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Review Article

Smart Blind Stick for Blind People: Drawbacks and Impacts

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Abstract
Because they can receive and interpret visual information for the brain, the eyes, or organs of vision, are an essential component of human physiology. Furthermore, because 83% of environmental information is gathered through the eyes, they are essential to human existence. A smart blind stick with sensor integration has several advantages. For those who are blind or visually handicapped, it facilitates their navigation by detecting obstacles and emitting an alert through beeps or audible signals. The stick's infrared and ultrasonic sensors allow it to detect obstacles such as walls, water pools, automobiles, and stairwells. Furthermore, some sticks have tilt sensors that can be utilized to detect accidents and transmit messages to family members via GPS and GSM connectivity. Additionally, the stick can be associated via Bluetooth with a smartphone app to help the user locate it if they misplace it. We have covered the advantages and disadvantages of the smart blind guy sticks in this study. Also covered are the parts required for the implantation.

Keywords: *Drawbacks, Digital Era, Impacts, Internet of Things (IoT), Smart Stick, Blind Person.*

I. INTRODUCTION
According to the 1987 NSSPD, 0.4% of participants (6,826 individuals) reported blindness, increasing to 12.33 million individuals with visual impairments by 2006, accounting for 14.9% of all impaired individuals [1]. Blind persons face unique daily challenges due to physiological impairments. The primary obstacle is accurately detecting and avoiding obstacles, currently addressed by guide dogs and guiding instruments. However, training guide dogs requires substantial resources and long-term commitment, and their assistance is temporary. This study aims to develop an innovative, cost-effective Smart Blind Stick, enhancing mobility and independence for visually impaired individuals through intuitive obstacle detection, providing a user-friendly alternative to traditional guiding instruments.

II. RELATED WORKS
The CTT blind guide developed by Xu Xiangyu's group [2] is accurate and clear in locating obstacles from a three dimensional standpoint. It still cannot be used practically, and its operability and practicability are restricted. The intelligent trip navigation helmet for blind individuals made by Huang Hongzhi [3] uses visual processing to identify obstructions and traffic signals. Despite its many features, the helmet is heavy and difficult to carry. Although infrared detection is used by Lin Chen's intelligent blind walker [4] to automatically avoid obstacles and transmit information with head-mounted sensors, the precision of infrared rays is not high, is highly dependent on the surroundings, and is cumbersome to carry. According to the intensity of reflected light, Wu Xue et al.'s multi directional infrared-ranging intelligent bracelet [5] uses infrared ranging, and the system accurately verifies its obstacle avoidance capability over black, white, and gray obstacles. The bracelet can detect just a restricted number of things, which limits its use. A blind aid system is available in the public space created by the Karen Duarte team; however, its use is restricted to the relatively small space of a shopping center. The Sularso Budilaksono team's blind guide rod, which is small and only has one function—the HC SR04 ultrasonic sensor—is controlled by an Arduino master controller. This means that blind individuals cannot benefit from a better experience. This paper designs a blind guide stick with an STM32 single-chip microcomputer at its core. This microcomputer can accurately measure the distance by ultrasonic and feed back to the

blind in time through voice broadcast, making up for the shortcomings of the above system's slow real-time detection, inaccurate infrared rays, and delayed feedback. When faced with danger, the vibration motor alerts the blind and allows them to send an SMS to their guardians. The system's implementation can significantly lower the potential safety risk associated with blind persons walking and the number of accidents brought on by their incapacity to perceive impediments [6]. This paper's primary contributions include an assessment of the state-of-the-art in travel aids from a design standpoint and an investigation of the following problems: (1) The significance of design concerns in wearable travel aids and the degree to which these are considered in various devices; (2) Any connection, if any, between the location and mode of use of travel aids and their features, design, and functions; (3) The limitations of current devices, the absence of certain ones, and future directions for research, especially in terms of satisfying the needs of potential users [7]. In this study, we provide a tool that facilitates the detection of impediments and puddles of water. This system consists of Android applications (APPs) and a walking stick. The walking stick has sensors, a global position system (GPS) module, a Raspberry Pi and programmable interface controller (PIC) as a control kernel, and components that provide alerts embedded in it. Obstacles can be identified with the use of sensors, and the VCP is alerted about them via buzzers or vibrations. Parents can use an application to track their child's location after the GPS module receives the coordinates of the VCP. Another crucial app is the emergency app, which allows the VCP to instantly contact friends or parents byshaking their phone or, in an emergency, pressing the power button four times in five seconds. We employed fewer parts to create a lightweight, comfortable, and feature-rich gadget with excellent performance. In the end, this gadget will boost VCPs' confidence in an unfamiliar setting by enabling them to live somewhat independently (and securely) [8]. Third Eye for the Blind using Ultrasonic Sensor [9]. A heart pulse sensor and other electronic modules that can be linked to the nearest relative's Android smartphone are used in the construction of this blind stick. The purpose of using pulse heart sensors is to measure a person's pulse rate per minute in order to assess their overall health [10]. Low-Cost Walking Stick for Obstacle and Stair Detection using Arduino [11]. The design, development, and testing of an Internet of Things-enabled smart stick that can identify and alert users to impediments is presented in this work [12]. The device is intended to help visually impaired persons traverse the outside world. This study presents the design, development, and testing of an Internet of Things (IoT)-enabled smart stick that can identify and notify users of impediments to aid visually impaired people in navigating their environment [13].

III. DISADVANTAGES OF SMART STICK FOR THE BLIND PEOPLE

Smart sticks for the blind, while offering advancements in navigation, have limitations. They can be expensive, less compact than traditional canes, and may not offer significantly more functionality than a smartphone. Additionally, current technology struggles to detect hidden dangers like stairs or holes, and the feedback systems (vibration or sound) can require training and potentially be embarrassing in public. They also have limited battery life and may not be waterproof or durable enough for everyday use, especially in rough environments.

Here's a more detailed breakdown of the disadvantages:

1. Cost:
   Smart sticks are generally more expensive than traditional white canes.
2. Size and Ergonomics:
   They can be bulky and less ergonomic than a regular cane, making them less comfortable to use and store.
3. Durability:
   The electronic components are vulnerable to damage from impacts, water, and general wear and tear.
4. Limited Functionality:
   While offering some obstacle detection, they may not provide comprehensive environmental information or active guidance.
5. Battery Life:
   Smart sticks typically have shorter battery life compared to smartphones, requiring frequent charging.
6. Hidden Dangers:
   They may struggle to detect hidden obstacles like stairs, potholes, or objects that are close to the ground.
7. Feedback Systems:
   The feedback mechanisms, such as vibration or sound alerts, can require training to interpret effectively, and the sounds may be embarrassing in public settings.
8. Maintenance and Replacement:
   The electronic components may be more difficult to replace or repair, and users may not have a backup readily available.
9. Dependence on Technology:
   Reliance on electronic components means they can malfunction or fail, potentially leaving the user stranded.
10. Lack of Comprehensive Environmental Data:
    Some smart canes may only provide limited information about obstacles, such as direction, distance, and shape, without a broader understanding of the environment.
11. Potential for Errors:

Sensors can be affected by environmental conditions like strong sunlight, rain, or snow, leading to inaccurate readings.

12. Security and Privacy Concerns:
    Smart canes with GPS or other tracking features may raise privacy concerns.
13. Accessibility for Low-Vision Individuals:
    Smart canes may not be suitable for individuals with low vision, as they rely on a combination of sensory feedback that may not be effective for all levels of vision impairment [16].

IV. ADVANTAGES OF SMART STICK FOR THE BLIND PEOPLE

1. Detects obstacles in front of you.
2. Less falls and stumbles meaning less bruises.
3. You can feel so much through the cane for example change in ground texture.
4. Simple to use and low cost [14].

V. COMPONENTS USED IN THE IMPLEMENTATION OF THE SMART BLIND STICK

1. Arduino Nano an open-source microcontroller board is called Arduino; Based on the ATmega328P, the Arduino Nano is a compact, feature-rich, and breadboard-friendly board (Arduino Nano 3.x). Arduino software is used to program the board's microcontroller. Sets of digital and analog input/output (I/O) pins on the boards allow them to be interfaced with other expansion boards, breadboards, and other circuits. Usually, a variant of C and C++ programming languages is used to program the microcontrollers.
2. GPS (Global Positioning System): is a satellite navigation system used to determine the ground position of an object. GPS technology was first used by the United States military in the 1960s and expanded into civilian use over the next few decades. Today, GPS receivers are included in many commercial products, such as automobiles, smartphones, exercise watches, etc. GPS systems include 24 satellites deployed in space about 12,000 miles (19300 kilometers) above the earth's surface. The earth orbits every 12 hours at an extremely fast pace of roughly 7000 miles per hour. The satellites are evenly spread so that satellites are accessible via direct line-of-sight anywhere on the globe. The navigation messages are broadcast at a rate of 50 bits per second. Utilizing this collocation of data, a GPS receiver in order to generate position data.
3. GSM-Module: GSM (Global System for Mobile Communication) is a digital mobile telephony system that is widely used all over the world. A GSM module requires a SIM (subscriber's identity module) card to be operated and operated over a network range subscribed by the network operated. It can be connected to an Arduino through a cable or Bluetooth connection. GSM module can be communicated to PIC-microcontroller using normal serial USART protocol. GSM is a mobile communication modem; it stands for global system mobile communication (GSM). The idea of GSM was developed at Bell in 1970. It is a widely used mobile communication system in the world. GSM is open and digital cellular technology used for transmitting mobile voice and data services operated at the 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz frequency bands. GSM system developed a digital system using time division multiple access (TDMA) technique for communication purposes. The digital system has the ability to carry 64 kbps to 120 mbps of data rates.
4. Ultrasonic sensor: an ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. The ultrasonic transmitter sends an ultrasonic wave. This wave travels in air, and when it gets absorbed by any material, it gets reflected back toward the sensor. This reflected wave is observed by the ultrasonic receiver module. The accuracy of an ultrasonic sensor can be affected by the temperature and humidity of the air in which it is being used. It operated in frequency at 40 Hz. It can measure the distance from 2 cm to 80 cm. This sensor is very popular because of its multiple-purpose application.
5. Rain Sensors: The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrops fall through the rain board and also for measuring rainfall intensity. The module features a rain board and the control board that are separated for more convenience, a power indicator LED, and an adjustable sensitivity through a potentiometer. The rain sensor detects water that completes the circuits on its sensor board printed leads. The sensor board acts as a variable resistor that will change from 100 ohms when wet to 2m ohms when dry. In short, the wetter the board, the more current that will conduct.
6. Buzzer: A buzzer is a compact but effective part that gives our project system sound capabilities. It is a two-pin structure that is incredibly small and compact. The audible frequency range of 20 Hz to 20 KHz includes the lower range of the buzzer. In order to do this, an electric, oscillating signal in the audible range is covered, and the result is mechanical energy [15].

VI. CONCLUSION

In this study, we have read a number of papers and observed the advancements in technology as well as the consequences of its use for individuals who are blind or disabled. Additionally, we have discussed the implementation strategy [17] and the resources needed to achieve it. The advantages of using the smart blind stick are evidenced by the fact that many of the examined studies did not discuss the advantages and implementation strategies simultaneously [16].

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