JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Smart Cap For Visually Impaired People Using Raspberry Pi

[1]T Godhandaraman, [2]Ameena Arfa Khanum, [3]Amreen Khanum, [4]Fiza Fathima, [5]Saniya Sahar

[1]Assistant Professor, [2]BE Student, [3]BE Student, [4]BE Student, [5]BE Student
[1]Department of ISE,
[1]HKBK College of Engineering, Bangalore, India

Abstract : A smart cap for visually impaired people using Raspberry Pi is a wearable device that utilizes the small computer to assist individuals with vision loss in navigating their surroundings. The cap is equipped with a camera and a variety of sensors that detect obstacles, identify objects, and provide audio feedback to the user. The Raspberry Pi processes the data collected by the sensors and uses artificial intelligence algorithms to provide real-time feedback to the user.

In order to provide location-based information, such as the user's present location and directions to their chosen destination, the smart cap can also be coupled with GPS technology. Additionally, the Raspberry Pi has the ability to store and analyse data, which can be used to increase the system's accuracy and give the user personalised feedback.

IndexTerms **– Speech technology, Text Recognition, gTTS, Reading System, Impaired Person.**

I. INTRODUCTION

The International Agency for the Prevention of Blindness (IPAB) and the globe Health Organization estimate that there are currently 285 million visually impaired persons in the globe, and that figure is steadily rising. A blind individual finds it extremely challenging to move independently without assistance. They are essentially dependent on others. Although there are numerous aids for the blind, they can only be used to identify a small number of dangers and cannot completely ensure the blind's safety. The smart cap described in this study can serve a variety of purposes and is lightweight and portable. In essence, it serves as a replacement for the blind person's natural eyes.

The inability of visually impaired people to perceive objects, read written words, and walk safely in the presence of possible hazards is a big issue. Therefore, there are some significant problems with blinds. The obstacle course covered in this article can be used to overcome these issues.

Image processing will now be applied to this picture. The camera has Python-based code for image processing that first removes text from the image before turning the text into sounds. As a result, such messages are easily audible to blind persons. Another purpose for this cap may be to relocate blinds around the house safely. It can snap pictures of stationary objects and compare them to the images that have already been added to the database. This hat can also pronounce the subject's name depending on the visual. Its technical terms are explained in greater detail in other sections.

II. METHODOLOGY

Let's have a look at some potential future scenarios that could have useful uses. The application development process can take into account a number of factors, some of which are highlighted below. These factors include network accessibility, bandwidth, coverage area, redundancy, user involvement, and impact analysis, which primarily concentrate on the characteristics of RFID, sensors, and communication-based IoT services. Network lowpan. RFID tags that are attached to goods, people, animals, logistics, and other items form the basis of this tracking. Everything that has an RFID tag in it can be tracked using the RFID tag reader at all intermediate stages. This pinpointing of the object's location might be skillfully used to start an alert, cause an event,or draw a specific inference about a certain topic intelligent Environment and business.

The methodology for developing a smart cap for visually impaired people includes several stages, which can be summarized as follows:

User needs assessment: This stage involves identifying the needs and requirements of visually impaired individuals. This can be done through surveys, interviews, and observations of the target user group to understand their daily challenges and how the smart cap can help address them.

- Hardware and software selection: Based on the user needs assessment, the hardware components and software platform are selected. The Raspberry Pi is a popular choice due to its small size, low power consumption, and versatility.
- Sensor integration: The selected sensors such as cameras, proximity sensors, and accelerometers are integrated with the Raspberry Pi to collect data on the user's surroundings.
- Algorithm development: Artificial intelligence algorithms are developed to process the data collected by the sensors and provide real-time feedback to the user. These algorithms can detect obstacles, recognize objects, and provide audio feedback to the user.
- Prototype development: A prototype of the smart cap is developed, which includes the hardware and software components integrated with the Raspberry Pi.
- User testing: The prototype is tested with visually impaired individuals to evaluate the system's effectiveness in addressing their needs. Feedback is collected from users to identify any areas for improvement.
- System refinement: Based on user feedback, the smart cap is refined and optimized for better performance and usability.
- Deployment: The final version of the smart cap is deployed for public use, and support is provided to ensure the system's continued functionality and effectiveness.

III. IMPLEMENTATION

A concept, idea, model, design, specification, standard, method, or policy is implemented when it is put into practice. In other words, implementation is the process of developing and deploying a technical specification or algorithm into a programme, software component, or other computer system. For a particular specification or standard, there might be a lot of implementations.

This project might be implemented in a variety of ways, but we choose to utilise Python because it is a well-liked high-level, all-purpose, interpreted dynamic programming language. Its design philosophy places a strong emphasis on code readability, and programmers can express concepts in less code than they would be able to use languages like C++ or Java thanks to its syntax. The language offers building blocks that allow for clutter-free programmes at both local and big scales.

Python supports a variety of programming paradigms, such as imperative, functional, and object-oriented or procedural programming. It offers a huge and thorough standard library, a dynamic type system, intelligent memory management, and more. The community development mechanism is shared by practically all of Python's other implementations, including Python, the standard implementation. The nonprofit Python Software Foundation is responsible for maintaining Python The project is divided into for different modules

A. Text to Speech (TTS)

The first text-to-speech process is carried out for the silent masses of the dumb. The thoughts of the mute are converted into text that can be converted into a voice signal. The espeak synthesiser speaks the transformed voice signal. Option OP1 is chosen, and the OS and subprocess are imported. Input text and call the text-to-speech feature. The text is converted to speech by the espeak synthesiser after being entered using the keyboard. Additionally, the procedure offers a ctrl+C keyboard break.

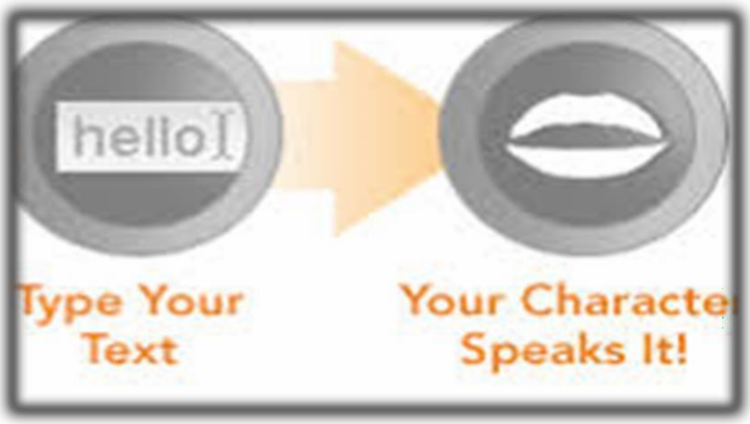

Figure 1 : Text-to-Speech

B. Image-to-Speech with Camera (ITSC)

The second method was created for blind people who are unable to read regular text. We connected a Logitech camera to the OPENCV programme in order to assist blind persons in capturing the image. Tesseract OCR is used to transform the captured image to text, and the text is then saved to the out.txt file. Open the text file, break it up into sentences, and then save it. In OCR, binary images are converted from the image to character outlines using adaptive thresholding techniques. Espeak reads the text that has been transformed.

Figure 2 : Image-to-Speech

C. Gesture-to-Speech (GTS)

For those with voice impairment who cannot communicate with other people normally, the third process was created. Stupid individuals communicate with normal people through gestures that are typically unintelligible to regular people. The procedure begins with the image being taken and the useful area being cropped. For better performance, convert an RGB image to a grayscale image. To obtain the image's highlighted area, apply Gaussian blur to the cropped image before passing it via a threshold function. Identify the two fingers' outlines and the angle between them. A finger point can be applied using the convex hull function. Count the number of flaws, or angles that are less than 90 degrees. The text is displayed on the screen and reads based on the quantity of flaws.

D. Speech-to-Text (STT)

For those with hearing impairments who are unable to grasp what regular people are saying, the fourth procedure was created. To assist them, our project has a switch that converts text from regular people to voice. We made use of the speechtexter.com URL, which is automatically connected by the chrome browser. In order to identify the voice signal, a minimum threshold voltage is assigned. Through the use of a microphone, text is created from the input. The website's URL is multilingual. It will print the text if the speech signals are recognized; else, it will produce an error sign.

Figure 3 : Speech-to-Text

IV. CONCLUSION

The goal of this initiative is to close the communication gap between the deaf and mute people and the rest of society so that they can enjoy regular lives. The system is used to convert hand gestures into text for the deaf and mute, speech to text for the blind, and text to voice for visually impaired people. In one small device, we created a prototype model for the blind, deaf, and dumb. The benefit of this gadget is that, thanks to its less weight and smaller size, it may be conveniently carried (ported). The system is language-independent and can be used as an intelligent assistant to help persons with disabilities communicate with others. The project seeks to close the communication gap between the blind, deaf, and dumb.

The development of smart caps for visually impaired people is an innovative approach to addressing the challenges faced by this community. These caps are equipped with sensors and other technologies that allow users to navigate their surroundings more effectively, and provide them with greater independence and autonomy.

Overall, the use of smart caps has the potential to significantly enhance the quality of life for visually impaired individuals by improving their ability to detect obstacles, navigate unfamiliar environments, and access information in real-time. The technology is still in its early stages, and there are likely to be further advancements and improvements in the coming years.

However, it's important to note that while smart caps offer significant benefits, they are not a substitute for comprehensive rehabilitation programs, assistive devices, or other forms of support for visually impaired individuals. Smart caps can be a valuable tool in the toolkit of those with visual impairments, but they should be used in conjunction with other forms of support and assistance as appropriate**.**

REFERENCES

[1] K Naveen Kumar, P. Surendranath&K.Shekar, "Assistive device for Blind, Deaf and Dumb People using Raspberry-Pi",2017.

[2] M Delliraj, "Design of Smart e-Tongue for the Physically Challenged People.", 2013

[3] Fernando Ramirez-Garibay, Cesar Millan Ollivarria**, "**MyVox—Device for the communication between people: blind,deaf, deaf- blind and unimpaired",2014

[4] P. Kumari, S.R.N Reddy ,"PiCam:IoT based Wireless Alert System for Deaf and Hard of Hearing",2015

[5] R Suganya, T. Meeradevi, "Design of a communication aid for physically challenged.",2015

[6] L. Anusha, Y. Usha Devi, Implementation Of Gesture Based Voice And Language Translator For Dumb People",2016

[7] Shraddha R. Ghorpade, Surendra K. Waghamare, "Full Duplex Communication System for Deaf & Dumb People," International Journal of Emerging Technology and Advanced Engineering (IJETAE), Volume 5, Issue 5, May 2015, ISSN2250-2459.

[8] ChucaiYi, Student Member, IEEE, YingliTian, Senior Member, IEEE, and Aries Arditi "Portable Camera-Based Assistive Text and Product Label Reading from Hand-Held Objects for Blind Persons" 2013IEEE.

[9] Vasanthi.G and Ramesh Babu.Y Department of ECE, DMI College of Engineering, Chennai, India."Vision Based Assistive System for Label Detection with VoiceOutput"Jan-2014.

[10] https://www.macs.hw.ac.uk

[11] https://opensource.google.com

[12] https://docs.opencv.org/3.1.0/d7/d8b/tutorial_py_face_detection.html

[13] https://www.pythonforbeginners.com.

[14] WHO," Universal eye health: a global action plan 2014-2019", ISBNNo: 978 92 4 150656 4.

[15] Dominic Basulto, "Artificial intelligence is the next big tech trend.", Washington Post, March 25, 2014 .

[16] Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi, "You Only Look Once: Unified, Real-Time Object Detection", Conference on Computer Vision and Pattern Recognition 2016, arXiv:1506.02640.

[17] Dionisi, A & Sardini, Emilio & Serpelloni, Mauro. (2012). "Wearable object detection system for the blind". 2012 IEEE I2MTC - International Instrumentation and Measurement Technology Conference, Proceedings. 1255-1258. 10.1109/I2MTC.2012.6229180.

[18] Nada, Ayat & Mashali, Samia & Fakhr, Mahmoud & Seddik, Ahmed. (2015). "Effective Fast Response Smart Stick for Blind People". 10.15224/978-1-63248-043-9-29.

[19] M.Everingham, S.M.A.Eslami, L.Van Gool, C.K.I.Williams, J.Winn, and A.Zisserman. The pascal visual object classes challenge: A retrospective. International Journal of Computer Vision, 111(1):98–136, Jan. 2015.

[20] L. Chen, J. Su, M. Chen, W. Chang, C. Yang and C. Sie, "An Implementation of an Intelligent Assistance System for Visually Impaired/Blind People," 2019 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, USA, pp. 1-2, 2019.

[21] N. Dey, A. Paul, P. Ghosh, C. Mukherjee, R. De and S. Dey, "Ultrasonic Sensor Based Smart Blind Stick," 2018 International Conference on Current Trends towards Converging Technologies (ICCTCT), Coimbatore, pp. 1-4, 2018.

[22] Shaha, S. Rewari and S. Gunasekharan, "SWSVIP-Smart Walking Stick for the Visually Impaired People using Low Latency Communication," 2018 International Conference on Smart City and Emerging Technology (ICSCET), Mumbai, pp. 1-5, 2018.