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Smart Cap for Visually Impaired Person using Raspberry Pi

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Abstract - *In our surrounding the Communication generally takes place through speech and text. The aim of this project is to provide an assistive technology to help the visually impaired person usage in disaster situations. The aim purpose of our paper is to develop a cap for blind which will guide them from their source to destination. The solution for smart Cap is to support visually Impaired person and it is cost effective wearable 'smart cap'. The Proposed system consists of web camera which is fitted into a cap, audio microphone, ultrasonic sensor, Raspberry pi, speaker for voice. The software's use in this project is Image processing. open cv, numpy, python. A Text-to-speech Synthesizer (TTS) software is used for converting the details of the detected object (in text format) to speech output. The aim of this project is to provide an assistive technology to help the blind people or visually impaired navigate their way out of any potentially disastrous situation. Smart Cap easily navigate the paths and detect obstacles. Smart Cap" give blind people confidence to walk confidently on busy road. The main advantage of this project to use in critical condition. The system and its usage in disaster situations is an innovative, cost-effective solution specifically addressing the needs of visually impaired persons.*

Key Words: **Raspberry Pi, web Camera, Ultrasonic sensor, image processing, open cv, Text-to-speech Synthesizer (TTS.)**

1. INTRODUCTION

The technologies always try to make human life easier. The people who are visually Impaired they faces many difficulties during navigation. India is home to the largest number of visually impaired people in the world, about 40 million, which accounts for 20% of the world's blind population. Moreover, more than 90% of these people have little to no access to the necessary assistive technologies. Blindness can be occurring due to many reasons including disease, injury or other conditions that limit vision. In this paper, we design and implement a smart cap which helps the blind and the visually impaired people to navigate freely by experiencing their surroundings. The objective of this research study is to design an assistive wearable cap for the blind or visually impaired persons. The solution present is an assistive wearable 'Smart Cap' that helps people with visual impairment interact and navigate their way to safety by wearing a cap fitted with a camera, which interacts with a voice navigation system (Smart Cap). The aim purpose of our paper is to develop a cap for blind which will guide them from their source to destination. Smart cap is easy for who live alone. This solution is also support visually impaired people to navigate their way to safely and identify dangerous objects, fire and flood water scenarios after disaster.

1.1 Problem Statement

In most cases the visually impaired people have a problem they cannot navigate freely in an environment. The solution is to design an assistive wearable cap for the blind or visually impaired persons. The proposed solution presents in an assistive wearable 'Smart Cap' that helps people with visual impairment interact and navigate their way to safely by wearing a smart cap. This system is easy for those people who live alone. The aim purpose of our project is to develop a cap for blind which will guide them from their source to destination.

2. EXISTING SYSTEM

Nowadays blind people are not come out because of their blindness problem. So there are some techniques to solve their problems by the help of smart cap. So in smart cap there is one cap for blind people to wear and go out comfortably. So basically these cap navigate the blind people for crossing the road, detect the object whatever in front of blind person. So in these project we are going use some hardware and software tools used.

The proposed system consists of a Raspberry Pi-3 processor which is loaded with open cv, numpy, text-to-speech synthesizer, speech recognition. The system and its usage in disaster situations it is cost-effective solution specifically addressing the needs of visually impaired persons. The proposed solution presents in an assistive wearable 'Smart Cap' that helps people with blind people interact and navigate their way to safely by wearing a smart cap. In this system here we store some pictures or images in .cvs file format in SD card. The system has a simple architecture that transforms the visual information captured using a camera to voice information using Raspberry Pi. The input device like mic, push button and camera module. This camera module take input from user while output devices like speaker gives the audio output to the user. This system is Easy for those people who live alone. Also Smart Cap easily navigate the paths and detect obstacles. Smart cap boosts Confidence of user to walk on the busy roads. Smart cap converts text to speech, thus making user to understand the what is front of them. The system and its usage in disaster situations is an innovative, cost-effective solution specifically addressing the needs of visually impaired persons.

3. Block Diagram

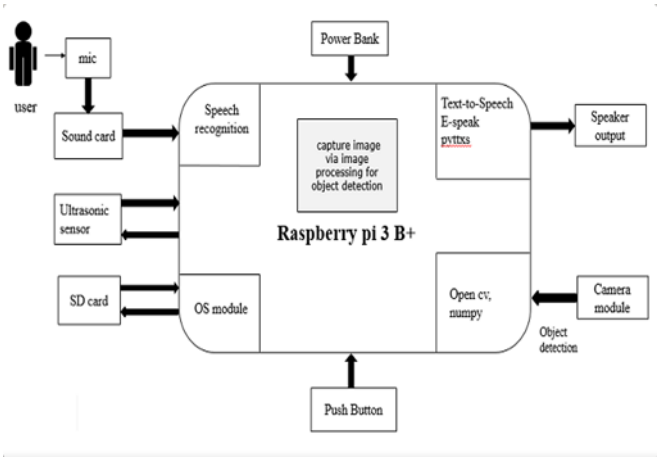

Figure1. Block Diagram for Smart Cap

Description:

The basic block diagram given in Figure 1. This give us an overview of the proposed system. The system has a simple architecture that transforms the visual information captured using a camera to voice information using Raspberry Pi. The block diagram of the system consists of various input and output devices. The input device like mic, push button and camera module. A webcam is a video camera that feeds or streams an image or video in real time to or through a computer to a computer network, such as the Internet. Webcams can be used as security cameras. This camera module take input from user while output devices like speaker gives the audio output to the user. The system has a simple architecture that transforms the visual information captured using a camera to voice information using Raspberry Pi. The Raspberry Pi-3 processor which is loaded with open cv, numpy, text-to-speech synthesizer, speech recognition. The system helps the visually impaired people to navigate independently using real time object detection and identification. The proposed system consists of a Raspberry Pi-3 processor which is loaded with open cv, numpy, text-to-speech synthesizer, speech recognition.

3. Flowchart

The basic flowchart given below in Figure 2. It is overview of flowchart of the proposed system The below figure 2 shows that flowchart of the existing system. The operation of the system some following are the procedural steps.

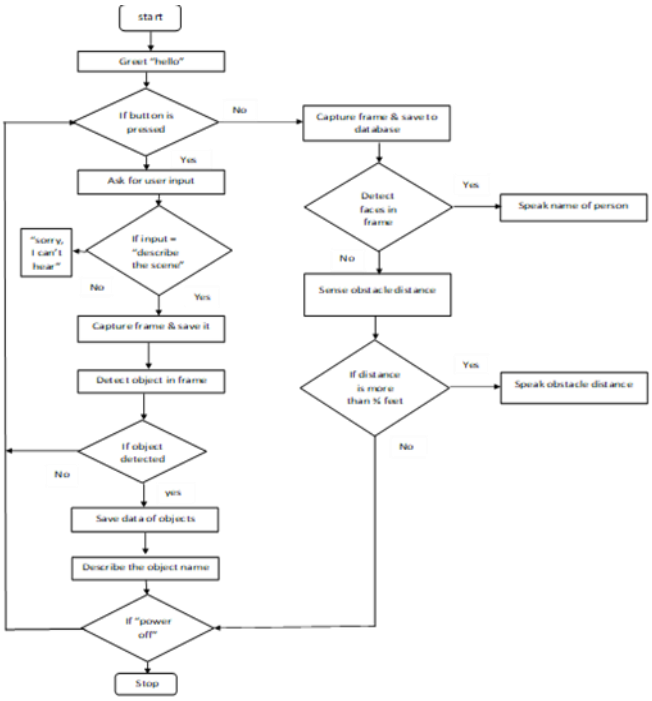

Figure 2. Flowchart of the Smart Cap

Following are the procedural steps:

1) When the raspberry is powered on the smart cap system, it's wake up and greets the user with any message we programmed during programming phase of development.
Now system is ready to process our commands and perform necessary actions.
2) After greetings the flow of program is directed to checking the status of the "Press Button", which is work by invoking the speech recognition function if not pressed then it flows goes to detecting faces and obstacle distance.
After the flow is directed towards button pressed block system asks for user input in the form of voice which is converted to text by the speech recognition module.
3) If the input command of the user is describing scene then the camera will capture the available frame (image)

and save it to captured frame folder in SD card and object detection is performed on that frame.
4) If the system finds objects in the scene (i.e. frame) then it finds the object name and save it in .csv file format inside SD card.
5) Along with saving the objects names, the system will create the sentence which describes all the objects that are present in the frame.
6) Now the system completed the one branch of flowchart. Now, if at this moment we want to interrupt the system then we can else it will continue to be in the loop and go to press button block.
7) At this point when system is waiting for button press if we do not press button then the system will capture the frames, save them and then perform the face detection on the captured frame and if it detects a person whose data is stored in our database then it will frame the sentence which speaks name of person it can see.
e.g. I can see Mr. x here.
8) After the face detection the program finds out the distance of any obstacle which may be present in front of it using ultrasonic sensor and after finding distance if distance of object is more than 3 feet or 4 feet it will speak warning regarding obstacle.
9) After speaking obstacle warning flow again waits for user input.

Results:

Smart Cap for Visually Impaired People using Raspberry Pi consists of a Raspberry Pi-3 processor which is loaded with open cv, numpy, text-to-speech synthesizer, speech recognition. The system and its usage in disaster situations it is cost-effective solution specifically addressing the needs of visually impaired persons.

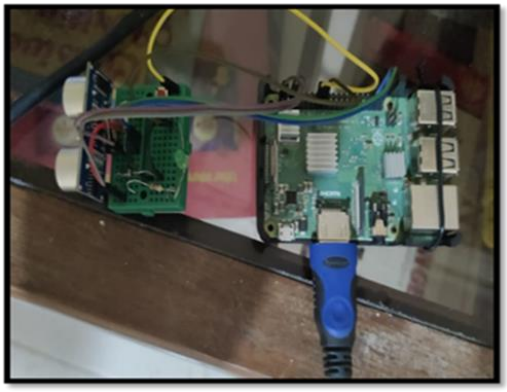

Figure 3. Hardware Implementation

Figure 4. Overall setup

The above Figure 3 and 4 shows that the circuit implementation of proposed system. In Figure 3. we have connected ultrasonic sensor to raspberry Pi and also connected HDMI pin to a raspberry pi. In figure 4 we have connected all input and output devices to raspberry pi.

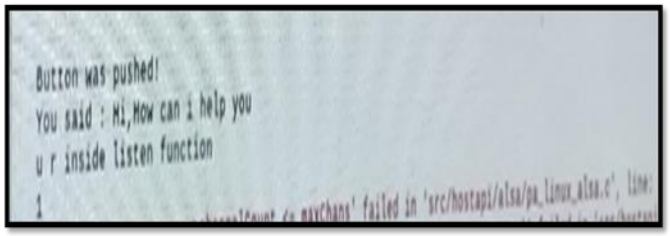

Figure 5. First output Hello, welcome to smart cap

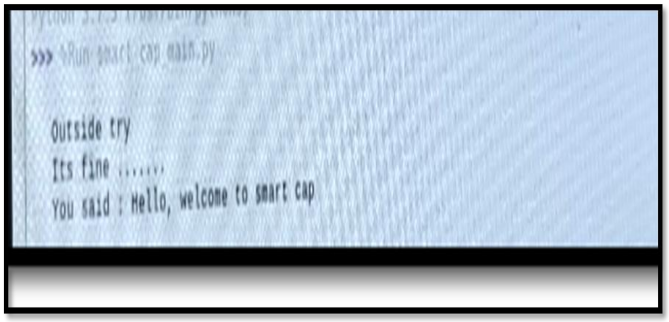

Figure 6. Second output Hi, how can I help you

The above figure 5 and 6 shows that smart cap gave an output to user. When smart cap told to user hello welcome to smart cap. How can I help you then the input command of the user is describing scene then the camera will capture the available frame (images).

Figure 7. Captured object

In this above figure 7. Shows that object is captured by camera. After that object save it to captured frame folder in SD card and object detection is performed on that frame.

Figure 8. Smart cap database output for the object

The above figure 8. Shows that database output. Smart cap is see the object and give voice command to user is I can see a scissors. After that face detection the program finds out the distance of any obstacle which may be present in front of it using ultrasonic sensor and after finding distance if distance of object is more than 3 feet or 4 feet it will speak warning regarding obstacle.

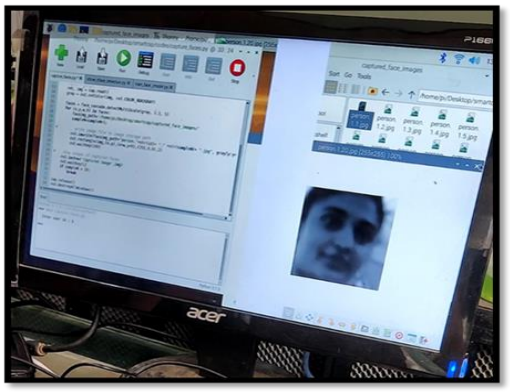

Figure 9. Detected face is stored in database

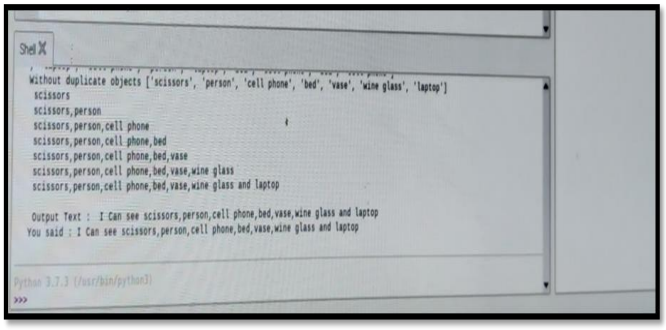

Figure 10. Final database output

face detection is the captured frame and it detects the person whose data is stored in our database then it frames of the sentence which speaks the name of that person it can see. e.g. I can see Mr. x here.

3. CONCLUSIONS

The implementation of the proposed system "Smart Cap for Blind People" has various benefits for the users. The system has a simple architecture that transforms the visual information captured using a camera to voice information using Raspberry Pi. The system consists of a Raspberry Pi-3 processor which is loaded with open cv, numpy, text-to-speech synthesizer, speech recognition. It is an open source software library for numerical computation using data flow graphs. The proposed system is cheap and configurable. The device is a real-time system that monitors the environment and provides audio information about the environment making his/her navigation safe and secure. The object detection is developed to count the number of objects in a scene. The number of objects can be increased by training the model by ourselves. Face detection is also incorporated so that the blind person can easily identify his/her family members and friends. In this system here we store some pictures or images in .cvs file format in SD card. So by the help of these blind people know which object in front of them or else when he or she go out the smart cap can navigate the direction. Smart cap converts text to speech, thus making user to understand the what is front of them. OpenCV develop real-time computer vision applications. It mainly focuses on image processing, video capture and analysis including features like face detection and object detection. A camera based structure is worked with respect to the Raspberry Pi, which is converged with Image processing & TTS. A TTS software is used for converting the details of the detected object (in text format) to speech output through speaker to the user.

REFERENCES

[1] Nishajith, A., et al. "Smart cap-wearable visual guidance system for blind." 2018 International Conference on Inventive Research in Computing Applications (ICIRCA). IEEE, 2018.

[2] M.Maiti, P. Mallick, M. Bagchi, A. Nayek, "Intelligent electronic eye for visually impaired people",978-1-5386- 2215-5/17/$31.00 ©2017 IEEE

[3] Namita Agarwal, Anosh Iyer, Sonalakshi Naidu, Snedden Rodrigues, "Electronic Guidance System For The Visually Impaired -A Framework", 2015 International Conference on Technologies for Sustainable Development (ICTSD-2015), Feb. 04 – 06, 2015, Mumbai,india

[4] Marut Tripathi, Manish Kumar, Vivek Kumar, Warsha Kandlikar "A Navigation System for blind people" e International journal for research in applied science and engineering technology (ijraset) – Vol. 2 issue 4, Jul-Aug 2014.

[5] Kabalan Chaccour, Georges Badr, "navigation of visually impaired people", 2016 IEEE 8th International Conference

[6] Swagat das, sonal petrol, ritika dad, "Arduino based Safety Device for the Visually Challenged." 2019 International Conference on Communication and Signal Processing (ICCSP). IEEE, 2019.

[7] Mala, N. Sathya, S. Sushmi Thushara, and Sankari Subbiah. "Navigation gadget for visually impaired based on IoT." 2017 2nd International Conference on Computing and Communications Technologies (ICCCT). IEEE, 2017

[8] Wahab, Mohd Helmy Abd, et al. "Smart cane: Assistive cane for visually-impaired people." arXiv preprint arXiv:1110.5156 (2011).

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

[10] Manjiree Pahade Rupali Nirgude5 1, Prathamesh Dhumal2, Yash Patil3, Ashish Ranjan4, "Blind Guidance using Smart Cap" Department of CSE, Dr. D.Y Patil Institute of Engineering and Technology, Ambi, Maharashtra, India