ACHAKSHUS – An Innovative Technology for Visually Challenged and Blind people

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Introduction:

Blindness is very common and unendurable Disability among many disabilities. According to the World Health Organization (WHO), there are million visually Impaired people. Visually impaired people usually have problems walking & avoiding obstacles in their daily lives. Traditionally such people use guide canes to detect obstacles in front of them. Thus, visually impaired people cannot exactly know what type obstacles are in front of them & must only depend on guide canes and experiences to walk safely and in the desired path.

Despite our gained knowledge, sadly, our efforts are not always successful and we are presented with the responsibility and challenge of caring for people who have to cope with visual impairment, perhaps for the rest of their lives. We have to understand their difficulties, recognise their abilities and learn how to cooperate and communicate with them in a social as well as hospital environment. It is often within the eye hospital itself that the lack in education of health workers and their understanding of the assistance needs of blind and visually impaired patients is all too evident.

A prototype of an intelligent guide for the blind person is successfully designed, implemented and tested. This Prototype **"Smart Cap"** Helps Blind Person to detect obstacle and also helps to detect the currency and Text.

Objectives

- Main objective of our project is to enable blind person to communicate and interact with external environment by the help of technology.
- The person can identify the obstacles, i.e. We are designing and building a working prototype that will help visually impaired person to sense the obstacles in front of them by sending text to speech from the system.
- The project also aims to facilitate the text detection and Currency detection for ex: Menu reading.
- This project is not just only a specific approach but also introduces a prototype that will be applied in reality.

Methodology

Pi Camera: This module is a camera which can be used to take pictures and high-definition video. Raspberry Pi Board has CSI (Camera Serial Interface) interface to which we can attach Pi Camera module directly. The Raspberry Pi Camera Board can be plugged directly into the CSI (Camera Serial Interface) connector on the Rasp-berry Pi. It is capable for delivering a crystal-clear image of 5MP resolution or having 1080p HD video recording at 30frames per seconds.
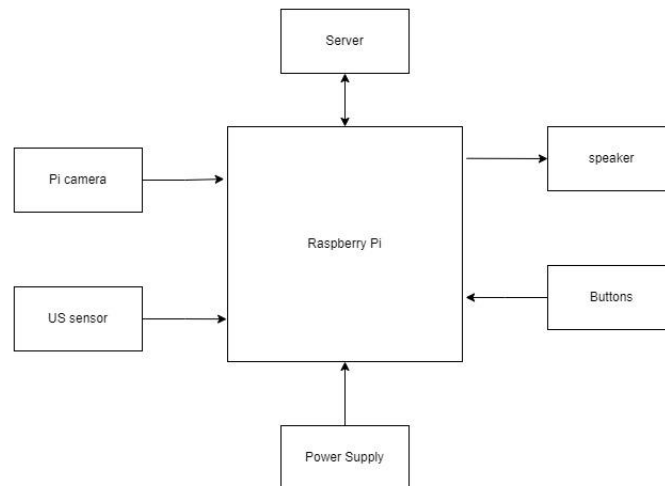
Block Diagram Representing Workflow of Smart Cap

Raspberry pi:

Low-cost high-performance computer which can be plugged in TV and monitor and can be used as computer which is very small as credit card, This raspberry pi works as the computer of the prototype.

- Its CPU is 700Mhz single core ARM1176JZF-S.
- It has 4 USB ports.
- It has dual core video core iv multimedia coprocessor.
- Size of its RAM is 512mb.
- It has micro SDHC plot for storage.
- Power rating of raspberry pi is 600mA i.e., 3.0W.
- It has 17*GPIO plus the same specific functions.

Ultra-Sonic sensor:

The ultrasonic sensor is used to calculate the distance of the object or for pothole detection. For object identification, the ultrasonic sensor is placed in prototype which sends ultrasounds and calculates the distance (max of 25cm), For pothole detection. A distance more than an average distance is set. So, when any pothole appears, its distance will be higher than the normal distance and hence we get alert.

Power supply: It differs from the normal 5V USB power supplies. This power supply will enable you to power your Raspberry Pi 3 to its full 2.5A load and a 1.2A on its 4 USB ports. Cana Kit power supply has been designed to withstand harsh normal use conditions. The Raspberry Pi can be powered up in a variety of ways. A voltage source must absolutely meet two requirements:

- a stable voltage of 5V
- at least 1000mA current carrying capacity

Hardware Requirements:
- Raspberry pi Kit
- Pi Camera.
- Speaker.
- Sensors – Ultraviolet Sensors.
- Power Supply(5v).

Software Requirements:
- Operating System: Raspbian OS
- OpenCV - Opensource computer vision library
- TensorFlow – Opensource Artificial Intelligence library.
- IDE: Integrating Development Environment
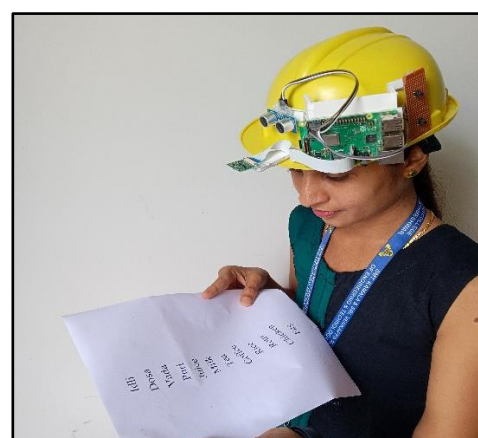- Python Language (3.9 version and above).

Results:

Smart Cap

Obstacle Detection

Currency Detection

Text Detection

Conclusion

- This System enables the Visually impaired and Blind users to read the text from Menu through protocol.
- Our prototype "Smart Cap" for Visually impaired and Blind People helps to detect the obstacle around them.
- The use of everyday objects in the development of this device also reduces the cost of manufacturing.
- Thus, making it available to people at reasonable price.