"ACHAKSHUS" – An Innovative Technology for Visually Challenged and Blind People

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ABSTRACT

As we look back into our lives, the greatest gift that all of us would undoubtedly cherish is the gift of vision. Vision allows us to see the world around us and also helps to navigate through an unfamiliar environment. Visually impaired people are often unaware of dangerous in front of them, even in familiar environments. Furthermore, in unfamiliar environments, such people require guidance to reduce the risk of colliding with obstacles. These persons find it more challenging.

Keywords : Blind People, ACHAKSHUS

I. INTRODUCTION

Blindness is very common and unendurable Disability among many disabilities. According to the World Health Organization (WHO), there are million visually Impaired people. Visually impaired people usually have problems walking & avoiding obstacles in their daily lives. Traditionally such people use guide canes to detect obstacles in front of them. Thus, visually impaired people cannot exactly know what type obstacles are in front of them & must only depend on guide canes and experiences to walk safely and in the desired path. Furthermore, when in unfamiliar environments, visually impaired people often require assistance in the form of volunteers to guide them through surrounding environment Visually impaired people cannot entirely depend on a guide can to become familiar with their surroundings or react quickly to unforeseen circumstances. Despite

our gained knowledge, sadly, our efforts are not always successful and we are presented with the responsibility and challenge of caring for people who have to cope with visual impairment, perhaps for the rest of their lives. We have to understand move out independently. There are millions of visually impaired and blind people in this world who are always in need of helping hands. Due to blindness visually impaired people are not able to read the paper and other texts which creates the major issue for blind population which leads to many problems. Another major problem such people deal with is currency(money) detection. A prototype of an intelligent guide for the blind person is successfully designed, implemented and tested. their difficulties, recognize their abilities and learn how to cooperate and communicate with them in a social as well as hospital environment. It is often within the eye hospital itself that the lack in education of health

workers and their understanding of the assistance needs of blind and visually impaired patients is all too evident. The rapid intensive use of technology nowadays has led into a dramatic increase in the demand of its usage in our daily life and make it more comfortable. There are large numbers of visually impaired people, which led us to develop such system in order to help them to avoid obstructions. Smart technology has helped blind people in many different life aspects, such as ascending stairs, reading e-mails and using computers and mobile phones. Aging is the main factor for blind people and 19% of the world's population, which are above 50 years old are getting more exposed to lose their vision. Therefore, several methods and devices have been developed and employed to serve blind people as guidance or in any other life aspects.

In summary, according to the implementations in previous studies, assistive devices for navigation for visually impaired people still focus on location and distance sensing, but cannot warn users about the types of obstacles in front of them. Moreover, distance sensing cannot provide additional information to help visually impaired people to understand their surroundings. Therefore, the practicability of such assistive devices is very low. Some solutions using RFID chips are expensive and vulnerable to damage from the sun and rain.

The feature of object identification helps the blind people to recognize what kind of object is before them and helps them to move around safely. Text reading helps them by reading out the reading out the texts before them and finally colour identification helps them to identify the colours before them. These are all done using technique of digital image processing by using compute vision2. This Prototype is light weight to carry around and this helps the blind people to move around as a normal people.

Many studies have investigated navigation for blind people. According to these studies, devices and recognition methods can be divided into the following three categories: Electronic travel aids (ETAs), Electronic orientation aids (EOAs), and Position locator devices (PLDs), which all have advantages and disadvantages. These categories are described as follows: ETAs are general assistant devices to help visually impaired people avoid obstacles. The sensing inputs of ETAs are mainly classified into depth camera, general camera, radio frequency identification (RFID), ultrasonic sensor.

OBJECTIVES

➢ Main objective of our project is to enable blind person to communicate and interact with external environment by the help of technology.

➢ The person can identify the obstacles, i.e. We are designing and building a working prototype that will help visually impaired person to sense the obstacles in front of them by sending text to speech from the system.

➢ The project also aims to facilitate the text detection and Currency detection for ex: Menu reading.

➢ This project is not just only a specific approach but also introduces a wearable prototype "SMART CAP" that will be applied in reality.

Existing System

The Project named "PARTHA: A Visually impaired assistants' system." [5] Devashish Pradeep, Rushikesh Karad, Apurva Kapse, Dr.Geetanjali Kale, Prathamesh Jadhav 2020 has been developed in the form of the smart glove which integrates Arduino UNO, ultrasonic sensors and flat vibrating motors. Ultrasonic sensors emit short, high frequency sound pulses at regular intervals. main purpose of the proposed system is to assist visually impaired people via obstacle and object detection. One of the modules (smart glove Fig. 5) of the system is very light weight and mounted on hand of the person. The combination of ultrasonic sensors and vibration motors is able to provide information about the obstacles and the direction as well as the range of the obstacles even in the low light.

Drawbacks:

➢ Cannot multitask activities, slower speed.

➢ No internet connectivity right out the box.
➢ This is temperature dependent kit.
➢ Expensive for the CPU power and memory.
➢ Limited number of IDE's

II. LITERATURE SURVEY

Literature survey in a project report represents the study done to assist in the completion of a project. A literature survey also describes a survey of the previous existing material on a topic of the report. It provides brief overviews or a summary of the current research on topics.

The Project named "PARTHA: A Visually impaired assistants' system." [5] Devashish Pradeep, Rushikesh Karad, Apurva Kapse, Dr.Geetanjali Kale, Prathamesh Jadhav 2020 has been developed in the form of the smart glove which integrates Arduino UNO, ultrasonic sensors and flat vibrating motors. Ultrasonic sensors emit short, high frequency sound pulses at regular intervals.

The main feature of this motor is, it has magnetic properties, lightweight, and motor size is small.

Because of the magnetic field, a force can be generated which causes the weight to move. The frequent dislocation of the weight generates an unstable force called as vibration.

Results: The main purpose of the proposed system is to assist visually impaired people via obstacle and object detection. One of the modules (smart glove Fig. 5) of the system is very light weight and mounted on hand of the person. The combination of ultrasonic sensors and vibration motors is able to provide information about the obstacles and the direction as well as the range of the obstacles even in the low light.

Drawbacks of Arduino:
1. Cannot multitask activities, slower speed.
2. No internet connectivity right out the box.
3. This is temperature dependent kit.
4. Expensive for the CPU power and memory.
5. Limited number of IDE's

M.Vanitha, A. Rajiv, K. Elangovan and S.Vinoth Kumar "A Smart walking stick for visually impaired using Raspberry pi" [4] this smart walking stick we use Raspberry pi to control the sensors and camera. The feature of object identification helps the blind people to recognize what kind of object is before them and helps them to move around safely. Text reading helps them by reading out the texts before them and finally colour identification helps them to identify the colours before them. These are all done using technique of digital image processing by using compute vision2. This smart walk stick is light weight to carry around and this helps the blind people to move around as a normal people.

This smart stick is an electronic walking guide which has four ultrasonic sensors. Out of these four sensors 3 sensors are used for obstacle detection which is placed on the side of the stick. The other sensor is responsible for pothole detection which is placed below the smart stick. These ultrasonic sensors range from 2-250cms. A camera is used for object identification and text identification. A toggle switch is kept which is operated by the user to enable the different features of the smart stick. Finally, the output of the stick is through an earpiece.

Result: This system gives the result for all 3600 from the position of the smart walking stick. So, this system provides overall support for the blind society in guiding. The broad beam angle ultrasonic sensors help in wide range obstacle detection. The main aim of this system is to act as a secure guard and helps the blind to be aware of their surroundings. Future work includes addition of GPS system along with designing an application and face recognition to find out the peoples before them. Addition of GPS system helps in locating the exact position of the blind person which helps their guardians to find them and provides a great guide.

Drawbacks:
1. Cost of the walking stick is too high.

2. They can't detect obstructions that are hidden but very dangerous for the blind such as downward stairs, holes etc.

3. Till now, GPS can't attach in it due to 40m to change coordinate as to follow the path/new path.

Isha S. Dubey Ms. Arundhati Mehendale "An Assistive System for Visually Impaired using Raspberry Pi" [3] The paper briefs about a different combination of a reading machine (OCR), virtual assistant and Demotics system using Raspberry-Pi which will be a combination of a great system. This is a helpful aid for visually impaired people and people with disabilities. OCR stands for optical character recognition where it recognizes the present text and converts them into audio speech using pre and post processing with GTTS (Google Text to Speech).

Google is used as its platform for virtual assistant which can be used in day-to-day life activities like checking mails, weather-forecast, news etc., further using Google Assistant, and python language we implement a voice-based home automation. The major objective of this project is to help visually impaired by using various fields of technology. By just voice commands tasks such as reading of document, home automation and personal assistant can be achieved.

Features:

1) Cortex-A53 (ARMv8) 64-bit SoC @ 1.4GHz, Broadcom BCM2837B0.
2) Bluetooth 4.2.
3) Extended 40-pin GPIO header with 4 USB 2.0 ports.
4) high-quality 2.5A power supply.
5) Pi-Camera: The Raspberry Pi Camera Board can be plugged directly into the CSI (Camera Serial Interface) connector on the Rasp-berry Pi. It is capable for delivering a crystal-clear Image.
6) Voice hat.
7) Read switch.

They have proposed a multifunctional system which act as an aid for enhancing the quality of one's life.

This project is made on various platforms like python with its various packages which is programmed and run-on Raspberry Pi 3B+ model. It was observed that personal assistants like Amazon Echo failed to provide the user with a sense of control as it sometimes remained unresponsive when given voice commands that are not valid and these personal assistant devices are expensive.

Drawbacks:

1. Reed switches have several inherent disadvantages, including susceptibility to breakage issues during installation.
   It has limited life due to the mechanical nature of the switch.
2. Reed switches are also impacted by shock and vibration, which can separate the contacts of the switch, making the part unreliable.

Bor-Shing Lin 1, Cheng-Che Lee 1 and Pei-Ying Chiang 2, "Simple Smartphone-Based Guiding System for Visually Impaired People" [2] posed system is not limited to specific indoor or outdoor environments and does not require the positioning of RFID chips in advance. Thus, the proposed system not only increases the number of available locations, but also provides more information for visually impaired people about their surroundings. The proposed navigation system employs a smartphone to continually capture images of the environment in front of a user and perform image processing and object identification to inform the user of the image results.

Result: The user can gain a more comprehensive understanding of the surroundings. This system enables visually impaired people to not only know the rough direction and distance to an obstacle, but also know what the obstacle is.

Drawbacks:

1. Smartphones do not have a hardware keyboard that enables the user to input correctly with tactile cues. Without them, selected keys are likely to be incorrect and extra time will be required to

confirm their correctness with visual or auditory feedback.

2. On the other hand, even with voice feedback provided blind users may find it too hard to perform touch interface operations without tactile cues.

3. The second largest problem was inaccessibility to and difficulty in using some apps and functions, which was reported by 13 blind (30.2%) and 8 low vision (21.1%) users. Inaccessible apps do not allocate alternative text to controls so that blind users cannot know their purposes.

III. DOMAIN ANALYSIS

Domain analysis is the process by which a software engineer learns background information. He or she has to learn sufficient information so as to be able to understand the problem and make good decisions during requirements analysis and other stages of the software engineering process. The word 'domain' in this case means the general field of business or technology in which the customers expect to be using the software.

Relevance to the area of the contest:

IOT: The Internet of Things refers to a system of interrelated, internet-connected objects that are able to collect and transfer data over a wireless network without human intervention.

Machine Learning: It is a type of artificial intelligence that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so.

IOT: The Internet of Things (IoT) describes the network of physical objects— "things"— that are embedded with sensors Over the past few years, IoT has become one of the most important technologies of the 21st century. Now that we can connect everyday objects—kitchen appliances, cars, thermostats, baby monitors—to the internet via embedded devices,

seamless communication is possible between people, processes, and things.

By means of low-cost computing, the cloud, big data, analytics, and mobile technologies, physical things can share and collect data with minimal human intervention. In this hyperconnected world, digital systems can record, monitor, and adjust each interaction between connected things. The physical world meets the digital world—and they cooperate.

Characteristics of IoT:

- Massively scalable and efficient
- IP-based addressing will no longer be suitable in the upcoming future.
- An abundance of physical objects is present that do not use IP, so IoT is made possible.
- Devices typically consume less power. When not in use, they should be automatically programmed to sleep.
- A device that is connected to another device right now may not be connected in another instant of time.
- Intermittent connectivity – IoT devices aren't always connected. In order to save bandwidth and battery consumption, devices will be powered off periodically.

Artificial Intelligence:

Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision. AI as a concept refers to computing hardware being able to essentially think for itself, and make decisions based on the data it is being fed. AI systems are often hugely complex and powerful, with the ability to process unfathomable depths of information in an extremely quick time in order to come to an effective conclusion. AI systems are now able to perform mammoth computing tasks much faster and more efficiently than human minds,

helping making big strides in research and development areas around the world. Some of the most notable real-world applications of AI are IBM's Watson, which is being used to power research in a huge range of fields, with Microsoft's Azure Machine Learning and TensorFlow also making headlines around the world. But AI-powered smart assistants are becoming a common presence on mobile devices too, with the likes of Siri, Cortana and Alexa all being welcomed into many people's lives.

IV. PROPOSED METHODOLOGY

The proposed methodology makes use of both qualitative and quantitative perspectives, and includes a broad array of approaches such as literature reviews, expert opinions, focus groups, and content validation. It also involves sophisticated assessment of construct validity including substantive and structural aspects.

Pi Camera: This module is a camera which can be used to take pictures and high-definition video. Raspberry Pi Board has CSI (Camera Serial Interface) interface to which we can attach Pi Camera module directly. This Pi Camera module can attach to the Raspberry Pi's CSI port using 15pin ribbon cable. The Raspberry Pi Camera Board can be plugged directly into the CSI (Camera Serial Interface) connector on the Rasp-berry Pi. It is capable for delivering a crystal-clear image of 5MP resolution or having 1080p HD video recording at 30frames per seconds.

The device itself is tiny which are around 25mm x 20mm x 9mm, and weighs just over 30 grams, which makes it perfect for various projects and other applications where size and weight matters. The sensor present in it has a native resolution of 5 megapixels, and has a fixed focus lens which is present onboard.
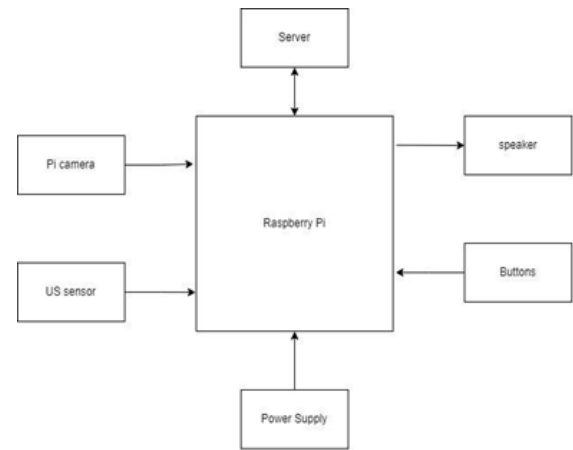
Raspberry pi:

Low-cost high-performance computer which can be plugged in TV and monitor and can be used as computer which is very small as credit card, this raspberry pi works as the computer of the prototype.

- Its CPU is 700Mhz single core ARM1176JZF-S.
- It has 4 USB ports.
- It has dual core video core iv multimedia coprocessor.
- Size of its RAM is 512mb.
- It has micro SDHCplot for storage.
- Power rating of raspberry pi is 600mA i.e., 3.0W.
- It has 17*GPIO plus the same specific functions.

Ultra-sonic sensor:

The ultrasonic sensor is used to calculate the distance of the object or for pothole detection. These produce elastic waves with frequency greater than 20,000 Hz and exists in solid liquid and gases. For object identification, the ultrasonic sensor is placed in prototype which sends ultrasounds and calculates the distance, For pothole detection. A distance more than an average distance is set. So, when any pothole appears, its distance will be higher than the normal distance and hence we get alert. They cover nearly about 70 feet distance at very high repetition rates.

Components:

Emitter: This component continuously emits the infrared signal

Receiver: It waits for the signal which is bounced back by obstacle

Indicator: On board LED to signal if obstacle is deducted by the sensor Output:

Could be used as Input for further processing of the signal

Ground: Ground/Negative point of the circuit Voltage: Input 3.3V

Power supply: It differs from the normal 5V USB power supplies. This power supply will enable you to power your Raspberry Pi 3 to its full 2.5A load and a 1.2A on its 4 USB ports. Cana Kit power supply has been designed to withstand harsh normal use conditions. The Raspberry Pi can be powered up in a variety of ways. A voltage source must absolutely meet two requirements:

- a stable voltage of 5V
- at least 1000mA current carrying capacity

V. RESULTS

Figure 2. This figure includes women wearing a prototype i.e., "Smart Cap".

Figure 3. This figure includes women wearing a prototype "Smarts Cap" that detects Obstacle.

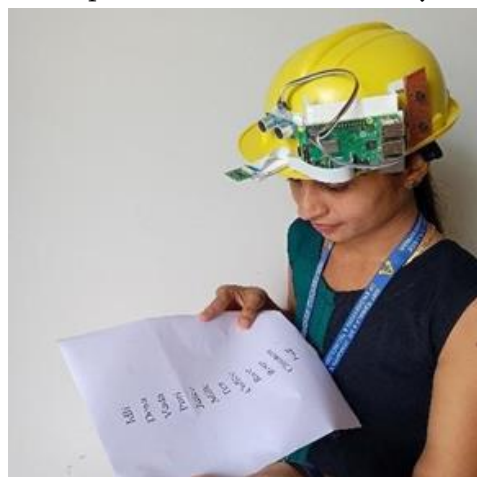Figure 4. This figure shows women wearing "Smart Cap" that detects the Currency.

Figure 5. This figure shows women wearing "Smart Cap" that detects the Text.

VI. CONCLUSION

This System enables the Visually impaired and Blind users to read the text through prototype. Our prototype "Smart Cap" for Visually impaired and Blind People helps to detect the obstacle around them. The use of everyday objects in the development of this device also reduces the cost of manufacturing. Thus, making it available to people at reasonable price.

VII. REFERENCES

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