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Modern Blind Stick

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Abstract:- People with visual impairment have trouble communicating and sensing their environment. Physical motion is a challenge for people with visual impairment because distinguishing where the person is and how to get from one location to another can become difficult. They need the assistance of a family member or a friend to navigate unknown areas. Research has been undertaken over the past decades on new systems to design a robust and reliable system for the visually impaired to detect obstacles in their path and alert them in unsafe environments. There are still some devices that have some shortcomings. Researchers have spent the last few years developing a smart stick to help and alert people with visual impairment from obstacles. The designed device is aimed at guiding the blind amidst their difficulties.

INTRODUCTION

As we all know blindness is one of the worst disorders that a person can suffer. According to a latest research by NFB, 36 million people are blind worldwide with 19 million (more than half) from India [1]. The aim of our project is to light up their hopes and give them a new life by trying to solve some of the problems they face on a daily basis.

The study also indicated that the majority of these people are between the ages of 65-80, therefore along with their age, new problems also arise for them, and so we have come up with an idea that would help these people.

Current technologies involve surgeries and eye transplant, but these will not be a feasible approach for everyone financially or biologically. Also, besides this, complications involving surgeries is a major issue. So, to help the blind, we have come up with an idea to evolve that one thing which is crucial for them, their cane. There are a few methods in the market which aids the blind people [2][3][4]

Our idea is simple, we want to make use of the belongings a blind person uses on a day to day basis (cane and smartphone). Our product is a simple cane with object detection sensors and a slot to place a smartphone, thereby having two major functionalities. The object detection sensors placed at the bottom would detect the obstacle and alert the person about the same with a beep. This is done to prevent the person to avoid the obstacles like potholes (a major problem in India) during rainy seasons or any other time. This is the first feature of our product. The second feature of our product is to detect what's in front of the person. The camera of the person's smartphone would capture the image in front of him/her with a click of a button on the stick, which would then be analyzed by Google's cloud vision API. The text about the items in front of him would then be read out to the person using text to speech software. This is useful when the person is curious to know what's in front of him. Basically, it will enable him to judge the situation pretty well.

These sticks are cost efficient, thereby making it available and affordable to everyone.

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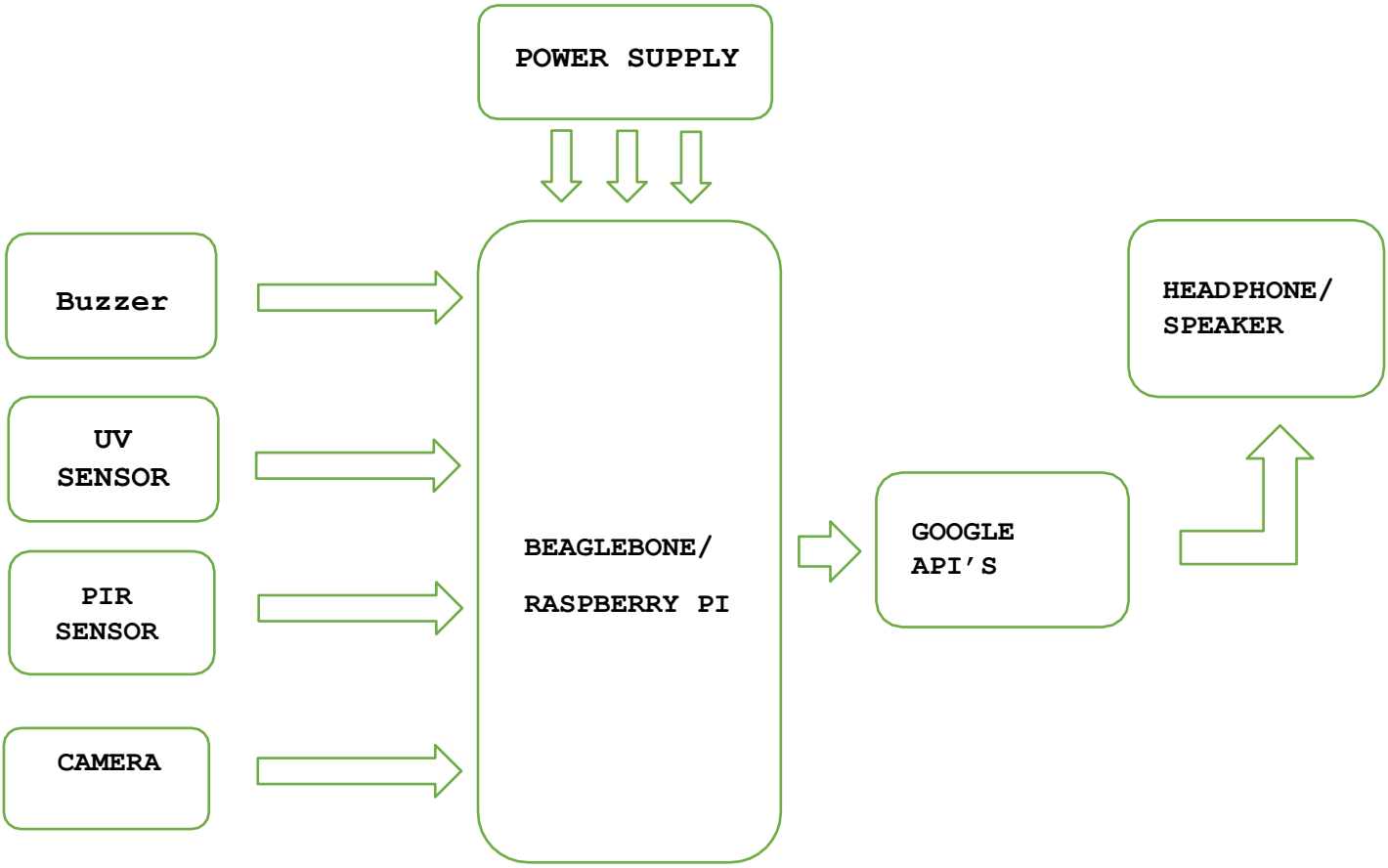
PROPOSED SOLUTION USING BLOCK DIAGRAM



HARDWARE/SOFTWARE IMPLEMENTATION OF EACH COMPONENT

1. **Power Supply**: A 5V/2A adapter is used to supply power to the Beagle Bone Development Board UV Sensor(PGA450Q1EVM-S): To determine the distance between the obstacle or an object ahead of the person and beep the buzzer when the distance is small
2. **PIR Sensor:** To detect the presence of an obstruction or an object near the person and activates the Buzzer if there is an obstacle
3. **Camera:** To click picture of the obstacle or the object ahead of the cane and eventually convert it to an audio format and playing the audio file through the speaker or headphones
4. **Google API's:** Image to Audio conversion API's from Google are available to converted the captured Image into Audio format
5. **Beagle Bone Development Board:** To interface all the mentioned sensors and process the captured Image and converting it into an Audioformat
6. **Headphones/Speaker:** To output the converted Image to Audio file and play it to the user

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EXPECTED OUTCOME

The Cane Stick used by the user contain various features like Obstacle Detection, Distance Estimation from the obstacle and Capturing the Obstacle or any object that the user wishes to know that it is, the captured image is then converted to Audio Format by the Google API's and the corresponding audio file is played over the Speaker or Headphones. In case of presence of an obstacle near the Cane, the inbuilt PIR sensor detects the presence of obstacle and sends a signal to the Buzzer which Beeps and sends a notification to the user about the presence of an obstacle or a hindrance near the user. If the user wishes to know the distance from the obstacle present near the user, the inbuilt UV Sensor helps in determining the Distance and notifies the user if he is too close to the object. The UV sensor continuously measures the distance of the surroundings, in case the person is getting too close to it, it automatically sends a signal to the Buzzer and notifies about getting too close the present obstacle

TECHNICAL CHALLENGES FACED

1. The Google Vision API that converts Image to Audio format was not able to identify the captured images and correctly convert them into audio format
2. The selected Camera had really low captured Image resolution as there was too much compression present which was why the API was unable to convert it correctly into audio format.
3. Continuous measurement of exact distance using UV Sensor was not possible as the UV sensor was to be placed exactly perpendicular to the object to measure it's exact distance

NON-TECHNICAL CHALLENGES FACED

1. Due to presence of many components, the error in output was a bit hard to debug as it was hard to figure out what the origin of the error was
2. The UV sensor misplaced itself from its place

THINGS THAT ADD FURTHER VALUE TO YOUR PROJECT

The walking sticks are common assets due its simplicity and ease to use it, but also lack many needed features. Our proposed have the necessary and basic features that every Cane/Walking Stick is desired to have. It helps the person in dodging the upcoming simple dangers or problems that he might face while on the road like potholes, running into obstacles.
The innovation for these types of people in India is very less and can be considered that almost no new technology has been discovered to make their lives easier to live. It was always the traditional cane stick that is still used. Our proposed design will definitely make the lives of people with Blindness much easier and they can be more confident on the road like never before and also be independent without waiting for help from the people near by.
We also have another feature in mind which helps the person navigate the person from Point A to Point B which guides the person through audio in terms of footsteps to be taken before the next turn or the path. This will add further more value and enhancement in the technology of the proposed solution for the Intelligent Modern Blind Stick. This will also add on to the vision of our Prime Minister, encouraging the Make in India vision. This can gradually show a rise in the Indian Currency and make it better that today. It would also set a new benchmark in the Cane Sticks industries and define the new smart technology in this field and also enhance and make the like much more easier for the people with such disabilities.

CONCLUSION

The Modern Blind Stick designed functions as a fundamental platform to assist the visually impaired to be safer in the modern generation of growing smart aided devices. It's also very efficient and easily affordable making it reach a wider audience with ease. It contributes to excellent outcomes in identifying the barriers that lie ahead of the user, detecting the dangerous obstacles in their way.

This model provides low-cost, reliable, mobile and robust navigation solution. The proposed design, with the highest degree of accuracy, the visually impaired will be capable of moving from one place to another without assistance from others, resulting in increased autonomy for the visually impaired. The blind stick developed with several sensors will aid the user navigate while walking and will keep the user alarmed if any danger or obstacle is detected.
People with Visual impairment need to have access to a reliable and easy to use device in order to comfortably live their daily lives. There exists a necessity for a cost-effective alternative in a developing nation such as India so that many individuals can have access to a quality product discussed in this paper.

[1] https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment
[2] https://circuitdigest.com/microcontroller-projects/arduino-smart-blind-stick
[3] https://nevonprojects.com/ultrasonic-blind-walking-stick-project/
[4] Shruti Dambhare, Prof. A.Sakhare. "*Smart stick for Blind: Obstacle Detection, Artificial vision and Real-time assistance via GPS"* in 2nd National Conference on Information and Communication Technology (NCICT) 2011 Proceedings published in International Journal of Computer Applications.