

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 4, April 2018

Assistant Navigation System for Visually Impaired People

Shweta Rawekar¹, Prof. R.D.Ghongade²

P.G. Student, Department of Electronics and Telecommunication Engineering, P.R. Pote College of Engineering & Management, Amravati, India¹

Associate Professor, Department of Electronics and Telecommunication Engineering, P.R. Pote College of Engineering & Management, Amravati, India²

ABSTRACT: There are about 285 billion visually impaired people in the world; 39 billion people in that are blind and 285 billion are low vision. They are not able to experience the world the way we do. This System aims to provide this missing experience for them. The system uses state of the art deep learning methods from Microsoft Cognitive Services for image classification and tagging. The Experience is powered by Ear Phone or Speaker. This System aims bring the beautiful world as a narrative to the visually impaired. The narrative is generated by converting the scenes in the front of them to text which describes the objects in the scene. Examples of text includes 'A group of people playing a game of football', 'yellow trunk parked next to the car', 'a bowl of salad kept on table'. For the first prototype of the system, one line along with some keyword are played as an audio to the users but in the later versions a detailed description would be added as the feature.

KEYWORDS: Raspberry Pi 3, Assistant Navigation System, Webcam, Visually Impaired, Amazon Web Services, Microsoft APIs.

I. INTRODUCTION

Vision is most important part of human Physiology as 83% of human gets information from the environment via sight. The 2011 statistics by the World Health Organisation (WHO) estimates that there are 285 billion people in the world are visually impaired; 39 billion people in that are blind and 246 billion with low vision. The Oldest and Traditional mobility aids for visually impaired people are walking stick and guide dogs. The guide dogs are assistance dogs and they are trained to lead visuallyimpaired around obstacles. The main drawback of these techniques is necessary skills, training phase, range of motion and very little information conveyed. Also this White cane has several restrictions such as long length if cane, limitations in recognizing obstacle and difficulty to keep in public places. The Advance modern technologies are introduced for the visually impaired people for navigation includes both hardware and software. Recently there has been lots of Electronic Travel aids (ETA) [1] designed and devised to help visually impaired people navigate independently and safely. Also recently, high end technological solutions have been introduced to help blind people navigate independently. The Blind people use the Global Positioning System (GPS) [2] technology for outdoor navigation to identify position and orientation and location due to need for the line of sight contact to satellite, they still need addedmechanisms to improve on the resolution and proximity detection to prevent accident of the blind persons with other objects and hence person life in danger. However in comparison to other technologies many blind guidance systems uses an array of ultrasonic sensors[3],[4] which is basically works on the principle of the ultrasonic sound generation and alert mechanism. Also, the ultrasonic is popular because the technology is relatively inexpensive, and also ultrasound emitters and detectors are small enough to be carried without the need for complex circuitry.

For both blind and visually impaired people, our proposed work offers a simple, efficient, configurable electronic intelligent system to help them in their mobility regardless of where they are, outdoor or indoor. Also, the user of the system does not need to carry a stick or any other self-explanatory tool. The Blind person can just wear a cap just like

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 4, April 2018

others. This system aims bring the beautiful world as a narrative to the visually impaired. The relations generated by converting the scenes in front of them to text which describes the important objects in that scene.

II. LITERATURE REVIEW

Literature review is carried out to gain knowledge and skill to complete this project. The main sources for this project are the previous publications related to this project. And the other sources are journals and articles. Therefore the analysis of the project did by other researches, these is the possibility to know are lacking in their projects. It is very important to improve and to develop a successful project.

Information about few research papers or previously implemented projects that we have used as a reference for making our project is mentioned below:

D. Yuan et al [5] proposed an international symbol tool of blind and Visually Impaired People just like the white stick with a red tip which is used to enhance the blind movement. However, this instrument has several boundariessuch as long length of the cane, limitations in identifying obstacles, and also difficulty to keep it in public places. No smart phones have designed for blind person until now. Thus accessibility of the Mobile application is a different question.

Due to the development of modern technology, many different types of Navigational Systems are now available to assist the blind people. They are commonly known as Electronic Travel Aids. Some of these travel aids are Sonic Pathfinder [6], Mowat-Sensor [7] and white stick [5], but having very narrow directivity. K. Magatani et al [8] proposed Electronic Travel Aid (ETA) devices which are used to help the blind people to move freely in an environment regardless of its dynamic changes. ETAs are mainly classified into two major standpoints one is sonar input such as laser signal, infrared signals, or ultrasonic signals and another is camera input systems which consists mainly of a mini CCD camera. These strategies operate like the radar system to recognize height, direction, and speed of fixed and moving objects which uses ultrasonic laser. The distance between the obstacles and the person is measured by the time of the wave travel. However, all of the systems which already exist inform the blind people to the presence of an object at a specific distance in front of or near to people through tone signals or vibrations that need to training. These details permit the blind people to change their way only, but they are not comfortable and safe.

Some of these ETA devices are vOICe [10], NAVI [11], SVETA [12] and CASBLIP [13]. In voice, the image is captured by using single video camera mounted on a headgear and the caught picture is filtered from left to right direction for sound generation. The sound is generated by altering the top of the image into high frequency tones and the bottom portion into low frequency tones. The loudness of sound depends on the brightness of the pixels. Similar work has been carried out in NAVI where the captured image is resized to 32x32 and the gray scale of the image is reduced to 4 levels. The image is differentiated into foreground and background using image processing techniques. The foreground and background are assigned with high and low intensity values respectively. Then the processed image is converted into stereo sound where the amplitude of the sound is directly proportional to intensity of image pixels, and the frequency of sound is inversely proportional to vertical orientation of pixels. In SVETA, an improved area based stereo matching is performed over the transformed images to compute dense disparity image. Low texture filter and left/right consistency check are carried out to remove the noises and to highlight the obstacles. To map the disparity image to stereo musical sound, sonification procedure is used. In CASBLIP, the object is detected through sensors and stereo vision. In addition to this, orientation is computed using GPS system. This system is embedded on the Field Programmable Gate Array (FPGA).

III. RELATED WORK

The architecture of the system includes Raspberry Pi 3, online computer vision API's and TTS Engine. The Block diagram of this system is as follows.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 4, April 2018

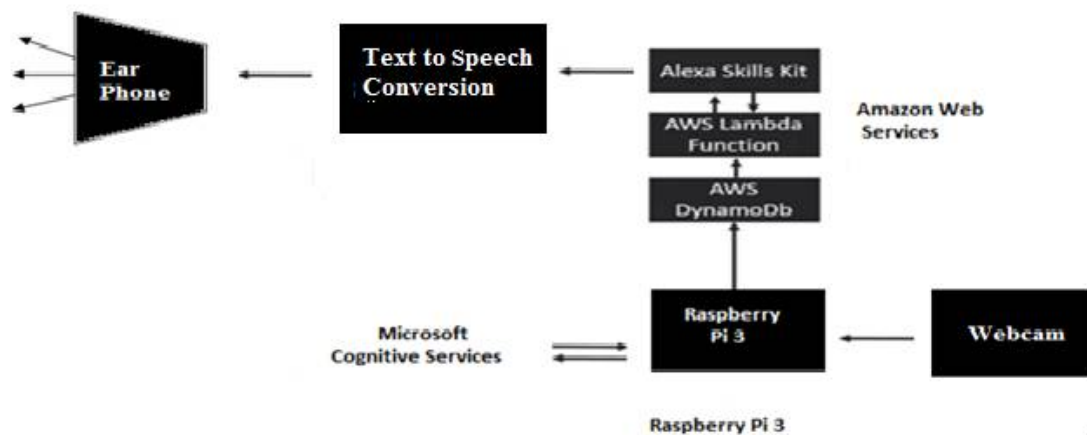


Fig.1. Block Diagram of the Assistant Navigation System

This Assistant Navigation system aims bring the beautiful world as a narrative to the Visually Impaired People. The relations generated by converting the scenes in front of them to text which describes the important objects in that scene. The working of this Intelligent System is as follows.

1. The blind person can have our system which is portable and easy to use. As he/she has to carry the module with them for assistance.

2. In this intelligent System, the Webcam is used to capture the real time image of the Obstacle (such as Human Being, table, chair etc.).

3. The main module is of raspberry pi which is on its own a mini-computer, which processes the image captured by the webcam.

4. We are using here Microsoft Cognitive Services which are used for emotion and video detection; facial, speech and vision recognition; and speech and language understanding. Raspberry pi module, which contains the image processing code loaded, then goes toward Microsoft Cognitive Services where the image Recognition process is done.

5. After Recognition of image, the image is converted into Text using AWS Dynamo DB Which is one type of the software used which is a fully managed NoSQL database service that provides fast and predictable performance with seamless scalability.

6. The Alexa Skills Kit triggers Amazon Lambda function to bring the data from the database dynamoDB. The use of Lambda functions as triggers for Amazon dynamoDB table.

7. Text To Speech Module: Text-to-Speech (TTS) Platform is a modular hardware design for text-to-speech applications. It provides Platform which is fully integrated module that converts a stream of digital text into speech. The text is converted to voice and then is heard from the audio jack port using ear phones. Pico is use for converting machine monotonic voice into normal voice.

International Journal of Innovative Research in Science, Engineering and Technology

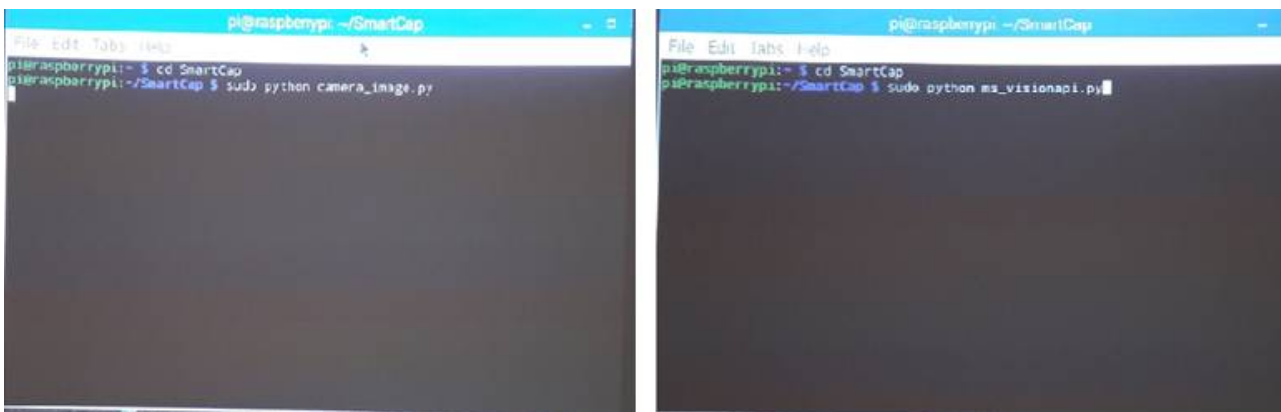
(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 4, April 2018

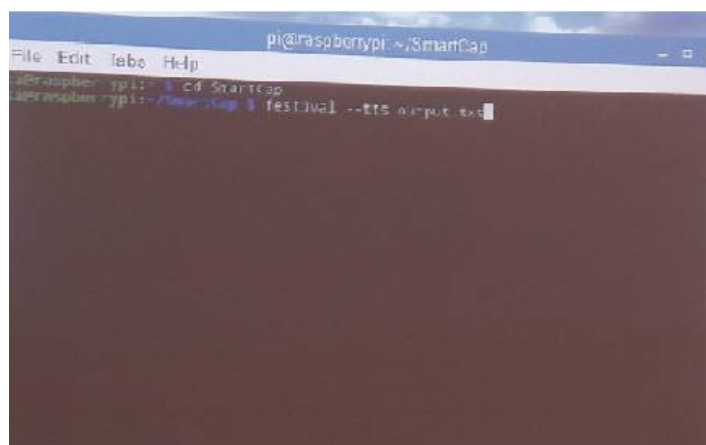
IV. EXPERIMENTAL RESULTS

Figures show the results of the Assistant Navigation System. Fig. 2 (a), (b) and (c) shows the command windows. Figs. 3, 4 (d) show Image captured by Webcam. (e) Output / simulation result. The system employs key technology of Amazon web services such as Alexa Skills kit, AWS dynamoDB, AWS Lambda function and the most important Microsoft Cognitive Services which are called Microsoft APIs and IOT. The system consists of webcam which are continuously capturing image and image recognition process is done on the cloud and database created in dynamoDB. This process is done until the power is off. Once the power is off you can reset your system for another use. Hardware module of proposed system is done with raspberry pi board.



(a)

(b)



(c)

Fig. 2. Command Windows (a) Capturing image (b) Image Recognition (c) Text to Speech Conversion.

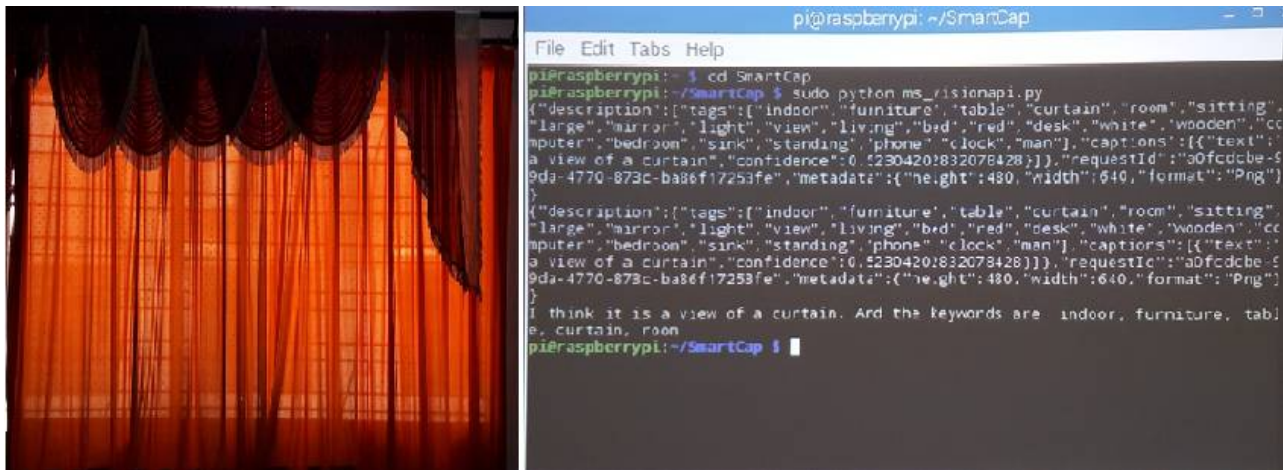
In this command window, the first command **sudo python camera_image.py** is used for capturing images and second command **sudo python ms_vision.py** is used for recognition of image and third command **festival - -tts output.txt** is used to convert text message to speech output which is heard by the visually impaired people using earphone or speaker.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 4, April 2018



(d)

(e)

Fig. 3. (d) Image captured by Webcam. (e) Output of the Assistant Navigation System.

Fig.3.(d) Shows the image captured by webcam and the exactly description of that image is given in the Fig. 3.(e). Description of that image is **‘I think it is a view of a curtain. And the keywords are indoor, furniture, table, curtain,room’**.



(d)

(e)

Fig. 4. (d) Image captured by Webcam. (e) Output of the Assistant Navigation System.

Fig. 4.(d) Shows that the image captured by webcam and the exactly description of that image is given in the Fig. 4.(e). Description of that image is **‘I think it is a desktop computer monitor sitting on top of a desk. And the keywords are computer, indoor, desk, table, monitor’**. The webcam which is used in this Assistant Navigation System is retrofitted on the Cap or Eye Glasses which are beneficial for the Visually Impaired People for exact correct vision.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 4, April 2018

V. CONCLUSION

A simple, straightforward, configurable, simple to deal with Assistant Navigation System is proposed to provide constructive assistant and support for blind and visually impaired people. The advantage of this system lies in the fact that it can prove to be very effective solution to millions of Visually Impaired People worldwide. The main functions of this system are narrating the scene. The different working units makes a real-time system that screens position of the client and gives double input making navigation more safe and secure.

REFERENCES

- [1] Amit Kumar, RushaPatra, M. Manjunatha, J. Mukhopadhyay and A. K. Majumdar, "An electronic travel aid for navigation of visually impaired", Communication Systems and Networks (COMSNETS), 2011 Third International conference on 4-8 Jan 2011.
- [2] Shamsi, M.A.; Al-Qutayri, M.; Jeedella, J.; "Blind assistant navigation system", Biomedical Engineering (MECBME), 2011 1st Middle East Conference on 21-24 Feb. 2011.
- [3] Hashino, S.; Ghurchian, R.; "A blind guidance system for street crossings based on ultrasonic sensors", Information and Automation (ICIA), 2010 IEEE International Conference on June 2010.
- [4] Baranski, P.; Polaczyk, M.; Strumillo, P.; "A remote guidance system for the blind", E-Health Networking Applications and Services (Healthcom), 2010 12th IEEE International Conference.
- [5] D. Yuan and R. Manduchi, "Dynamic environment exploration using a Virtual White Cane," in Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR '05), pp. 243–249, IEEE, San Diego, Calif, USA, June 2005.
- [6] A. Dodds, D. Clark-Carter, and C. Howarth, "The sonic PathFinder: an evaluation," Journal of Visual Impairment and Blindness, vol. 78, no. 5, pp. 206–207, 1984.
- [7] A. Heyes, "A polaroid ultrasonic travel aid for the blind," Journal of Visual Impairment and Blindness, vol. 76, pp. 199– 201, 1982.
- [8] K. Magatani, K. Sawa, and K. Yanashima, "Development of the navigation system for the visually impaired by using optical beacons," in Proceedings of the 23rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, pp. 1488–1490, IEEE, October 2001..
- [9] D. Dakopoulos and N. G. Bourbakis, "Wearable obstacle avoidance electronic travel aids for blind: A survey," IEEE Trans. Syst., Man, Cybern., vol. 40, no. 1, pp. 25–35, Jan. 2010.
- [10] P. Meijer, "An Experimental System for Auditory Image Representations," IEEE Transactions on Biomedical Engineering, vol. 39, no 2, pp. 112-121, Feb 1991.
- [11] G. Sainarayanan, "On Intelligent Image Processing Methodologies Applied to Navigation Assistance for Visually Impaired", Ph. D. Thesis, University Malaysia Sabah, 2002.
- [12] G. Balakrishnan, G. Sainarayanan, R. Nagarajan and S. Yaacob, "Wearable Real-Time Stereo Vision for the Visually Impaired," Engineering Letters, vol. 14, no. 2, 2007.
- [13] G. P. Fajarnes, L. Dunai, V. S. Praderas and I. Dunai, "CASBLiP- a new cognitive object detection and orientation system for impaired people," Proceedings of the 4th International Conference on Cognitive Systems, ETH Zurich, Switzerland, 2010.