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SMART EYE FOR VISUALLY IMPAIRED PEOPLE

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ABSTRACT: This paper presents an idea of developing a smart system which can assist the visually impaired people in their daily activities. Actually, there are many challenges faced by visually impaired people. In most cases, they require constant support in almost all scenarios especially in their day to day activities. Some of the major challenges include difficulty in moving from one place to another without the assistance of someone. Other challenges include difficulty in recognizing people, detecting obstacles, etc. In order to count avert this situation, we propose a "smart eye system" in this work. The device is a voice enabled system that would direct the visually challenged person in their day to day works. The device combines the various available technologies and integrates them into a single multipurpose device that can be used by the visually impaired. The paper discusses about the design of such a system and the challenges involved in designing the device.

Keywords: Software, hardware & visually impaired

1.INTODUCTION

The Internet of things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The definition of the Internet of things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", covering devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. Significant numbers of energy-consuming devices (e.g. switches, power outlets, bulbs, televisions, etc.) already integrate Internet connectivity, which can allow them to communicate with utilities to balance power generation and energy usage and optimize energy consumption as a whole. These devices allow for remote control by users, or central management via a cloud-based interface, and enable functions like scheduling (e.g., remotely powering on or off heating systems, controlling ovens, changing lighting conditions etc.). The smart grid is a utility-side IoT application; systems gather and act on energy and power-related information to improve the efficiency of the production and distribution of electricity. Using advanced metering infrastructure (AMI) Internet-connected devices, electric utilities not only collect data from end-users, but also manage distribution automation devices like transformers

The number of visually impaired is so large that it has a huge impact on the economy of the country. In fact, in this busy world, common

man doesn't have time to even look at these differently able ones. Thus, the visually impaired people constantly require the support of someone in their daily works, especially while on roads. Most often these people are considered a burden by others while some just ignore their presence and leave them to care for themselves all alone. This creates a feel of loneliness in them. This concept of being dependant on someone creates a feeling of demotivation and loss of self –confidence in some cases as well. Some of the major challenges include difficulty in moving from one place to another without the assistance of someone. Other challenges include difficulty in recognizing people, detecting obstacles on their way and so on. Some devices available in the market help them to overcome a few of these challenges. There is always a huge number of researches involved with the sole aim of building devices to help these visually challenged people. Thus, there arises a need for building a system or device which could aid the visually impaired in all their activities. As mentioned above, the visually impaired need to be extra careful while on roads and a Global Positioning System (GPS) enabled with obstacles detection would come handy in such situations. It also becomes difficult for the blind to recognize a person. Usually, blind identify people based on their voice. This is always not effective as it might be difficult for the blind to recognize the voice of the person who had not been in touch for a long time. Thus, a device to help identify known people becomes necessary. This issue can be resolved by using face detection algorithms. Face recognition is one of the most relevant applications of image analysis. The true challenge here is to build a system that could integrate all these and work as an eye for the visually impaired. Hence, the objective of this work is to aid the visually impaired in their day to day activities like moving from one place to another and identification of persons.

2.PROJECT DESCRIPTION

2.1 EXISTING SYSTEM:

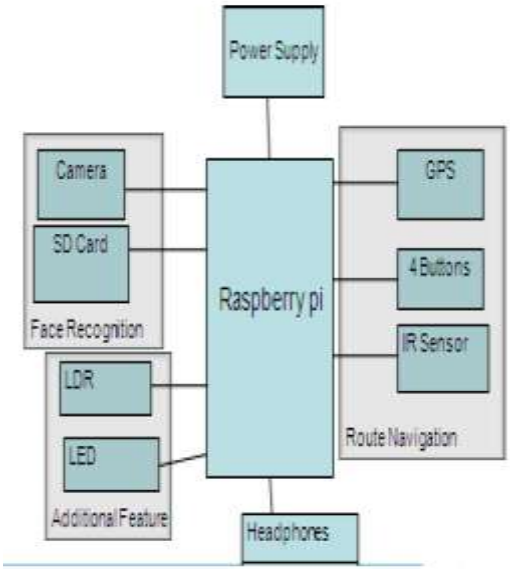
Walking cane which detects obstacles on the way using IR sensors and issues a buzzer sound as warning. The white cane can only be used to detect obstacles up to knee-level within a limited range of 2-3 feet. The major drawback is that the buzzer sound can be unheard of in the traffic sounds on the roads. In addition to that Chaitrali et al proposed a navigation device uses voice output for. issuing warnings when obstacles are detected. Here, obstacles are detected with a help of IR sensors and Radio Frequency Identification (RFID) technology. This device is connected to an android phone through Bluetooth. An android application is designed which gives voice navigation based on RFID tags read and also updates person's location information on the server. Moreover, one more application is designed for family members to access the blind person's location through the server whenever needed.

2.2 PROPOSED SYSTEM:

Any device aimed at assisting the visually challenged should be handy and easy to use. There is also a need for voice to text as well as text to voice convertors. This should also be independent of touch screens as they are commonly used in android systems. Therefore, building a system with above constrains is a real time challenge. The aim here is therefore to build a system that is compatible in all aspects as well as provides scope for extension in future. The various technologies used to ensure these factors include image processing and embedded technology. The system includes voice enabled route navigation (GPS based) system with obstacle detection, image processing to identify persons with no need of Internet connectivity and it is not based on android features. The smart eye consists of Raspberry Pi as the microcontroller with camera, sensors

headphones and other sub components connected to it. The design of the system is The various components like camera, Global Positioning System (GPS) module, Infra Red (IR) sensor and Light Dependent Resistor (LDR) kit need to be interfaced with the Raspberry Pi for the effective functioning of the device. All the components are connected via General Purpose Input Output (GPIO) pins. It also has a slot in which 16GB Secured Digital (SD) card is inserted to store data.

2.3 BLOCK DIAGRAM:



3. HARDWARE REQUIREMENT

3.1 IR SENSOR:

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real-time. When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM339). Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low. Thus the output of the comparator (LM 339) goes high and the LED starts glowing. Resistor R1 (100), R2 (10k) and R3 (330) are used to ensure that minimum 10 mA current passes through the IR LED Devices like Photodiode and normal LEDs respectively. Resistor VR2 (preset=5k) is used to adjust the output terminals. Resistor VR1 (preset=10k) is used to set the sensitivity of the circuit Diagram. Read more about IR sensors.

3.2 GPS:

The Global Positioning System (GPS), originally NAVSTAR GPS, is a satellite-based radio navigation system owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system (GNSS) that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Obstacles such as mountains and buildings block the relatively weak GPS signals. The GPS does not require the user to transmit any data, and it operates independently of any telephonic or

internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.

3.3 CAMERA:

An Internet Protocol camera, or IP camera, is a type of digital video camera that receives control data and sends image data via the Internet. They are commonly used for surveillance. Unlike analog closed-circuit television (CCTV) cameras, they require no local recording device, but only a local area network. Most IP cameras are webcams, but the term IP camera or netcam usually applies only to those used for surveillance that can be directly accessed over a network connection. Some IP cameras require support of a central network video recorder (NVR) to handle the recording, video and alarm management. Others are able to operate in a decentralized manner with no NVR needed, as the camera is able to record directly to any local or remote storage media. The first centralized IP camera was Axis Neteye 200, released in 1996 by Axis Communications. WIFI Home camera is the IP cameras that are sitting in the homes, and that utilize high speed broadband Internet access to capture and transmit High-definition video. [11] The gap of IP camera used in small business and home is diminishing. Current home security camera can be used in small business due to its easy installation, that translates no installers required so it's far more cost and time savings. The exception is to monitor large businesses or commercial space like a mall. Some will require super high resolution videos (ie 4K) and will a great many cameras (possibly up to hundreds) and professional applications to accommodate these type of needs. One of most popular applications is the Wifi home security cameras allows users to remotely view their homes indoors and outdoors via a Mobile app installed on their Mobile device. Most cameras offer such features as wide angle (around 140 degrees, or pan/tilt up to 350 degrees' horizontal, 90 degrees vertical), low/night vision, and motion activation notifications. When an event occurs, users will receive alarms via an app. Video clips are stored in the local device (if a Micro-SD is present) or on the Cloud computing. The market size of home security system has reached $4.8 billion dollars in 2018. This is displayed a CAGR of 22.4% between 2011 a 2018. Countries such as including Uganda, Sweden, Italy, and Tanzania suffered from high crime rates particularly robbery and theft, are keen to adopting the home security cameras. In addition, two countries, US and China, have high implementation rate of residential security cameras. Major key players in home security market are Nest (US), Ring (owned by Amazon, US), Arlo (owned by Netgear, US), and SimpliSafe (US). Hikvision Digital Technology (Ltd) and Leshi Video Tech (China) are the largest camera manufacturers. As for alarm security industry, key players are ADT Inc., Security Services (US), Vivint Inc, and Front Point Security Solutions.

3.4 LDR:

A photoresistor (acronymed LDR for Light Decreasing Resistance, or light-dependent resistor, or photo-conductive cell) is an active component that decreases resistance with respect to receiving luminosity (light) on the component's sensitive surface. The resistance of a photoresistor decreases with increase in incident light intensity; in other words, it exhibits photoconductivity. A photoresistor can be applied in light-sensitive detector circuits and light-activated and dark-activated switching circuits acting as a resistance semiconductor. In the dark, a photoresistor can have a resistance as high as several megaohms (MΩ), while in the

light, a photoresistor can have a resistance as low as a few hundred ohms. If incident light on a photoresistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photoresistor can substantially differ among dissimilar devices. Moreover, unique photoresistors may react substantially differently to photons within certain wavelength bands. A photoelectric device can be either intrinsic or extrinsic. An intrinsic semiconductor has its own charge carriers and is not an efficient semiconductor, for example, silicon. In intrinsic devices, the only available electrons are in the valence band, and hence the photon must have enough energy to excite the electron across the entire bandgap. Extrinsic devices have impurities, also called dopants, added whose ground state energy is closer to the conduction band; since the electrons do not have as far to jump, lower energy photons (that is, longer wavelengths and lower frequencies) are sufficient to trigger the device. If a sample of silicon has some of its atoms replaced by phosphorus atoms (impurities), there will be extra electrons available for conduction. This is an example of an extrinsic semiconductor.

3.5 RASPBERRY PI:

The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards and mice) or cases. However, some accessories have been included in several official and unofficial bundles. The organization behind the Raspberry Pi consists of two arms. The first two models were developed by the Raspberry Pi Foundation. After the Pi Model B was released, the Foundation set up Raspberry Pi Trading, with Eben Upton as CEO, to develop the third model, the B+. Raspberry Pi Trading is responsible for developing the technology while the Foundation is an educational charity to promote the teaching of basic computer science in schools and in developing countries. The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support. This block diagram describes Model B and B+; Model A, a+, and the Pi Zero are similar, but lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the Pi Zero, the USB port is connected directly to the system on a chip (SoC). On the Pi 1 Model B+ and later models the USB/Ethernet chip contains a five-port USB hub, of which four ports are available, while the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port. Unlike all other Pi models, the 40 pin GPIO connector is omitted on the Pi Zero with solderable through holes only in the pin locations. The Pi Zero WH remedies this. The Broadcom BCM2835 SoC used in the first generation Raspberry Pi [26] includes a 700 MHz ARM1176JZF-S processor, VideoCore IV graphics processing unit (GPU), [27] and RAM. It has a level 1 (L1) cache of 16 KB and a level 2 (L2) cache of 128 KB. The level 2 cache is used primarily by the GPU. The SoC is stacked underneath the RAM chip, so only its edge is visible. The ARM1176JZ(F)-S is the same CPU used in the original iPhone, [28] although at a higher clock rate, and mated with a much faster GPU. The earlier V1.1 model of the Raspberry Pi 2 used a Broadcom BCM2836 SoC with a 900 MHz 32-bit, quad-core ARM Cortex-A7 processor, with 256 KB shared L2 cache. The Raspberry Pi 2 V1.2 was upgraded to a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, the same SoC which is used on the Raspberry Pi 3, but under clocked (by default) to the same 900 MHz CPU clock speed as the V1.1. The BCM2836 SoC is no longer in production as of late 2016. The

Raspberry Pi 3 Model B uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache. The Model A+ and B+ are 1.4 GHz. The Raspberry Pi 4 uses a Broadcom BCM2711 SoC with a 1.5 GHz 64-bit quad-core ARM Cortex-A72 processor, with 1MB shared L2 cache. The Raspberry Pi Zero and Zero W use the same Broadcom BCM2835 SoC as the first generation Raspberry Pi, although now running at 1 GHz CPU clock speed.

3.6 LED:

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. [5] White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device. Appearing as practical electronic components in 1962, the earliest LEDs emitted low-intensity infrared light. Infrared LEDs are used in remote-control circuits, such as those used with a wide variety of consumer electronics. The first visible-light LEDs were of low intensity and limited to red. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with high light output. Early LEDs were often used as indicator lamps, replacing small incandescent bulbs, and in seven-segment displays. Recent developments have produced high-output white light LEDs suitable for room and outdoor area lighting. LEDs have led to new displays and sensors, while their high switching rates are useful in advanced communications technology. LEDs have many advantages over incandescent light sources, including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. LEDs are used in applications as diverse as aviation lighting, automotive headlamps, advertising, general lighting, traffic signals, camera flashes, lighted wallpaper, horticultural grow lights, and medical devices. Unlike a laser, the light emitted from an LED is neither spectrally coherent nor even highly monochromatic. However, its spectrum is sufficiently narrow that it appears to the human eye as a pure (saturated) color. Nor, unlike most lasers, is its radiation spatially coherent, so that it cannot approach the very high brightnesses characteristic of lasers.

4. SOFTWARE REQIUREMENT

4.1 EMBEDDED C:

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. Embedded C programming typically requires nonstandard extensions to the C language in order to support enhanced microprocessor features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. In 2008, the C Standards Committee extended the C language to address such capabilities by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as fixed-point arithmetic, named address spaces and basic I/O hardware addressing. Embedded C uses most of the syntax and semantics of standard C, e.g., main () function, variable definition, datatype declaration, conditional statements (if, switch case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc. Embedded C Programming is the soul of the processor functioning inside each and every embedded system we come across in our daily life, such as mobile phone, washing machine, and digital camera. Each processor is

associated with an embedded software. The first and foremost thing is the embedded software that decides functioning of the embedded system. Embedded C language is most frequently used to program the microcontroller. Earlier, many embedded applications were developed using assembly level programming. However, they did not provide portability. This disadvantage was overcome by the advent of various high level languages like C, Pascal, and COBOL. However, it was the C language that got extensive acceptance for embedded systems, and it continues to do so. The C code written is more reliable, scalable, and portable; and in fact, much easier to understand. C language was developed by Dennis Ritchie in 1969. It is a collection of one or more functions, and every function is a collection of statements performing a specific task.

C language is a middle-level language as it supports high-level applications and low-level applications. Before going into the details of embedded C programming, we should know about RAM memory organization.

4.2 PROTEUS:

Many CAD users dismiss schematic capture as a necessary evil in the process of creating PCB layout but we have always disputed this point of view. With PCB layout now offering automation of both component placement and track routing, getting the design into the computer can often be the most time consuming element of the exercise. And if you use circuit simulation to develop your ideas, you are going to spend even more time working on the schematic. ISIS has been created with this in mind. It has evolved over twelve years' research and development and has been proven by thousands of users worldwide. The strength of its architecture has allowed us to integrate first conventional graph based simulation and now – with PROTEUS VSM – interactive circuit simulation into the design environment. For the first time ever it is possible to draw a complete circuit for a micro-controller based system and then test it interactively, all from within the same piece of software. Meanwhile, ISIS retains a host of features aimed at the PCB designer, so that the same design can be exported for production with ARES or other PCB layout software. For the educational user and engineering author, ISIS also excels at producing attractive schematics like you see in the magazines. It provides total control of drawing appearance in turns of line widths, fill styles, colours and fonts. In addition, a system of templates allows you to define a 'house style' and to copy the appearance of one drawing to another. Other general features include:

Runs on Windows 98/Me/2k/XP and later. Automatic wire routing and dot placement/removal. Powerful tools for selecting objects and assigning their properties. Total support for buses including component pins, inter-sheet terminals, module ports and wires. Bill of Materials and Electrical Rules Check reports. Net list outputs to suit all popular PCB layout tools. For the 'power user', ISIS incorporates a number of features which aid in the management of large designs. Indeed, a number of our customers have used it to produce designs containing many thousands of components. Hierarchical design with support for parameterized component values on sub-circuits. Design Global Annotation allowing multiple instances of a sub-circuit to have different component references. Automatic Annotation - the ability to number the components automatically. ASCII Data Import -. this facility provides the means to automatically bring component stock codes and costs into ISIS design or library files where they can then be incorporated or even totaled up in the Bill of Materials report.

4.3 PHP:

PHP: Hypertext Preprocessor (or simply PHP) is a general-purpose programming language originally designed for web development. It was originally created by Rasmus Lerdorf in 1994 the PHP reference implementation is now produced by The PHP Group. PHP originally stood for Personal Home Page, but it now stands for the recursive initialism PHP: Hypertext Preprocessor.

PHP code may be executed with a command line interface (CLI), embedded into HTML code, or used in combination with various web template systems, web content management systems, and web frameworks. PHP code is usually processed by a PHP interpreter implemented as a module in a web server or as a Common Gateway Interface (CGI) executable. The web server outputs the results of the interpreted and executed PHP code, which may be any type of data, such as generated HTML code or binary image data. PHP can be used for many programming tasks outside of the web context, such as standalone graphical applications and robotic drone control. The standard PHP interpreter, powered by the Zend Engine, is free software released under the PHP License. PHP has been widely ported and can be deployed on most web servers on almost every operating system and platform, free of charge. The PHP language evolved without a written formal specification or standard until 2014, with the original implementation acting as the de facto standard which other implementations aimed to follow. Since 2014, work has gone on to create a formal PHP specification.

4.4 WAMP

WAMP is an acronym that stands for Windows, Apache, MySQL, and PHP. It's a software stack which means installing WAMP installs Apache, MySQL, and PHP on your operating system (Windows in the case of WAMP). Even though you can install them separately, they are usually bundled up, and for a good reason too. What's good to know is that WAMP derives from LAMP (the L stands for Linux). The only difference between these two is that WAMP is used for Windows, while LAMP – for Linux based operating systems. Let's quickly go over what each letter represents:

"W" stands for Windows, there's also LAMP (for Linux) and MAMP (for Mac).

"A" stands for Apache. Apache is the server software that is responsible for serving web pages. When you request a page to be seen by you, Apache grants your request over HTTP and shows you the site.

"M" stands for MySQL. MySQL's job is to be the database management system for your server. It stores all of the relevant information like your site's content, user profiles, etc.

"P" stands for PHP. It's the programming language that was used to write WordPress. It acts like glue for this whole software stack. PHP is running in conjunction with Apache and communicating with MySQL.

Instead of installing and testing WordPress on your hosting account, you can do it on your personal computer (localhost).

WAMP acts like a virtual server on your computer. It allows you to test all WordPress features without any consequences since it's localized on your machine and is not connected to the web.

First of all, this means that you don't need to wait until files are uploaded to your site, and secondly – this makes creating backups much easier.

WAMP speeds up the work process for both developers and theme designers alike. What

is more, you also get the benefit of playing around with your site to your heart's content.

However, to actually make the website go live, you need to get some form of hosting service and a Domain. See our beginner-friendly article about web hosting for more information.

5.CONCLUSION

The proposed system integrates the working of the various modules and thus provides a multipurpose device for the visually impaired. The device is designed in such a way that it is handy and portable. The device continuously monitors the current location of the user with the help of the GPS. The device also issues warning when obstacles are detected on the way. It also helps to identify people based on the previously stored images. It can also be kept in pockets, thus relieves the user from the need to hold on the device for a long time as in case of sticks. The clarity of output is high since the output is given as voice commands through headphones. Since all the data are fed to the system before its use, it doesn't require Internet connectivity for its working. This is particularly helpful if Internet connectivity is not available all throughout the city. In addition, the device doesn't use any Android or other touch screen related technology thus it is very simple and easy to use. The device as of now is customized for a few locations only. However, there is scope for extending it to more locations as well as integrate it with Google Maps for better performance of GPS. The obstacle detection module can be enhanced to the extent of identifying the obstacle and naming it along with warning. The camera can be placed in spectacles for better positioning of images. The camera can be made to take pictures at different angles as well. Another enhancement could be to let identify or recognize faces by processing video instead of images.

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