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# Voice based Assistance for Visually Impaired Individuals

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**Abstract:**

This study provides a framework for a smart cane that offers an object recognition system for visually impaired people which assist them in a better walking experience. Framework will explain the details how Bluetooth enable device will identify the obstruction object and communicate it to the user through voice module. For the working of the system, Ultra sonic sensors senses the obstructions clicked through moveable camera and transferred using Bluetooth to the phone connected with the smart cane. Phone is installed with application that can process images using required API for ML (Machine Learning) and NLP (Natural Language Processing). Outcome of the algorithm is a text that will be further converted into a voice alert and communicated to the user through an earpiece.

The goal of this research piece is to assist visually impaired people during theirs walks by making them aware and communicated about the objects coming on the way so they can be more independent during their movements.

**Keywords**: Real Time Systems, Human Assistance Systems, Object Identification System, Smart Canes with Technology Assistance, Object Detection, Object Recognition, Sound Based smart Canes, Ultra sonic sensors.

## 1. Introduction:

Owing welfares, that it offers to the blind, it's having a cutting edge in the market and sells like a hot cake not only in Indian market but at world market as well. It market size is projected to be $ 1,167.87 million by the end of 2030. [1][Ref: Picture 1]. This data is from market prediction but


**Picture 1: Smart Cane World market in 2030 [** [1]**]**

WHO says that most of visually challenged person don't want to use stick and get rid of it or want some drastic support in their stick [ [2]]. To overcome this frame one would think of smart canes enabled with smart devices like camera, sensors, Bluetooth and Wi-Fi which would assist them in the way they are comfortable with. Differential work is going on in this direction where some of the researchers are trying to identify the face identification using above mentioned techniques are conveyed it to challenged individual through vibrations [ [3]]. Others are trying to identify not only face but any other object that they senses on the way through sensors and convey its indication through vibrations [4]. Other prominent works in this area is through IOT, adding voice assistance and GPS monitoring in the smart cane [ [5] [6]] through which kin's can easily locate and assist visually impaired. Each system has certain limitations and advantages. The authors have tried to bridge some of gaps through their current work and hope to get a system that visually challenged would like to adopt and will use in routine.

**2. System Architecture: System comprises 3 modules/processes:**

**2.1. Obstacle Detection:** It is required to identify the obstacle coming on the way of visually impaired to protect them from the collision with obstacle. Sensors are used for obstacle detection in the current environment. This system will make use of Ultrasonic sensors. Ultra sonic sensor calculates the target distance by emission of ultrasonic sound waves and convert them into electrical signals. The biggest advantage with Ultra sonic sensors is the speed of their waves which is faster than audible sound [7]. Multiple sensors should be placed at distant height on "Smart cane" in order to get the notification of obstacle present at distant height.


**Figure 1: Smart Cane multiple Ultra sonic sensors**

**2.2. Picture SIVO (Snap Identification Voice Output) Module:**

**2.2.1. Snap:** Once the obstacle presence is signaled by the sensor, the moving fully HD mini camera installed on the smart cane is activated to click the picture of the obstacle. As three sensors are installed on the cane so accordingly camera will be rotated in the direction of the sensor that has generated a signal. When camera direction is set as per the sensor location then the touch sensor placed on the top of the cane will be activated.

**2.2.2. Identification:** The camera installed in the system will click the picture and transfer it to mobile using inbuilt wi-fi/ Bluetooth. Mobile application will capture and picture and activate Google Lens to identify the object clicked and transferred. For that Google Lens API if incorporated in the mobile application.

***[Google Lens is a set vision based computing services that can identify and understand object you are looking at and further used this information to copy and translate it into text. Google Lens uses image recognition and artificial Intelligence to complete its task. This feature is incorporated in mobile application through Vision API Library.]***

**2.2.3. Voice Output:** The text generated by the Google Lens will be given to Text To Speech converted [8]]. The functionality s incorporated in the mobile application through API offered by the Google.

**Bluetooth Module:** The voice output generated will be transferred to the Bluetooth headset paired with the mobile phone.

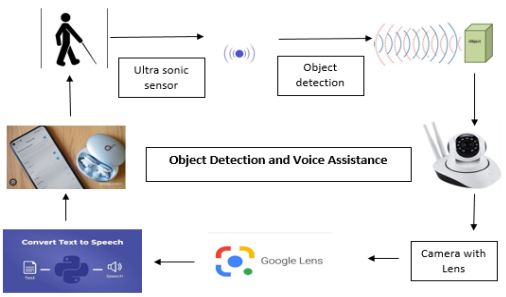


**Fig 2 : Voice Based Object Detection System for Visually challenged**

## 3. S/W and H/W Requirements for the Voice Based Smart Canes:

### 3.1. Hardware Requirements:

**3.1.1. Ultra Sonic sensors and IP Camera Installed in smart cane:** A fully HD mini camera can be installed in a smart canes and can be operated by clicking on a button. Camera is installed with Wi-Fi and connected with the smart phone. On click of a button picture is clicked and can be send to the phone attached.

**3.1.2. Smart Phone:** An android phone paired with camera and ear piece installed with the application mention in software requirements 3.1[Image Processing Application] & 3.2 [Text to Speech Converter]

**3.1.3. Ear Piece:** An ear piece paired with mobile phone that can be used to listen the sounds produced by text to speech converter.

## 4. Software Requirements:

**4.1. Application Installed in Phone for image processing:** Application is using Google lens for processing the images received through camera. **Google Lens:** It is a vision based ability provided by Google that can transform any images "anything you are looking" into a text and you can easily perform many useful actions [9].

**4.1.1. Incorporating Google Lens in Application:** Google Lens can be easily incorporated into android project. Although there are many languages that cab used as an option like: Kotlin, Python. C and C++ ( for native applications) but authors have opted Java for this project as it is known as official android application. Google offers ML kit which comprises many Vision and NLP API's that can be used in this project:

| Vision API's | NLP API's |
|---|---|
| - Barcode scanning | - Language ID |
| - Face detection | - On-device translation |
| - Image labelling | - Smart Reply |
| - Object detection and tracking | - Entity Extraction |
| - Text recognition | |
| - Digital Ink Recognition | |
| - Pose detection | |

**4.2. Text to Speech Converter**: A converter (written in Java Language) is installed application. That converter is used to receive text and convert it into sound and earpieces paired with phone can used to communicate these words/word to the user.

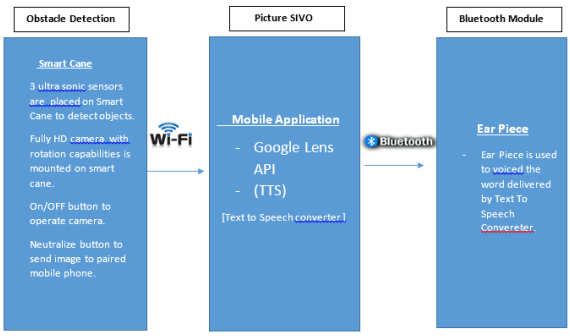


**Figure 3: Modules/Processes of Voice Based System**

**Conclusion and Future Scope:** The above mentioned research piece details about the conceptual details of the system and hardware and software requirements for the system. The team has already started it tasks for the sensor details and software API inclusion in the mobile application. The other hand team is looking for a assistance required for the architectural and labortary support.

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