by their government for treating and curing them. Around 1,58,000 health care sectors for visually impaired will raise to more than 90% i.e. 3,25,000 by the year 2040. frequently many softwares and equipments has been industrialized and commercialized for reading but, these softwares and equipments need of a network and backup support. They are unsuccessful in usage. In legalize to overcome the hardships faced by the visually challenged, our group has developed a equipment for them to analyze the traffic rules and perform their activities as a typical person.

Index Terms—Optical character recognition, pattern matching, Laboratory Virtual instrumentation engineering workbench, Braille libretto.

I. INTRODUCTION

TYPICALLY, assistive devices helps to backing and guide visually challenged community to evaluate their problems and try to remedy it. There are many assistive devices which are carryout for the benefit of visually challenged community.

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Nowaday's visually impaired people using assistive devices for education, day-to-day activities such as educational materials, low vision mechanism, mobility appliances. Normally these devices helps to interpret any information for them, but the devices may need an extraneous backing. To get the better result for this issue, we have suggested to carryout a device for visually challenged community to analyse traffic rules by practicing labview technique. Recent development in mobile, computer vision and using different sensor systems and technologies like raspberry pi as well as applications such as OCR systems to guide the blind people in their day to day life. This paper is ordered as following: The review of the work is explained clearly in part II and part III describes the procedure. The part IV and V concludes about paper with development and subsequent task respectively.

II. LITERATURE REVIEW

Mihai Oproescu et al. [1] have explained about the different technical applications which are useful for blind people to learn about a personal computer keyboard and numeric keypad which can be helpful for their future. The Spelling error and Missing letters are easily detected and calculate by the keypad and rectify it. The major drawback is that the blind people can only learn about a personal computer keyboard and numeric keypad.

Abhishek Mathur et al. [2] have discussed on the Artificial Intelligence based recording system which can be used with the help of optical character recognition by android mobile phones that can detect the textual data. The data will be converted into digital form and the system will recognize the data and gives as output speech. The system can recognize Free hand written text, Normal text, Numbers and it is high effective and user friendly but it can be used by single user because it is developed using android mobile phones.

Megha P Arakeri et al. [3] have implemented on the wearable device which is useful to learn and recognize the characters and also text for visually challenged people. The device is portable, compact and cost effective which can read different algorithms of text and also in an image but it cannot capture the farrest objects.

Akila et al. [4] have implemented a prototype which could capture a image, and the image can be extracted into a text form and and by converting the text form to an desired output that is in the form of audio in the different languages by using software and hardware technologies.

The prototype is easy to use for understanding the language clearly. The disadvantage is that the language which is used in this process is not a very effective for mobile development and also for data access.

OD Sasanka Fonseka and Nirosha Wedasinghe et al. [5] have viewed the images and braille characters by using hardware and software technologies. The hardware technology such as braille display will display the braille characters and these characters will be read by software technology such as, screen reader which can be useful for blind people. The system will reduce the complexity and also identifies the complex image into simple image. The major drawback is that the characters can be converted into text but not in speech.

Pranab Gajanan Bhat et al. [6] have implemented a technology for visually challenged people to learn and to survive. For learning and reading a textual data, OCR has been implemented for reading a data and for seeing the images some algorithms have been implemented. The algorithm is simple, easy to understand and data cannot be separable. The disadvantage is that the algorithms which are used cannot read exact values because the output data is continuous and grouped.

Ani R et al. [7] have implemented a device for the visually impaired people to detect the textual data and analyze it in the voice form as output. The OCR will detect the textual data and software will convert them into speech. The OCR had a capability to detect any form of text, color and background of an image but it can be used by only single person and the detection of images from far regions is difficult.

Mrim Alnfai and Srinivas Sampalli et al. [8] have explained about Brail Enter, and this Brail Enter is only for the recognition of the characters for visually challenged people. The method implemented in this paper is simpler and easier. The disadvantage of Brail Enter is not effective and speech recognition is not implemented.

Samruddhi Deshpande and Ms. Revati Shiram et al. [9] have described about camera based system which will be needful for the visually impaired persons for identifying and understanding the text pattern present on the different hand held objects like shampoo cover, soap cover etc., through audio form. In proposed method, the camera will capture the image and region of the object will be detected by MSER (Maximally Stable External Regions) feature. An algorithm is tested on different scenes. The identified text will be compared with the template and converts to audio output in the form of speech. With the help of Region Feature, there is a no involvement of smoothing, both fine and large structure is identified. The drawback is this method will be difficult for identifying moving objects.

J. Antonio Garcia-Maciasa et al. [10] have designed a modular and adaptable wearable systems to guide the blind people. The subject can sense the things and also guided by the system response which is provided by the system. The system is portable and easily carried out but the cost of design and development is very high and more modules are required.

D. Sreenivasan and Dr. S. Poonguzhali [11] have described about reading system. This system will capture the text which is in the form of image and analyzed the character by the

optical character recognition system. The system will send the character to the Arduino board which can be recognized by the visually challenged people with the help of braille enter. The reading aid can easily understand the Braille language and extract the image into text to gives an exact output in different fonts for better understand but cannot be implemented for speech recognition and more in circuit complexity.

Mohammad Shirali-Shahreza and Sajad Shirali-Shahreza [12] have introduced a new captcha method which can be used by visually impaired users. In this type of a method a basic mathematical problem is designed with respect to already defined patterns and gets converted by Arduino in the form of speech by TTS method. The Captcha method can easily solves the mathematical equations and makes data safer from spam and virus. This method is to use different TTS systems for conversion of different languages.

Lorenzo Picinali, et al. [13] have developed an acoustic interactive Virtual Reality system which could benefit the visually impaired people to gather information regarding spatial configuration which can face any situations with the help of computers. The Virtual Reality can enable users to create an artificial environment for their comfort and cannot be developed in every place.

Mallapa D. Gurav et al. [14] have introduced an OCR system so as to guide the vision loss to learn and read the textual data. The image captured with the help of camera which can be implemented with raspberry pi. The OCR technique can have a little staff training required, no processing errors and results can be processed quickly but it may not convert characters with very large or very small font sizes.

Mr. Rajesh M, Ms. Bindhu K. Rajan et al. [15] have implemented Tesseract optical character recognition technique. They have used the raspberry pi and it needs battery source, where the power supply is essential for raspberry pi and they used power bank which has more capacity. The system is simple, reliable and user friendly which can detect the directions of the user with help of GPS but there is probability of getting heat transferred to the assembly kit is high.

Stephen L. Hicks, Iain Wilson et al. [16] have developed a device for the obstacles recognition, which displays the size and detects the closer objects position, and for this they made a display which is mounted a camera on head with a depth camera and software for identifying the distance to close by obstacles. The advantage is the device can be used in external environment and used for detecting the obstacles. The disadvantage is that they should need to learn to use this display.

Rithika H and B. Nithya santhoshi [17] have mentioned about the conversion of English to native languages which is mostly used by the travellers. Tesseract OCR technique is used mainly to convert the text or image into users native language but the device needs more storage for storing data and if the font size varies there will be problem in detection.

Roberto Neto and Nuno Fonseca [18] have worked using an application which is to be used for reading any text by converting into audio form by OCR and TTS methods, which

are incorporated in mobile. The drawback is that, there is a chance of misleading the application by hacking.

Shubhankar Nalawade, Bhagyashree Parkar et al. [19] have analyzed that by using mobile application named oculus, the recognition of nearby objects by using camera described in the form of audio for blind people can be provided. The system can easily be accessible with the smart phones by using mobile application. The disadvantage is it can be used by only single user and the far objects cannot be recognized.

Roshani B. Palandurkar and Apeksha Sakharev [20] have presented for directing the visually impaired in correct way by the assistance of RFID tags to guide them by using ultrasonic sensor. Impediment detection for his or her indifferent day-day reversion by the help of ultrasonic sensors. Segmentation, detection of textual content, and extraction of features are intended to be done using OCR. The prototype can reduce manpower, process the data speed with high accuracy. The disadvantage is continuously moving objects cannot be identified correctly.

Sanjana B. and J. Rejina Parvin [21] have mentioned that they created a method which converts text to speech module for easier understanding of text. The advantage is, this method can be easily accessible and understandable. The drawback is, if the font size increases or decreases, the recognition of text to system will be difficult and also it will be only useful for reading the books.

Wararat Wongkha, Kanlaya Naruedomkulb and Nick Cerconec [22] have discussed about i-math, and it is an educational reading aided tool which can read mathematical documents by using the blind students read and practice anytime and anywhere in this they can do assignment, class work and exercise conveniently. The advantage is, it can be used as mathematical tool. The disadvantage is only this tool is used for math related operations.

Dawpadee B. Kiriella, Shyama C. Kumari et al. [23] have described about eastern music notation for blind people, and it should be assisted in a way that they should create an interest in music by using OMR technique, the musical notations are recognized. The blind people who are interested in music can easily learn. The drawback is the eastern music cannot be converted into another style of music like Carnatic music.

Mohamed L. Mekhalfi et al. [24] have developed an prototype which can capture number of objects. The prototype contains different units such as guiding system and analysing system. This prototype incorporates camera, IMU, lens sensors on chip and different algorithms for learning, reading and analysing the data. The system is a wearable and voice controlled can easily guide the user. The disadvantage is that, there are predominant errors which are made by the sensors while capturing the output.

Anna Pribilova and Jiri Pribil [25] have introduced different methods to distinguish the voice between different categories for the blind people based on the frequency of their voice modulations. The system can determine different categories of voice modulations with high quality but at a single time, minimum number of samples can be determined by the system.

BerglindFSmaradottir et al. [26] and Sakthivel Sankaran [27] have explained about assistive technology which can be used for blind people. This technology will be more effective between the blind people and technological devices. The blind people can easily handle this technology. The drawback of this technology is depends on hand gesture and not an advanced technology which is used to promote fulfil advantage to visually challenged people.

Vasanth K, Mounika Macharla and Varatharajan [28] and Kumar, M. P [29] have undergone speech synthesizing aid for visually challenged people. This synthesizing aid converts the speech signal into textual data which can be displayed on liquid crystal display and same can be converted into audio. The advantages can be hear the data in the audio. The major disadvantage is the transferring of the signals from hardware to software which is delay and requires more bandwidth.

Gabriel B. Holanda et al. [30] have presented a reading device for blind people to learn about braille characters easily and try to understand each and every character and gets the desired output. This device can be used for learning basic script for blind people. The major drawback is to apply more learning techniques and also no proper extraction of text from input base.

Narcisa Isaila [31] have developed assistive software tool is very useful and necessary for the development of blind student's abilities. The software will be very easy to use and understandable without any complications. The drawback is, this software tool which will be only helpful for navigation purpose, pattern matching etc.

Monica Gori et al. [32] have summarized about why the majority technological devices are developed for adult but not for children and also there is more advancement in technology but there is less user. And also about the causes for loss of vision and its some of the technological solutions have been discussed.

Arzu Gurdal Dursin [33] have mentioned that the information maps fixed will be placed in some places of city in that informative materials are provided information about guidance and direction of where they have been visually impaired people depends upon their presence. The informative brochures will be circulated to all teachers and students to each and every place of the city by this blind people who will know how to use the maps. In this, the advantage is blind people can travel individually without any major support from others. The drawback is, the procedure is cost expensive and difficult to implement in cities of India.

Alexy Bhowmick and Shyamanta M. Hazarika [34] have described that the needs of visually impaired and blind people is higher when compared with before techniques in existence. The increase in performance of movable technologies, moving forward in computer vision processing algorithms, cutting-edge new medical interventions and miniaturization of electronic devices, are anticipated to make this area forward towards the problems and reality of finding successful assistive methods.

Adam Czapota et al. [35] have discussed to present an outline of these developments depending on current

advancements in normal research and application development. While a base, a strategy is summarized for future research in movable interaction design with corresponds to challenged people with special necessity, and also finally in relation to sensor-bridging applications.

Rabia Jafri et al. [36] have explained about a generic object recognition, particularly in an closed surroundings, to help the blind people. It is an area that should be developed, however it many not provide many solutions that are being developed for this reason, everything having various limitations.

Xi Wang, Xi Zhao et.al. [37] have proposed a panel reading system targeting on usage of panel-interface machines with low vision people with a real-time interactive guidance. Unlike fully sighted people, the users are not able to read the button on the panel without additional assistance (i.e., Braille near the buttons). Sometimes, if the panel is flat and smooth, they cannot even easily find where the panel is. The system functions as an augmentation of the user's ocular cognition. It guides the user to find the panel and to operate on the panel step by step. The limitation is this setup cannot be used by fully blind person.

Yingli Tian [38] have discussed assistive systems which are computer vision-based and ways for visually challenged people, mainly by the help of RGB-D sensors. Mainly three main drawbacks for present RGB-D sensor-based computer vision technology for the application of blind people for finding the path and navigation. It is useful for the recognition of the colours in an image but tough to attain 100% accuracy to apply only computer vision-based technology because of complex surroundings.

AnnisalstiqomahArrahmah et al. [39] developed a device for people with blind can change to sound from text image with a functionality that is sufficient and the tolerance of readability is less than 2%, with an average time processing less than 2 minutes for A4 paper. . It will be useful for the reading of A4 as most of the data will be carried in A4 papers in daily activities. The disadvantage is that the accuracy is not 100%.

Chucaí Yi et.al, [40] have implemented a model to identify text on various objects for assisting visually challenged people. To overcome the common difficulty for sightless people, they have described a motion-based method to find the object when the vision loss people casually shake the item for a few seconds. This technique can effectively differentiate the object from background or with other objects in the camera view. It is a portable device which can be carried anyone and anywhere. Recognizing of font is difficult if the size increases or decreases from reference one.

Ho Vu Duong and Quoc Ngoc Ly [41] have discussed a recognition system that depends on feature learning method for images in external environment. They also tested the performance of the system on few popular and difficult data samples. The advantage is, it useful for external environment and portable. It is challenging to extract text if the background is complex.

ASM Iftekhar Anam, Shahinur Alam, and Mohammed Yeas [42] have presented an expression system that evolved through

the participatory design approach and design thinking.

The implementation and a thorough evaluation substantiated the effectiveness of the system, and they describe the insights obtained through the process and suggest outstanding issues for future development and improvement of the user experience with wearable devices. It is very comfortable to wear glasses for the user. The limitation is google glass which they are using will get over heated for the usage of more time.

Palaiahnakote Shivakumara et al. [43] have implemented technique to recognize the different language scripts for the automatic selection on appropriate OCR when video contains various scripts. Although script identification in video frames is exigent because for the reason of complex background and less resolution of video which often cause disconnections or the loss of text information. This paper proposes a novel idea that integrates gradient spatial features (GSpF) and gradient structural features (GStF) at block level based on the factors of error and the weights of the features for identifying several scripts. Then this method divides into two equal parts of horizontal and vertical gradient blocks at the centroid in the horizontal directions. Histogram operation is performed to the selected dominant pixels of text from the relevant subparts of both gradient blocks, whose outcomes will be in text components. From the text components, GSpF and GStF will be extracted and they finally integrates spatial and structural features depending on end points, intersection points, junction points and frames of text components for recognizing the script. The method is used for various scripts but it is very complex and should be done very carefully.

III. METHODOLOGY

The steps are listed below by the following the methodology diagram is shown in Fig. 1.

1. Initially the camera will capture the image from the Environment.
2. The captured image is taken as an input which is in the form of a text with the help of MYRIO National Instruments Hardware, the image is transferred in the LabVIEW Software.
3. By using IMAQ function, the Optical Speech Recognition operation will be processed. In OCR process, the edge detection of image has been done.
4. After the edge detection process, we use NI Vision Assistant to generate template, that specific template will be given as input data in IMAQ function.
5. The template contains letters, and these letters will be converted into words by using Accent conversion process.
6. These words will give to the Text to speech synthesizer; and the Synthesizer will convert the words into audio.
7. The Audio will be given to the amplifier. The Amplifier will amplify the Audio Signals and later be given to the Hearing Bud. Finally, the subject will recognize the audio and understand it.

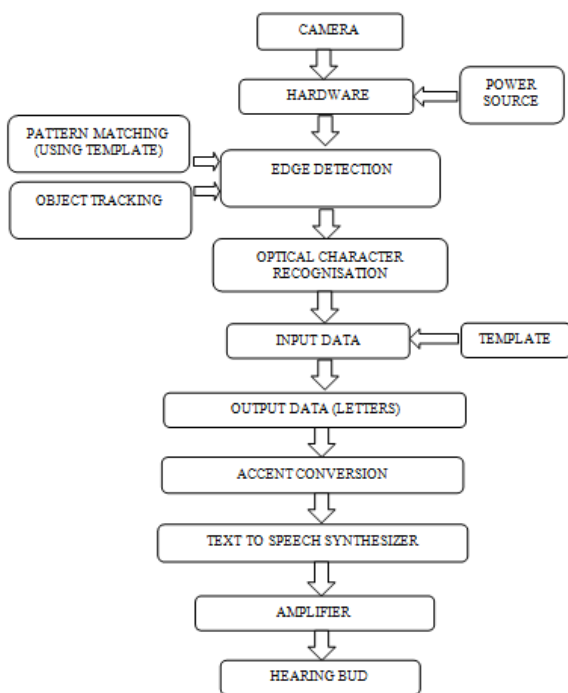


Fig. 1. Methodology for the suggested technique

IV. CONCLUSION

This project deals with the community of visually challenged people which supports visually impaired people for reading rather than using different software's for reading different systems. Instead for using different software's for reading different systems in order to overcome our team has designed an assistive device. Our project is to read all the systems so that it will be convenient for them read using the single software which reduces the time consumption, cost and time duration.

V. FUTURE SCOPE

In future, we have planned to develop a device by which the visually challenged people can read other common information which make them to act like a normal person, and using object tracking we have planned to track the vehicles which are crossing the road and it alert them to take decisions while crossing the road.

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