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Assisting Blind using Light Weight IoT Tool: A Review

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Abstract:
In a time where technology is a significant part of people's lives, to manage daily tasks. Although it is helpful to the broader population, blind people have a hard time adjusting to new technologies. The biggest issue they encounter is navigation. Blind people use common sticks to locate obstacles, but they can still be deadly in some settings. The term "Internet of Things" (IoT) refers to a particular kind of network that utilizes the Internet to link various devices. The Internet of Things has made it possible to track and monitor devices, send data between them, and do other things. IoT enables items to share data and automate processes without requiring human interaction, making them "smart". A simple and convenient example of IoT in our daily life is a wearable health monitoring gadget. A smart gadget with sensors that is connected to the internet covers the entire community utilizing a variety of tools and physical items. Kevin Ashton came up with the idea for this IOT term in 1999. The fundamentals of IoT are presented in the paragraph that follows. It disperses various IOT covers as well as many linked fundamental denominations. It is essentially lending a hand by using the Internet to do it. The Internet of Things (IoT) can be used to automate homes, offices, and other structures when household appliances are connected to it. A more effective technique would also inform the user of the obstacle's nature and direct them as they go about their daily lives and travel to the desired area. Most prototypes have been suggested to be able to adapt to new altering conditions in order to solve this issue. In order to provide functions like identification, obstacle avoidance, and navigation, this study proposes a support system that combines Internet of Things (IoT) devices and sensors with computer vision algorithms. This technique combines voice help from a smartphone to direct the user with suitable haptic feedback determined by a variety of sensors and actuators.

Keywords: Internet of Things" (IoT), Google maps, Application Programming Interface (API), Smart devices.

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I. Introduction

Currently, India has 70 million blind individuals and 4.95 million blind persons, 2,40,000 of whom are children. To lower the prevalence of blindness and visual impairment, early detection and treatment of blindness, similar to cataract surgery, is essential. Since the adoption of Vision 2020: The Right to See, significant advancements have been made in the prevention, treatment, and management of blindness.

Based on the prevalence of blindness in India, this study was carried out to gather data on blindness and visual impairment there. For our estimations, the system employed secondary and public accessible data along with a number of assumptions. The use of magnifying glasses, long

canes, eyeglasses, optoelectronic reading systems (such as video magnifiers), large print books, audio books, touch watches, and phones are just a few examples of the low-tech visual aids that can be useful to elderly individuals with visual impairments. It features big buttons, braille books, and walking aids. Electronic stick for the blind that is more dependable, reasonably priced, and can handle most of their challenges. The model that is offered can be used anyplace without any hassle. The current work does not assist them in identifying the type of impediment they are encountering; it merely detects it. Although there are numerous mobile apps that can assist them identify items, using them is difficult. Combining object recognition and obstacle detection.

II. Literature Review

Zeeshan Saquib.et.al [1] suggested BlinDar as an intelligent electronic travel assistance (ETA). The Internet of Things (IoT) is nicely integrated into the smart ETA guide, which is made so that blind and visually impaired people can move around freely in both indoor and outdoor settings, improving their quality of life. The BlinDar is a very effective, dependable, quick-acting, portable, low-power, and economical gadget for the blind. GPS and ESP8266 Wi-Fi modules were used to share data, and an ultrasonic sensor was utilized to identify impediments and potholes up to 2 meters apart. the cloud and the location information. A Tx/Rx RF module and a MQ2 gas sensor are utilized to detect fire in progress and an out-of-place stick, respectively. 54 digital I/O pins of the Arduino Mega2560 microcontroller are available for simple component interaction. When there are more potholes than actual barriers, a smart guiding stick like BlinDar is desperately needed. Researchers and scientists are developing a number of technologies to solve the environmental, societal, and navigational issues that blind and visually impaired persons confront. The blind requires a technology that is more intelligent, versatile, easy to use, and affordable. The BlinDar is a fantastic option and the best replacement.

N. Sathya Mala et.al [2] provide electronic aids for the world's visually impaired population, this study puts forth a theoretical framework and a system concept. The Internet of Things is the interconnection of many systems that communicate with one another via a network or specific signals. The cane's Global Positioning System (GPS) can be used to determine where the blind is right now. The Bluetooth Stick is used to pair the helmet and cane that are advised. As a result, Bluetooth, which is linked and facilitates communication between devices, is the IoT that aids blind persons in navigating through cane-hat communication.

Md. Rakibuz Sultan et.al [3] make using and accessing computers simpler for those who are visually impaired, this work assessed the status of assistive technology employing speech recognition and constructed a model of a voice-enabled desktop program on the Microsoft Windows platform. Housewares. Furthermore, the application's functionalities are accessible to those who are not blind, allowing them to use it as a virtual assistant. The app is user-independent and receives human voice commands in English. Users can manage installed programs, send and receive email, or browse the Internet using this application paradigm. This device also has the ability to read a portal and gives customers voice control over their household equipment. Core Processing Module (CPM), Email Module, Surfing Module, News Reading Module, and Home Automation Module have all been developed.

Joe Louis Paul I. et.al [4] intended for portability and convenience. With the use of the GPS, the device constantly tracks the user's present location. When obstructions are seen in the path, the device also gives warnings. Based on the previously saved photographs, it also aids in identifying certain individuals. It can also be carried in a pocket, which eliminates the requirement for the user to hold on to the object for an extended period of time like with sticks. Since the output is sent as spoken instructions through headphones, the clarity is excellent. Since all information is entered into the system before use, there is no need for an internet connection. If internet connectivity is not available throughout the city, this is extremely helpful. Due to the fact that it does not employ Android or any other touchscreen-related technology, this device is very straightforward and simple to use. Only a few locations are currently configured for this device. However, there are ways to integrate with Google Maps to reach more areas and enhance GPS functionality. The obstacle detection module can be expanded by naming obstacles with warnings and detecting obstacles.

Devashish Pradeep Khairnar.et.al [5] given Obstacle avoidance, object detection, indoor navigation via Wi-Fi access points, and real-time outdoor location sharing make up the system's main 4 modules. recognizing barriers, the integrated hardware module (smart glove) employs vibration motors and proximity sensors to detect obstacles and determine the user's distance from them. The user interacts with the other three features through an Android application. Users and Android applications communicate by using voice-based commands. The visually impaired person is given information about the obstacle after it has been

discovered by the object detection module. Before the user, the object detection module will inquire about the name of the object. Google Maps and similar apps only offer outside navigation. Your location is determined by the app using a GPS. Utilizing a WiFi connection, this method is utilized for interior navigation. It establishes the user's precise location within the structure using the access point's RSSI data. Relatives can follow blind persons outside by using real-time location sharing. The system is more functional and user-friendly because to its numerous modules and straightforward architecture. The system promises to assist blind individuals by not only detecting but also identifying barriers in their environment and providing pertinent details like the type and proximity of obstacles. Results so far indicate that the system is user-friendly and efficient. The system accepts instructions and offers audible responses, making it user-friendly.

Vanitha Kunta.et.al [6] describes Blind persons can walk on their own in the long run thanks to smart shoe design. Blind persons will be able to travel independently with the aid of smart shoes. Several sensors, microcontrollers, and buzzers are embedded into the shoe thanks to Internet of Things (IoT) technology. When the wearer steps in front of an obstruction, the shoe warns them by buzzing. Smart glasses have built-in sensors to boost efficiency, cover a larger area, and aid in object detection. They are created utilizing the Internet of Things (IoT). To prevent users from running into objects in their path, the smart shoes and smart glasses communicate with one another and coordinate their movements. The Thing Speak cloud's ultrasonic sensor creates the distance vs. time graph. The graph shows how far away things are in front of the user as determined by an ultrasonic sensor. The Bluetooth module and buzzer are activated, alerting the user to impending difficulties. In order to get rid of the drawbacks brought on by the previous systems, such as inadequate coverage of a large area, energy consumption problems, and false alarms, the system merged those two modules and made them function together.

Ezekiel Marvin.et.al [7] introduced DAVID, a digital assistant application, in this system with the intention of assisting visually impaired persons in reading text on actual things and offering real-time voice feedback. Speech synthesis, text recognition, and speech recognition are all combined in VUI human-computer interaction technology. The goal of this program is to recognize user voice input and carry out user requests. The system can recognize text on actual things and instantly give the user audible response. The author wants to make it clear that DAVID is still a work in progress and isn't perfect. Therefore, additional work is required to enhance the system. For example, DAVID should be able to inform the user whether or not to rotate their phone up, down, or zoom in or out for improved text detection. Future work may also involve adding new functionality to the application, such as object detection, facial recognition, a text translation system, and low battery usage. Since DAVID is compatible with common gadgets (in this case, smartphones), people from all social strata will be able to take advantage of its features. DAVID is an A.I. that represents the future of human-computer interaction. and VUI system that has the potential to change how people interact with computers since it will make the need for well-designed program redundant because modern computers are capable of understanding user wants and preferences, which makes processes more effective.

Teja Chava.et.al [8] studied; shoe-based assistive system architecture is described. It makes use of sensors and IoT devices, as well as computer vision algorithms, to perform tasks including obstacle detection, avoidance, and navigation. The technique uses voice guidance from a smartphone and directs the user with suitable haptic feedback determined by a variety of sensors and actuators. The user will be able to browse to a specified location as the second function. This can be integrated into the programmed utilizing the voice assistant and Google Maps API. These components can be used to create a comprehensive system that helps ease navigation for people with visual impairments. In this piece, a system that combines the aforementioned features in order to assist those who require support. The technology that is being demonstrated consists of a shoe with an embedded Internet of Things device (sensors and actuators) and a smartphone application to make it easier for persons who are blind to move around. It efficiently recognizes numerous objects in the immediate area with the use of computer vision and correctly warns the user.

Sneha Rao.et.al [9] of this technology is to give blind individuals a voice assistant to help them with tasks like finding things or things, identifying people by their emotions, interpreting the environment, reading, etc. To help those who are blind or visually handicapped, this remarkable technology makes use of machine learning (ML), artificial intelligence (AI), image and text recognition. An Android smartphone app with features including money recognition, e-books, voice assistants, chat bots, and image recognition

will be used to implement this notion. It is a practical way for persons who are blind to interact with the outside world and use technological features. The program reads text from online pages and then automates any web page utilizing selenium text-to-speech and text-to-speech modules. This entire project is intended for people who are blind or visually impaired and is quite basic. It can also make daily duties easier for them. The Android software makes use of a voice-based virtual assistant system created specifically for this purpose to aid and direct visually impaired people as needed in daily tasks. This article offers a modular way to increase web-based accessibility for those with visual impairments. It is a practical way for persons who are blind to interact with the outside world and use technological features. The program reads text from online pages and then automates any web page utilizing selenium text-to-speech and text-to-speech modules. This entire project is intended for people who are blind or visually impaired and is quite basic. It can also make daily duties easier for them. The Android software makes use of a voice-based virtual assistant system created specifically for this purpose to aid and direct visually impaired people as needed in daily tasks. This article offers a modular way to increase web-based accessibility for those with visual impairments.

Dr. B. Harichandana.et.al [10] Walking outside is particularly challenging for the blind due to poor road conditions. being on guard at all times to avoid the negative effects of sprinting up and down stairs, hitting stationary or moving objects, or slipping on wet surfaces. Additionally, kids might occasionally be in trouble and wish to let their family or friends know where they are. The stick can also detect damp and wet surfaces, vibrating the user when it does so. With the aid of technology, several issues facing the blind can be resolved. The proposed approach enables communication between the blind and their surroundings by utilizing the Internet of Things (IoT) paradigm. To identify abnormalities like obstructions, stairs, and damp terrain, various sensors are used. The moisture sensor's operation is straightforward. The algorithm raises a vibratory alarm to the user using the vibration motor located at the top end of the stick utilizing the sensor's Boolean output after scanning the surface. The GPS module is queried for the user's coordinates when it senses a button press from the user. The suggested prototype consistently and accurately detected numerous obstacles of varied sizes that were in the user's way and was able to send SMS messages to his friends with the user's precise locations. Additionally, when lost, it has been easily found using the RF remote controlling the event of an emergency or crisis, the stick can also communicate the user's location to their careers. A small, high-performance sensor can be added to this to further enhance the design and minimize the joystick's footprint. To better match the angle of the stick, slightly adjust the sensor's angle.

Kabalan Chaccour.et.al [11**]** to their inability to distinguish between the environment and the terrain, blind people have limited movement. As they go about their daily lives, they are constantly in need of assistance and support. Solutions were put out decades ago, and now, thanks to developments in technology and integration, they are rapidly improving. A lot of tools have been applied to actual circumstances, while some ideas have been left as potential research topics. This article outlines a novel method for spatial navigation systems that enable people with vision impairments to travel around a space without restriction (home, office, etc.) without the aid of others. Each room's ceiling is covered by an IP camera as part of the system, and the subject's smartphone serves as the HMI (Human Machine Interface). A computer receives the frames and analyses the surrounding area in order to find and identify items. By identifying impediments, computer vision guidance algorithms assist users in reaching their destination or locating personal things. This was in Through a straightforward mobile application; you can charge by voice message. The application provides feedback to the user via voice messages. The system is a dependable option that helps these people navigate inside by showing them the best route to take to avoid obstructions. An innovative indoor navigation system for the blind is shown in this article. The suggested method's straightforward architecture enables the subject to function independently both at home and at work. The system offers indoor object detection, obstacle avoidance, and navigation aid. Subjects merely need to pick up and walk around with their smartphones, unlike other systems used for similar activities, and no particular manipulation abilities are needed. The system's complexity stems from the fact that computer vision processing algorithms interact with you naturally. Initial tests have yielded good results, and system users can utilize it with confidence. Inside a house or business, the user can move about freely without any assistance. Additionally, users are informed when they run against barriers, and they may quickly locate lost items (). The system's Watch Eye feature can be activated by users using a straightforward voice command from their mobile device. The system will continue to be developed in

the future. When motion is detected on an object, the system automatically launches the application at the application level (lifting a chair, walking, etc.). Under static conditions, it can also enter sleep mode to reduce battery usage. To prevent unsafe circumstances, the battery level can also be spoken aloud through voice message.

Mukesh Prasad Agrawal.et.al [12] Blindness is one of many issues that people are powerless to change. A person is deprived of the world's vibrant visual splendor by the. The absence of innate beauty, however, becomes one of these people's least concerns. This is due to the numerous obstacles we must overcome in order to carry out even the most fundamental duties in our daily lives. Their main worries are related to mobility, such as crossing roads, travel, or other public areas. Human support is always required for this. However, on occasion they are powerless in the absence of such assistance. Their dependency damages their self-esteem. By touching or poking impediments in their route, they utilized walking sticks to navigate in the past. This puts them and others in danger because it leads to numerous mishaps. Because we live in a technologically advanced society, we can assist these people of various abilities by offering them technology-based solutions. "Smart Stick" is the name of the system. a gadget that uses the joystick's range to identify impediments to direct the user. With the aid of several implanted sensors, it locates all obstructions in its path. The microcontroller takes the information and sends it as a vibration that warns the user of an impediment. It is a powerful tool that will be very helpful to those who are blind. This device serves as the assistive senses for blind individuals, which is a very useful invention. It is a thoughtful design that only considers everyday use. Even for mass production, heavy equipment is not necessary. Based on the foregoing, a smart joystick is a straightforward, affordable, and manageable electronic pointing device that provides the blind and visually impaired with helpful assistance and support. The tool is effective and distinctive in its capacity to establish the origin and proximity of an object that a blind person may come into contact with. Regardless of the height or depth of the blinds, you can examine the area to their left, right, and front. a user-friendly tool that potential recipients could utilize.

Masayuki Murata.et.al [13] gives the creation and use of a blind person's ultrasonic sensor-based cane. The buzzer is used to alert people while the HC-SR04 ultrasonic sensor module is utilized to identify impediments in the way of blind persons. A PIC 16F877A microcontroller is used to implement the suggested system. This cane makes it possible for blind individuals to travel safely. At a range of 5 to 35 cm, it can identify obstructions. This article suggests a design for an intelligent blind joystick based on an ultrasonic sensor and successfully executes it. It works well as a navigational aid for blind persons. allows the Smart Blind Joystick to emit an alert when it detects a barrier in the user's path. The technology in place is capable of detecting any obstruction between 5 and 35 centimeters in height. This can be expanded to enhance the range of obstacles detected and send this data together with the integrated GPS feature to send this data along with voice instruction for extra assistance. There are obstacles found. Roadblocks on the path.

Masayuki Murata.et.al [14] A promising solution to support independent mobility for people with vision impairments is continuous and accurate smartphone tracking. Although indoor positioning techniques have received a lot of attention, they are not yet ready for use in big and complicated contexts, such as shopping malls and hospitals, where Support for navigation is required. The present set of important strategies that improve probabilistic localization algorithms enables accurate, continuous, and real-time localization with cellphones in such circumstances. The method, which was created for smartphones, makes use of Bluetooth Low Energy (BLE) beacons' received signal strength (RSS) and mobile inertial sensors. A 21,000 square meter shopping Centre with three multi-story buildings and an open tunnel will use the evaluated and suggested technology. Tests in this field demonstrate that the suggested methods to increase location accuracy are effective Field tests with participants who are visually impaired attest to the proposed system's effectiveness in practical use cases. It was crucial to create a navigation system that could achieve a high level of accuracy in actual environments at the building scale in order to provide automatic step-by-step indoor navigation assistance to the visually impaired. In this post, we examined the difficulties that must be addressed in order to provide navigation support in a certain multi-layered real-world scenario. We built and implemented a location system that improves the probabilistic location algorithm with a number of changes to obtain precise location over time in order to handle the issues in a unified framework real. Using ground truth information gathered in a vast indoor environment made up of three multi-story buildings and an underground passage, the team conducted a number of tests. Advanced modules' ability to increase location accuracy and offer real-time navigation in practical situations has been proven by test evaluations. The average position

error specifically decreased from 3.0 m to 1.6 m. The suggested localized system facilitates visually impaired participants' independent mobility, as shown by the system's real performance in a study including those participants.

Sujith B Kallara.et.al [15] This article describes the development of Indriya, an intelligent assistive device that attempts to aid the blind. The Sanskrit word "Indriya" literally translates to "organ." The Indriya is a little handheld device for the blind that functions as a wise ally when used with a cane. The device offers full voice assistance for quick button presses and easy navigation. Additionally, it has a confirmed accuracy of 80% when separating things from people and can identify obstructions up to 3 meters in front of it. A precise collision warning is supplied via vibration and vocal feedback. Indriya combines support for Android and the Internet of Things to employ fewer sensors and increase intelligence (IoT). With this effort, we hope to offer a novel, affordable, and trustworthy method of assisting blind individuals in exploring the potential and strength of smartphone technology for navigating. Indriya, the study discussed in this article, offers a novel and reasonably priced way to help the blind navigate. The goal of the project is to improve upon the drawbacks of current systems and create a dependable smart gadget without sacrificing the comfort of the blind. By reducing the number of sensors utilized and making the gadget smaller and less expensive, Indriya succeeds in her goal. Indriya is a clever and practical device that enables independent and safe online browsing thanks to Android and IoT support. In the future, firmware and software will be updated to include more technological features including step detection, gradient detection, hardware modification for smaller size, lower power consumption, and improved obstacle detection range.

III. Conclusion

An aid for those with vision impairments was reviewed in this article. An overview of prototypes that have been implemented but have not yet been used is provided in this paper. The availability of all assistive technologies for blind individuals was surveyed. It lists issues that persons who are visually impaired deal with on a daily basis and offers solutions. We are enhancing the system to assist visually impaired persons in various industries so they can become independent and find work on their own based on the survey results. The future work is to implement a light weight IoT tool for blinds using computer vision and Natural Language Processing (NLP) to covert text to speech conversion and vice versa.

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