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Users satisfaction as regard the obstacles detector: An exploratory study

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Abstract
This paper seeks to assess the satisfaction of visually impaired people as regard the assisting devices available in the market. Generally, visually challenged people are using white canes as the assisting device given the cost constraints. The paper seeks to know the satisfaction level of users and identify any improvement or modifications expected by them. Users generally were not satisfied with the white canes for the reasons, one it is not much help and secondly it makes general public aware of their disability which makes them cautious and less confident. On the basis of feedback obtained the paper suggests use of assistive technology to make obstacle detector better work as sensor and secondly making obstacle sensor to be not apparent to general public.

Keywords: Visually-impaired, specifications for obstacle detector, assistive technology

Introduction
Over the years medical technology has made tremendous progress. But functionality of canes used by the blind persons remains limited. With use of available canes user rely on his physical ability to detect the object. User is solely responsible for his safety. It is a big burden on the user, especially taking into consideration the fact that the condition of Indian public space is not disable friendly. This problem can be reduced to an extent with the inclusion of additional security feature of an object detector technique. While using white cane person faces a challenge of changing the handle grip every time depending on the surroundings. Therefore, a need was felt to develop a cane that will adapt according to user rather than existing white cane requiring the user to adapt. To address these issues, this study tries to suggest some specifications for a device that detects physical object from a far and timely alert the user of the hindrance in his/her path.

Problem Recognition
Safe mobility and transition are amongst one of the paramount difficulties faced by the visually impaired people in their daily scenario. They take the help of white canes to detect close-by obstacles on the ground. However, the white cane has some major issues:
1. Only obstacle up to knee-level could be detected by canes. As a result, a visually challenged person is unable to detect raised obstacles.
2. Obstacles that are at a distance of less than 1metre could only be detected by cane. It gives the user less time to adjust accordingly. Also, it is difficult to detect obstacles like moving vehicles until they are at a hazardous proximity to the person.

There are different types of disabilities, like visually impairment, physical disability, hearing impairment people are facing. Latest technology referred as assistive technology are being developed to help such person. But such technology is costly making it a challenge for such disabled persons to adopt. To enhance obstacle detection techniques, researchers have developed Electronic Travel Aids (ETA). The use of technology there could be of great help in ameliorating the problems faced by the people with disabilities. (Nuruladwan *et al.*, 2010) [3]. Mazo and Rodriguez (1998) [12] asserted that the blind Cane is one of the essential assisting tools for visually impaired persons. Herman (1995) [9] also identified that visually-impaired persons were found to have lost their physical integrity and confidence in themselves.

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Similar findings were reported by Bouverie (2007), in a project named "Project Prakash" which was undertaken to analyse how visually-impaired persons utilize their brain to identify set of objects that come across their way. According to Chang and Song (2010) [7] visually-impaired persons find it difficult to memorize the locations of the object or obstacles when they walk into a new environment. These studies highlight about various challenges faced by visually-impaired people.

Objectives of the Study
1. To evaluate the satisfaction of users when they use white canes;
2. To suggest some specifications for an obstacle detector to make it more user friendly which includes better warning system and enhances object detection range while maintain affordability.

Research Methodology
Data is collected through primary data. Researchers personally got the questionnaires filled from the people with special needs from various blind schools in Delhi and NCR. Researchers got 200 responses across various blind schools. Ms-Excel is used to analyse the data and to prepare the graphs.

History of White Canes
White cane finds it novel origin in Europe in 1920s. A photographer named James Biggs lost his eye sight. He then painted his walking stick as white and started using as supportive device. The idea was to alert the public of his presence. Again, when in World War II many soldiers lost their vision and returned back to America, they wanted to still have soldiers' life and not to depend on people and attract their sympathy. This resulted in white cane as we see today from being altered from mere walking stick painted white. As per World Health Organization globally at least 2 billion people face vision challenge. Half of this is attributed to lack of medical facilities. Visually challenged people are more in developing countries given the medical constraints. Also, majority of people are above 50 years of age. This highlights the underlying need for supporting devices to be designed and developed in such way that it remains cost effective.

Characteristics of a Visually Impaired Person
Visually Impaired individual is one who has clinically proven to have visual acuity of 20/70 or less in the stronger eye, while person have visual acuity of 20/200 or less in the stronger eye is blind. Such people receive governmental benefits in the form of aids and certain rights, like to use a white cane or sometimes a dog that acts as guide. A white cane offers the advantage of freedom in movement to the visually challenged people.

It serves dual purpose; one it warns the users of the potential obstacle/threat and secondly it alerts the pedestrians and motorists of their disability. White canes fall into three categories: identification canes, support canes, and long canes. Identification canes reach only till user's waist and are short in height. The idea is to alert the others. It does not offer much support to the user. Support canes are similar but better than identification canes. They comparatively provide better support and protection to the users. The safest ones

the long canes. They are longer in height and reach users' breastbone and thus offers more protection. It alerts of users of walls, doors, height changes and changes in terrain. Users use all three types.

User Feedback of White Canes
We decided to do a survey as to find out what the general feedback of users is when it comes to white canes, and how satisfied they are with it.

Also, we wanted to know what expectations they have when it comes to technological advancements in the field of science for the visually impaired. And what all do they expect an obstacle detector to do.
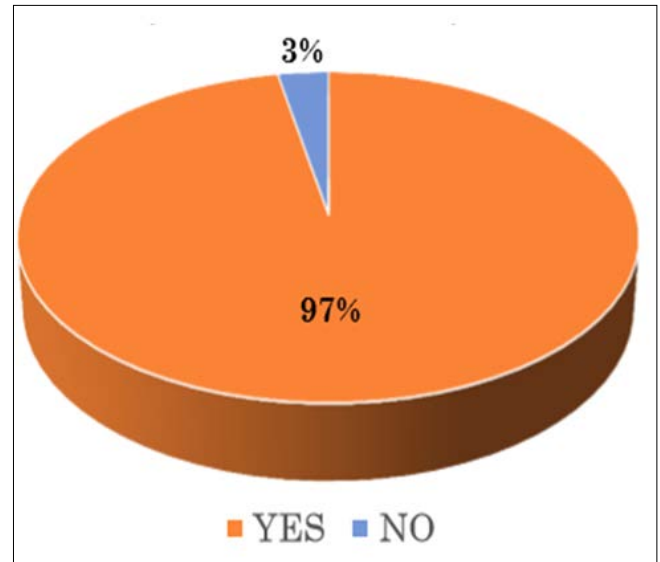
The findings were as follows:

Fig 1: Do you think there must be any sensor device that helps you in better way?

The current users were clearly not satisfied with the simple white canes since they were not completely effective when it came to navigating safely. An automated obstacle detector is the need of the hour.

Next, we wanted to know what their preferred mode of alerting them about an upcoming obstacle was, we got the following results:
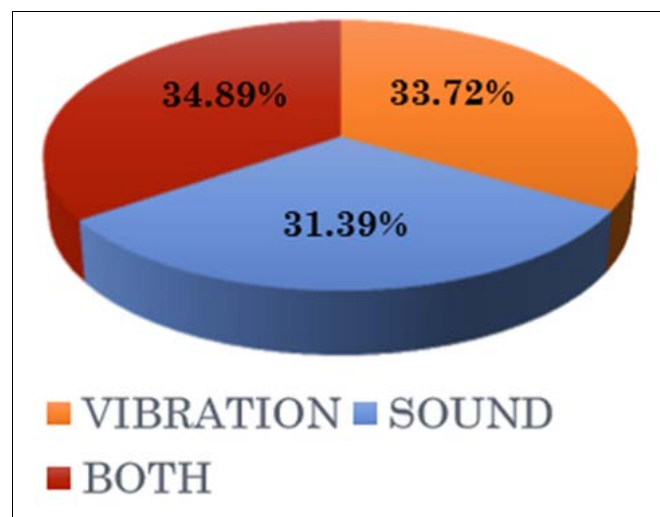

Fig 2: Which mode do you prefer for giving and alert for sensor device?

As it can be seen there was almost a tie, when it came to preferred mode of alerting them.

We also wanted to know what in the user's opinion should be the cost of such a device:

We found out that, a majority of the surveyed audience wanted the device to be cheap so that it is easily accessible. But it was found that even 15% of respondents are also willing to pay even more in the range of Rs 1500-3000.
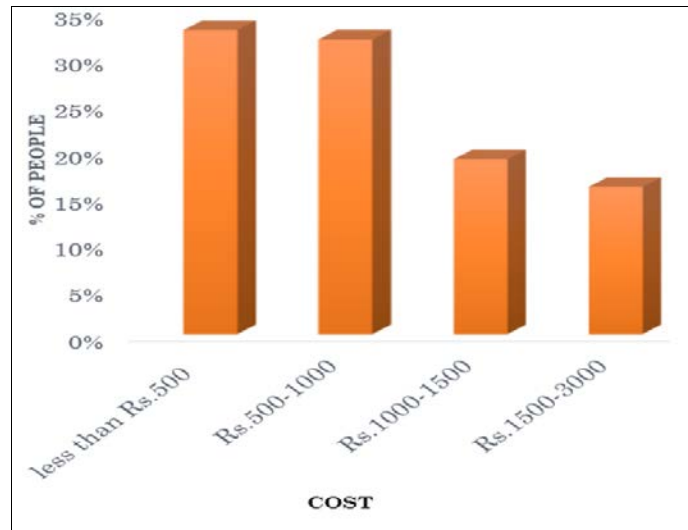

Fig 3: In your opinion what should be the cost of such device<

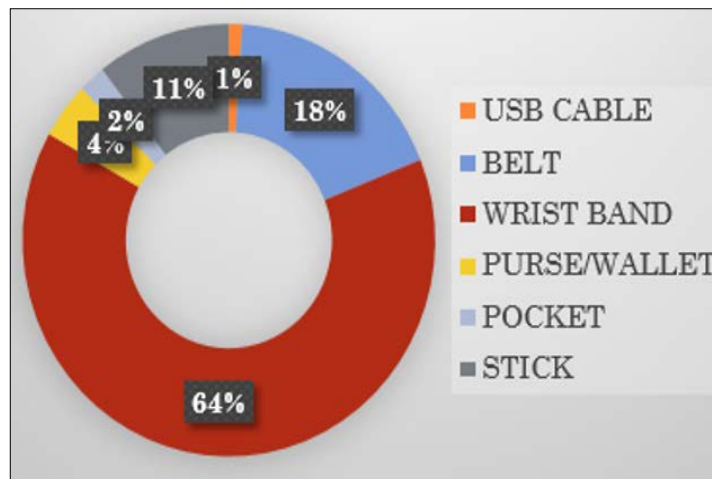The next question that we felt, that needed to be asked was, in what form would they like to use the device:

Fig 4: How would like to use it?

We found out that, a majority of them wanted the device to be in the form of a wristband.

Another question that we felt was the need of the hour was, how sensitive in terms of distance should the device be:
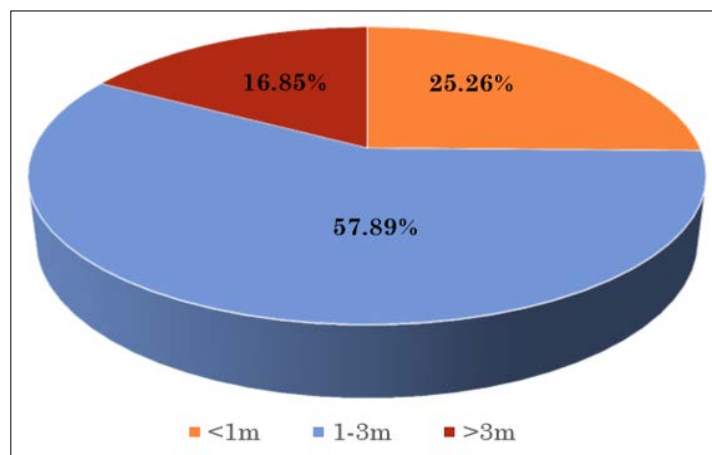

Fig 5: Distance

The result, as can be seen that almost 60% of the surveyed user wanted it to detect a range of 1-3 metres.

Conclusions

The study concludes that users are not very satisfied with current obstacle devices. There is a need to have a sensor device that helps the visually impaired people in a better way. The necessity is to technologically update the existing devices using better sensors, vibration and sound while maintaining its affordable price. Also, there is dire want from the users to make the device more compact, handy and less apparent to external public.

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