IoT based Smart Devices for the Visually Impaired People

Widanapathirana W.P.V.K
IT19018560
Department of Computer Science and Software Engineering
Faculty of Computing
Sri Lanka Institute of Information Technology
vichakshi64@gmail.com

Diwyanjalee K.V.S
IT20115852
Department of Computer Science and Software Engineering
Faculty of Computing
Sri Lanka Institute of Information Technology
kvshashadiwyanjalee@gmail.com

Warnakulasuriya I.S.G
IT20115920
Department of Computer Science and Software Engineering
Faculty of Computing
Sri Lanka Institute of Information Technology
greshanw@hotmail.com

Perera J.S
IT20097042
Department of Computer Science and Software Engineering
Faculty of Computing
Sri Lanka Institute of Information Technology
shevanthapraneeth@gmail.com

***Abstract*— The Internet of Things is a new revolution of the net. IoT allows network-enabled objects to be heard and remotely controlled, creating opportunities for direct physical integration into computer-based systems, leading to reduced human intervention. The mobility of visually impaired people without the assistance of someone else has become a tremendous major task. The term Internet of Things (IoT) has proven to be very beneficial for blind people to find their way home through communication between user and device. This review examines and analyses how IoT is used to help people with disabilities visually perform tasks without the help of others. This review also criticizes the commonly used devices for the visually impaired as well as IoT-built devices and equipment for blind people. This review paper carefully examines the differences between commonly used non-IoT devices and IoT-based smart devices so that visually impaired people can perform their daily tasks more easily. The discussion section of this review paper is used to evaluate the various types of equipment available to blind people and devices being processed.**

Keywords*— *IoT, blind, devices, visually impaired people, smart canes

INTRODUCTION

One of the most important senses in almost every living thing on earth is vision. Vision helps to establish a connection with nature. About 65 percent of people have visual impairments, and 82 percent of all blind people are 50 years of age or older. And the price continues to rise. People all over the world are experiencing new vision problems. People who are blind or partially sighted are dependent on other resources such as a light rod or other people. When they are in familiar places, they often memorize directions and boundaries on their route and navigate based on what they have memorized. However, depending on one's memory from one location to another location does not mean that it is safe for the blind. Since blind people do not always receive help, there is a need for equipment, such as crutches, to support the visually impaired in all aspects of life. At first, people with visual impairments did not believe in the electronic aids that were now available on the market. Dogs and white sticks were preferred over electrical appliances, often because of reliability issues and high costs. As a result, durable and inexpensive electrical appliances are designed for the visually impaired to replace the many difficulties they face. We live in an age when technology is advancing at an alarming rate. It helps us to do repetitive tasks, allowing us to devote more time to the most important tasks. Artificial limbs, health support tools, and drug development are examples of how technology can play a vital role in a person's life. As a result, an increasing number of professionals are trying to build and solve any problems that we may encounter. This work aims to help people who are blind or visually impaired. As a smart blind guidance system, the system is designed to be easy to use. It is designed to help the blind and partially sighted avoid obstacles that might be dangerous in various situations while allowing them to fend for themselves. Our strategy is to create a simple, hands-free, and easy-to-use system that allows visually impaired people to go wherever they want. The purpose is to enable the consumer to become self-reliant and to protect him or her from potentially harmful substances.

It has long been known that men have many mental and physical problems that paralyze and hinder their daily activities. Among these, one of the most common causes of blindness is the inability to see the world around them. These disabilities range from a wide range of visual impairments to being able to look at objects at different distances either short or long. Blindness is caused by a variety of genetic factors, accidents, aging or even birth defects, and another poor visual acuity when looking at screens. Medicine is not what it used to be then but blindness is not something that can be completely cured. It is no secret that the growth of technology is growing rapidly and reaching out to all areas of technology

be it education, medicine, tourism, shopping, and the economy. With no cure for the blind and a growing need for people to be able to live on their own without the help of a blind person, scientists and doctors are working together to develop technological solutions to help the visually impaired find their way around. In this regard, the Internet of Things has played a major role, especially with the use of Artificial Neural Networks to identify objects and people around them. From smart walking chairs to shoes and glasses, to great programs such as home security and shopping and tourism technology soon offers other ways for blind people to live as normal a life as possible without allowing their disability to isolate them from others.

DISCUSSION

According to figures released by WHO (World Health Organization) in 2010, there are an estimated 285 million visually impaired people in the world, of which 39 million are blind. In addition, it also identifies major causes of impaired visual acuity refractive errors (43%) and cataracts (33%). Turns out the first cause of blindness is cataracts (51%). Visual impairment has become a global health problem. Therefore, the majority of researchers have done research based on blind people using IoT. Researchers have discovered several gadgets and have made changes in those gadgets that may help blind people to get to their destination with minimal obstacles. Some of the most prominent and existing products on the market for visually impaired people are white canes, smart canes, and RFID-based mapping systems.

Challenges faced by Visually Impaired People

Blind people face a number of visible challenges every day from reading the label on a frozen dinner to finding out if they are at the right bus stop. Blindness may be caused by disease, injury, or other visual impairments. Official blindness means a person with an average vision of 20/200 or more, explains the Iowa Department of Blind. For example, a person with a vision of 20/200 sees something from 20 feet a person with a complete vision of 20/20 can see from 200 feet. Knowing the challenges of blindness may help blind people to understand what blind people are going through on a daily basis.

- Social - Blindness creates significant social challenges, often in terms of activities that a blind person may not be able to participate in. Often, blindness affects a person's ability to perform multiple tasks, greatly reducing his or her chances of employment, explains the World Health Organization. This will affect not only one's finances but also one's self-esteem. Blindness can also cause difficulties in participating in activities outside the workplace, such as sports and academics. Many of these social challenges reduce a blind person's ability to interact with people, and this adds to the insecurity.

- Environmental - People who are totally blind or visually impaired often find it difficult to walk outside well-known places. In fact, physical activity is one of the biggest challenges for blind people, explains World Access for the Blind. Walking or just walking on a crowded road can be very difficult. As a result, many visually impaired people will bring in a sighted friend or family member to help them roam the unknown. Also, blind people should read all the details about the home environment. Large obstacles such as tables and chairs should be in one place to prevent injury. If a blind person is living with others, each member of the family should be diligent in keeping the routes clear and in good condition.

- Technology - Technology also poses a challenge for blind people. For example, a blind person cannot read the information on a web page. Internet search requires screen reading software to read the information on the website, but this may require significant time to learn the process. Visually impaired people may have difficulty viewing websites as well, especially small fonts, images, and screen colors used by many sites. Visually impaired people may need special equipment that can greatly enhance the screen. Other technologies, such as music players that require visual selection of music, or messages, will also create challenges for blind people.

- Finding/Keeping a Job - Work is a completely different thing if you do not see it clearly. Considering the easily accessible unemployment and work environment, one can already think about why hiring a visually impaired person could not be considered a corporate obligation. This has a detrimental effect on the self-esteem and emotional well-being of the visually impaired, while completely undermining their economic independence. Lacking the opportunity to feed themselves, people who are blind or partially sighted cannot stand on their own.

- Leisure - Lack of access to the visually impaired is part of the problem for blind and partially sighted people. Recreation is another on the list. There are a limited number of activities that include visually impaired people, as simple as visiting a museum. In addition, the literature available is not limited. According to the World Blind Union, “more than 90 percent of all printed material is inaccessible to the blind and the blind.” The Internet, as in the new era we all go online for fun, is also not fully accessible, as many websites ignore their visually impaired visitors and do not check the content accessible to the blind and visually impaired. Considering these points and many more that are not listed here, one can clearly see that there are limited options for recreation for the visually impaired.

Devices

The "thing" in IoT is the first IoT solution. It is usually a data creator and interacts with the physical world. Items are

often very limited in terms of size or power supply. Therefore, they are usually organized using microcontrollers with very limited capabilities. Microcontrollers enable specialized IoT devices for specific tasks and are designed for mass production and low cost.

Many researchers have used modern technology to improve their equipment. Many of them consider safety and security to be the most important factor when designing/developing a device or technology. In addition, a few researchers have considered price and awareness about the device. As noted, many visually impaired people are unaware of this newly installed machine. There is a gap in marketing those profitable devices among the visually impaired so that most blind people are often unaware of the tools and technology they can use to make their lives easier. In addition, visually impaired users of the equipment should be provided with additional information about IoT, cloud storage management, navigation, and smart photography. As IoT has made great strides in the field of technology, it is widely accessible, accessible, and extremely dangerous, and paves the way for the rapid growth of connected objects across the Internet to help and support visually impaired people. There have been times when users have expressed fears about using ultrasonic devices, believing that they could affect their health. This is due to a lack of information about technology and the use of IoT.

There are a variety of gadgets that we have seen, which in our view, can be customized for greater use. Some of them are clever sugarcane and blind sticks that work in many ways of them. These devices should be upgraded in the future by removing existing obstacles and threats. When considering sugarcane, it can be continuously improved to detect liquid in a moving path. And when you draw the consideration of a multi-functional blind rod, it can be further expanded by adding small, efficient sensors, which can enhance the design while minimizing the space required for the handle. A few adjustments to the sensor angle setting can be made to move in line with the direction of the rod relative to the edge, rather than being set at a fixed angle

White canes

A white cane is a tool used by many people who are blind or visually impaired. The white cane allows its user to explore the area around them to detect obstacles or stop signs, but it is also useful for viewers to identify the user as blind or visually impaired and to take proper care. White sugarcane does not contain any other element of finding and identifying objects and obstacles around you. It is a simple machine that does not have to communicate with a visually impaired person to avoid obstacles before dealing with them. The white reed can only see obstacles such as objects or things around it, holes, walls, stairs, etc. And these barriers can only be seen from a limited distance, one to two feet around the user. Therefore, there are limits to identifying distant obstacles. Thus, several other products are proposed to help them. For some reason, white canes are the most common and widely used visual aid. However, this may be due to the cost of the product, or they may not be aware of the smart products available today.

Under this section, some selected research papers are reviewed on how IoT is used to help blind people. Most applications are for a location for the visually impaired. There are a few web-based and mobile-based applications that are built to help them as they are more likely to erroneously navigate and end up elsewhere. But there are very few things that are suggested to help them with their daily needs. Therefore, with the help of IoT, there are several IoT products designed to identify objects and obstacles around them so that they can get to their destination without much hassle.

Some possible solutions for the visually impaired using IoT are as follows.

A. Smart Canes

Smart cane is a tool used by visually impaired people to find the obstacles in front of them. It uses ultrasonic sensors to identify obstacles and alert the user through vibration. An ultrasonic sensor is an electrical device that measures the distance of a target object by emitting ultrasonic sound waves and then converting the resulting sound into an electrical signal. Ultrasonic sensors can also detect objects without being influenced by their color, although they have the same shape and contrast, objects can be detected with the same settings. The vibration of the sensor hits the obstacle and is visible. Therefore, the vibration produced will depend on the distance between the visually impaired and the obstruction. Vibration force is directly proportional to the distance from the obstacle. This means that the vibration is powerful, an obstacle or an object approaching, and vice versa. It also has a sound system that sounds when the user is close to an obstacle. In addition, it also has a built-in speaker that helps the visually impaired person navigate using voice commands. This electronic program can be easily attached and disassembled so that the user can change it whenever needed. It also fits over a standard white stick that benefits the user to use it the way he or she likes. As this device emits ultrasonic waves to detect a barrier distance compared to the user and restores vibrations, many people think that the device is harmful to the human body. But it is said that it does not harm people and is easy to use. Also, it is said that the system is not fully developed and most ordinary blind people are unaware of this machine. In addition, some canes have built-in GPS (Global Positioning System) icons with the sound that helps a person find their way around the area. This not only helps the person find their way but also helps the family member find the person's location if they choose to send an SMS (Short Message Services) informing them of the loss. This SMS will contain links to the person's location and be sent via a built-in microprocessor at the request of the blind person.

B. Body miro and nano-sensors

The retinal prosthesis is designed to restore some vision to patients affected by retinitis pigmentosa and age-related macular degeneration, two diseases that cause degenerative blindness. A pair of mirrored cameras can be used to transfer image data to a retina stamp, which is made up of a network

of tiny body sensors. This artificial retina uses electrical impulses to activate appropriate ganglion cells, which convert these electrical impulses into emotional signals. The generated response is transmitted through the optical nerve to the brain. Bio-Retina is designed to replace the damaged photoreceptor in the eye with a 5000pixel retina (second generation) retinal detachment. It converts naturally received light into an electrical signal that stimulates neurons, sending Bio-Retina-captured images to the brain. Parts of nano-sized implants are powered by special eye-opening mirrors.

C. Smart shoes

Blind people find it extremely difficult to walk without help. In many aspects of life, they must depend on others. The biggest problem is finding the way when they walk the streets. It is almost impossible to spot all the obstacles in their path. The concept of smart shoes offers a long-term solution for blind people to walk the streets without help. A smart shoe will help a blind person to get to his destination independently.

The smart shoe is an IoT-based system for the blind and uses an Arduino UNO board with ultrasonic sensors mounted on it. It also contains a variety of sensors, buzzers, and microcontrollers installed in the shoe. Whenever a user walks in front of an obstacle, the shoe frightens the user by making loud noises in the shoe. Buzzers vibrate and buzz to indicate left or right turns on the road. The vibrator can also be used to let the user know that the bar is approaching. If there is a barrier on the right of the user, the vibrator on the right will be sound, and if there is an obstacle on the left of the user, the vibrator on the left will be noisy. If one needs to move forward, the front vibrator will vibrate, and when one needs to stop, all four vibrators will vibrate. Ultrasonic sensors are connected to the servo motor and placed in front of the shoe. Ultrasonic sensors detect obstacles in front of the shoe and the servo motor helps rotate the sensor to monitor and capture as large an area as possible in front of the user. These are connected to the buses that notify the user of the location of obstacles near the range. Smart shoes contain electric piezo panels built into the sole of the shoe that enable the user to generate electrical energy while on the move and this current output can be used to charge batteries. Battery charging has always been a common problem in IoT technology. These piezo power panels also solve the problem of battery charging. The data collected and stored by the ultrasonic sensor will be sent to the cloud for processing and then analyzed there. The machine learning algorithm can be developed in the future to make the device automatically when the user is in-house. By accessing the cloud, the caregiver can stay informed and monitor the visibility of each individual in real-time. There are some vacant holes that can be used to enhance this product by adding new sensors.

D. Single wearable device developing for the Assistant aid of the blind

A team of researchers has proposed a single wearable system that includes face recognition, location tracking, a newspaper reader, and a quality detection module integrated into a single device. It is designed to design using advanced technology to avoid the most common rod. This device uses a camera instead of reading text using fingers. Face detection is widely used for security and policy purposes. These researchers have developed a Raspberry Pi-based face recognition system that can be used using standard face recognition methods and monitoring methods such as HAAR detection and LBP (Binary Area Pattern). Using the HAAR cascade algorithm face can also be detected and detected using the LBP algorithm. HAAR is a machine-based method in which the cascade performance of a large number of positive and negative images is trained in bulk. With a face detector, the OpenCV algorithm is also used, which contains pre-trained detectors for faces, eyes, etc. LBP has made it easy to define and define the texture and shape of a digital image. This is achieved by dividing the image into different sub-regions. Live images are compared to previously saved images and if the images match the user you will be notified by the speaker. In-Text Recognition, the Raspberry Pi processor board served as the basis for this model. Border components, such as camera, speaker, and character and number monitor, serve as a visual interface between the device and the user. Optical Character Recognition (OCR) is widely used to scan text and output it through a speaker. In addition, the camera scans and captures paper and thus the processed image is recreated into a text format by the system. It is then notified to the user by the speaker. It simply takes a picture, makes it local and extracts the text region, and processes it with readable code. This helps visually impaired people to grow up since then they do not need help getting help to read the bill, book, article, and so on. Similarly, the MRP standard detector system captures an image, makes the text area geographically, the text area is detected in the image, identifies the value, and converts the text into speech with the e-speaker tool. Location identifier or location tracker is built using the GPS module. The GPS module is basically used to determine the location. Location information is provided to the user by a speaker. Using audio signals, a visually impaired person delivers discipline and receives a corrective response. The GPS receiver always sends latitude and longitude values, and audio signals are used to provide the user with links. Electrical Equipment Controllers that use voice commands to control electrical equipment such as fan, electric lamp, air heater, etc. Electrical controls convert voice signals into binary code, which sends the binary code to the controller as small as input. It then produces output according to voice input. This system makes it easier for visually impaired people to manage modern items without having to go to a set point. In addition, the speaker is used to extract MRP rating, news, paper title content, road signs, GPS location for user navigation. Also, switches are used to change the operating mode of the device. The fixed storage environment of the device makes it easier and more convenient for the user as he writes and deletes the content that is repeatedly stored on the system storage.

E. RFID – based Assistive Devices

An important RFID-based application is a roaming program. It helps blind people to find their way into an unfamiliar area. RFID tags are still distributed locally.

Tourism has become a major source of revenue for governments and retailers in many lands. The mall marketer wants the mall to attract a wide range of buyers, including visually impaired people. The aim of this study is to improve the service of blind people who allow them to shop on their own, without the help of others, using their smartphones. People with poor eyesight may also be inclined to buy on their own, without the help of others. If a person with a visual impairment enters a shopping mall, he may need to find out what types of shops are there and what they are selling. The proposed solution relies on RFID technology and focuses on assisting visually impaired people, by locating them and providing them with the necessary information about nearby stores, and by directing them to their preferred locations. The app can also provide a warning service based on the real-time, closing time of a particular store, and predictable required purchase time, allowing the user to make their preferred and necessary purchases in advance. The system uses RFID technology to provide a low-cost solution to this problem. The cost to store owners will be the cost of the RFID tag. Each store in the mall should not cost more than $ 1–2. As a result, shop owners will be able to advertise their products to everyone in the mall and increase their sales by attracting customers and making more money without paying for advertising.

The only requirement for users financially is to download the Android app and have a "Grok," a device that connects to the cell phone via an audio port and allows them to use the stand and navigation system on their phone. RFID technology is used in the framework, which includes the reader and the marker. RFID tags will be distributed throughout the mall, each tag belongs to a specific store. This allows the blind user to see the store. Supermarkets that decide to offer this service to the blind will have a website that contains a map with relevant information for each store in the mall. Store name, store location, and store offers will be included in this information. The mobile app is intended for use on a blind person's cell phone. An app allows a user to select a specific website associated with the shopping mall they wish to visit. The app will contain various web pages for different supermarkets and when a user selects a local shopping mall, the device downloads a map and all the information about the stores in that mall. RFID tags and user phone interact. When a user reaches the RFID mark level that represents a particular store, the device automatically starts to provide voice information for that particular store.

F. Multifunctional blind stick

Existing systems, such as crutches, can help blind people to navigate by allowing them to see obstacles in their path. In addition to the above, smart belts, smart rings, smart canes, and other accessories can help themselves to detect obstacles using ultrasonic or laser sensors. To alert them, these systems emit sound or vibration in response to identified obstacles. Expensive, inefficient, unreliable, and features and usability are severely limited by the limitations of existing systems. The proposed model consists of an ultrasonic sensor, humidity sensor, infrared sensor, shock button, GPS module, GMS module, buzzer, speaker, vibration monitor, RF receiver, RF transmitter, remote. analyzes and monitors situations and takes appropriate action. Ultrasonic sensors can be used to calculate the distance to an object. It sends a sound wave at a certain frequency and waits for it to return. It can calculate the distance by measuring the time elapsed between the two conditions. Two ultrasonic sensors are mounted on a pole to detect various obstacles such as people, cars, and rocks outside and walls, furniture inside. The presence of fluid in the path of the visually impaired is detected using a soil moisture sensor. The two probe sensors act as variable resistors. When placed in a wet environment, electricity conducts very quickly, leading to lower durability. As electricity conducts poorly in arid areas, additional resistance is provided. The sensor learns resistance between these two probes to determine the humidity level. The infrared sensor is made of infrared LED and a photodiode that can be used to both produce and detect infrared radiation. The photodiode detects the illuminated IR waves transmitted by the LED. RF transmitter and receiver make RF module. This module can be used to trace a missing rod. Serial data can be transmitted using an RF transmitter. Similarly, an RF receiver can receive this transmitted data. The transmitter is installed on a simple remote control for this project. The rod has a receiver attached to it. The GPS module can be used to monitor the physical location of a blind person by locating GPS coordinates. The GSM module is used to transfer blind user location to appropriate contacts. The buzzer is a widely used audio generator. If the rod is lost, the buzzer is activated when the button on the RF remote is pressed. Vibration is produced by a vibrating engine, which is a mechanical device. When a moisture sensor detects the presence of fluid in the path of blind people, it works. The pressure button acts as a warning/stress signal to the user, and when pressed, will send the user's location message to the appropriate contacts in the event of an emergency. The Arduino Uno microcontroller is used to connect various sensors, switches, and modules. It acts as a decision-making system by detecting various signals from a variety of sensors and effectively activating the output sensors. The switch interferes with the power supply by disconnecting or reconnecting the conductor to the electrical circuit. It is used to save battery life by turning it off or on while not in use. The controller is powered by a 12-rechargeable Li-ion battery, which then provides the required power to all sensors and devices connected to it. The blind stick introduced in this paper will help the visually impaired user to navigate through various obstacles and obstacles. In an emergency or discomfort, the staff may also notify the user's caregivers of their location. The rod can be obtained with the help of an RF remote control. This can be further improved by combining smaller and more efficient sensors, which will improve the design while also reducing the amount of space taken up in the grid. A few changes in the positioning of the sensor angle can be made to move like a rod with the ground so that they are more likely to point directly than to be positioned at a vertical angle.

G. Smart Security Devices and Systems

There are systems currently in place to detect a visitor visiting a home, office, or other building in the form of face recognition, fingerprints, and sometimes even voice. With this feature, the user will be notified if the visitor is a well-known relative or friend or if he or she is a completely new person and potentially a threat. However, with the complexity of human features and a large amount of background noise, this can be a daunting task for a machine trained with clean and simple data that is cleaned and filtered to get the most accurate results. Ignoring these threats, the system devoted to this specification can be a good tool for identifying burglaries. Although photographic information can be viewed on a smartphone or laptop via Wi-Fi, it may not be helpful for blind people, and this is where voice alerts can come in handy for blind people. The device will then serve as a visual aid for the visually impaired. In addition, the proposed system with its feature recognition capability will allow the user to identify any objects that a person nearby might be carrying. The Smart Security System incorporates a combination of technologies to achieve the best results. The Raspberry Pi camera captures video, and the captured video is integrated into the Raspberry Pi module. The captured video is split into frames by module and face and feature removal is processed. The recovered faces are compared to an existing website for segmented images of people with access to security. In addition, Artificial Neural Networks and Open-Source Computer Vision have been used to process real-time images to increase system accuracy compared to other technologies in the current market. Android libraries and Applications integration have been used to compile and transfer data to the owner's mobile phone or smart device using IoT (Internet of Things).

H. Smart glasses

The main purpose of smart glasses is to help blind people and visually impaired people by developing new technologies that allow them to move without the help of another person through voice commands. Smart glasses work in much the same way as smart shoes because they help or improve the discovery of the object well. The sensors that are also in the smart shoe are connected to a pair of mirrors and play a similar role in detecting obstacles in front of them. This clever mirror design will help make it more efficient by covering a wide area, allowing even taller people to see the obstacles in front of them. The second radar in this module is mounted on the mirrors and is positioned at the head in a way that covers the entire front of the user's head. Two small modules are also included in this module. One is to set up the main radar and the second submodule is to set the module parameters. A collection of batteries can power smart glasses, but the weight of the glasses will be unacceptably high. To prevent this from happening, power is available from the piezoelectric generators in the shoe. If there is a disturbance at the user's head level the main radar can detect it, commands given to the main radar will be discarded and removed by a Bluetooth-connected hearing aid. The Bluetooth module helps the user avoid obstacles so that they can move around smoothly. Smart mirrors are made using IoT, which is also sensor-assisted and assists in the acquisition of an object by covering a wide area, in order to improve performance. Smart shoes and smart mirrors work together and interact to prevent the user from colliding with any obstacles in his path. Smart shoes and smart glasses are two integrated modules that work together to eliminate existing system barriers such as location, power issues, false alarms, and more.

CONCLUSION

In this paper, an overview of the IoT solutions available for visually impaired people is presented. Various types of visual aids were analyzed. This analysis helps in selecting appropriate blind assistance. These proposed methods remain open for future investigation. Internet of Things (IoT) is a network of virtual reality devices, systems, and other technologies to communicate and share data and information between devices and systems over the Internet. These devices vary in complexity from standard household appliances to advanced industrial equipment. Experts predict that by 2025, there will be more than 22 billion users of IoT-connected devices, and the number will continue to grow. This work aims to help people who are blind or visually impaired. Portable and portable gadgets have become very popular for people today. Clothing helps people by reducing the amount of time they spend on their hands and reducing the amount of work they have to do. These devices are especially useful for visually impaired people. This reduces the difficulties they have to face and makes it easier for them to navigate the human world. The concept of smart shoes offers a long-term solution for blind people to walk the streets without help. A smart shoe will help a blind person to get to his destination independently. The main purpose of smart glasses is to help blind people and visually impaired people by developing new technologies that allow them to move without the help of another person through voice commands. Smart shoes and smart mirrors work together and interact to prevent the user from colliding with any obstacles in his path. Smart cane is used by visually impaired people to detect obstacles in front of them. It uses ultrasonic sensors to identify obstacles and alert the user through vibration. a blind service that allows them to buy on their own, without the help of others, using their smartphone has been developed using RFID technology. A single wearable system that includes face recognition, location tracking, a newspaper reader, and a measurement module integrated into a single device to make the lives of visually impaired people much easier. The blind stick will help the visually impaired user to navigate through various obstacles and obstacles. In an emergency or discomfort, the staff may also notify the user's caregivers of their location. Blind people will benefit greatly from these devices because they will

enable the blind and the visually impaired to move in and out without assistance, enabling them to be independent.

ACKNOWLEDGMENT

The authors would like to thank the Distributed Systems module team for promoting research among students by encouraging students to learn about current research topics and giving students the opportunity to write this review paper. The authors also thank the Sri Lanka Institute of Information Technology (SLIIT) for providing us with access to the IEEE website and as a result providing us with access to and use of the vast amount of information available.

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