DEVELOPMENT OF VOICE NAVIGATION SYSTEM FOR THE VISUALLY IMPAIRED BY USING IC TAGS

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**Abstract:** There are about 300,000 visually impaired persons. Most of them are old persons and cannot become skillful in using a white cane, even if they make effort to learn how to use a white cane. Therefore, some guiding system that supports the independent activities of the visually impaired are required. In this paper we will describe about a developed white cane system that supports the independent walking of the visually impaired in the indoor space. This system is composed of colored navigation lines that include IC tags and an intelligent white cane that has a navigation computer. In our system colored navigation lines that are put on the floor of the target space from the start point to the destination. The white cane has a color sensor, an IC tag transceiver and a computer system that includes a voice processor. This white cane senses the navigation line that has target color by a color sensor. When a color sensor finds the target color, the white cane informs a white cane user that he/she is on the navigation line by vibration. So, only following this vibration, the user can arrive at the destination. However, at some landmark points, guidance is necessary. At these points, an IC tag is set under the navigation line. The cane makes communication with the tag and informs the user about the landmark point by pre-recorded voice.

**Keywords**— the visually impaired, white cane, IC tags, line of the color.

**I. INTRODUCTION**

A white cane is a typical supporting device for the visually impaired. The visually impaired are able to sense obstacles around them and walk safely by using a white cane. Therefore, in the area where they know well, they can walk safely using a white cane. However, they cannot walk independently in the unknown area, even if they use a white cane. In such cases navigation of others are necessary, because a white cane is an obstacle detecting instrument and not a navigation system. In such situation, a supporter who assists a visually impaired person is imposed much strain. From these reasons, the navigation system for the visually impaired is required.

Many navigation systems for the visually impaired are developing. For example, a navigation system by using GPS which support the independent activities of the visually impaired is being developed. However, most of them are for outdoor space and not for indoor space. Our objective of this study is a development of the navigation system which can be used in the indoor space (e.g. underground shopping mall, airport, hospital etc.) and support activities of the visually impaired without help of others.

**II. SYSTEM DESIGN METHODOLOGY**

![Fig 1 Block diagram of System Design](image)

The users of this system use a white cane that includes a color sensor, a transceiver for IC tags, a vibrator and a voice processor, and all these devices are controlled by a one chip microprocessor. White cane senses the line using a color sensor and informs that the user is on a selected line by a vibration. The cane also makes communication with an IC tag at the landmark point and informs the area information by a pre-recorded voice. Motor is used for Vehicle Movement.

**A. Conception of system**

![Fig 2 conception of System](image)

Fig 2 shows conception of our system. This navigation system is composed of a colored navigation line that is attached on the floor along the navigation route and the intelligent white cane. A colored navigation line is attached on the floor. This line is attached from start point to destination point along the navigation route. If there are many destinations, different color sensors are attached to each route.
B. TC Tag Guidance System

Fig 3 Shows conception of system using IC tags. In the navigation route, there are some points where the system has to notify the user of area information. For example a corner to turn left or right etc and so on are the points. In previous navigation systems, optical beacons that were set on the ceiling and a receiver for the beacons were used for this objective. However, an optical beacon consumes electric power continuously to emit the area code as infrared signals, and an user should have an receiver for the optical beacon in addition to white cane. so, IC tags are used in this system and its not necessary to have own power source for an IC tag, power for IC tag is supplied by the transceiver that can make communication with an IC tag by a radio wave, and is the benefit of using IC tags.

C. White Cane

Fig 4 represents the block diagram of System by a white cane. In this system color sensors that are attached on the tip of a white cane senses the floor color. These signals are amplified and limited their frequency band by a low pass filter, then 8 bit analog to digital signal is converted by a A/D converter that is present in one chip microprocessor. When the system finds the target color that indicates the way to destination, one chip microprocessor turns on the vibrator.

D. IC Tag Transceiver

Fig 5 represents the block diagram of IC tag transceiver. Both receiving sensitivity and output power of ordinary RFID micro reader are too small for our system, a pre amplifier for the receiver and a power booster for the transmitter are developed and equipped in our system. When the white cane finds an IC tag, the system begins to make communication with an IC tag. A transmitter transmits the power for IC tags and instruction codes and a receiver receives an area code where the IC tag is set on. One chip microprocessor analyses this area code and selects the navigation voice data, then the user can hear the area information from the speaker which is pre recorded.

III. EXPERIMENTAL ANALYSIS

Ten normal subjects were tested with our developed system and all are subject to blind folded.

IV. RESULTS

We had placed IC tags along the navigation line and asked the user to follow the path and when ever the user reaches the particular destination, he will be informed about the area information with a pre recorded voice.
see the white cane platform on which an LCD display, microcontroller and a buzzer are placed.

Fig 7 Prototype

V. CONCLUSION

In this paper, a novel method for voice navigation system for the impaired has been discussed. A prototype of the system has been developed which is believed to provide better support to people who are visually impaired when compared to optical beacons because of the friendly support to impaired, who can be easily able to move here and there without others to help. There is also a magnificent scope to improve features for this system on which research is underway.

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VII. REFERENCES