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Smart Walking Stick for Blind Integrated with SOS Navigation System

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Abstract: Blind people face difficulty to interact with the society. The aim of this project is to provide a tool which will help blind people to navigate as well as give the message to the family member. We plan to propose a working model which is Walking Stick with in-built e-SOS (electronic Save Our Souls) Switch and the controller. The Camera is used to click picture of traffic light depending on programming it gives signal to the blind person so that he will navigate safely. On clicking picture webcam sends the data to the Raspberry-pi Controller. By using Image processing controller extract some useful information about the intensity of light and give it to the person through the Headphones. If camera is not working properly then the circuit does nothing. In addition we also plan to connect e-SOS (electronic Save Our Souls) system whenever blind person feels any discomfort while navigating then he press an e-SOS distress call button on the stick to give a message to his family member. Message in the form of link is generated which shows the location of the blind person to his family member. In this way, Blind person is guided to move along the path by his family member via the mail. In this module through GPS and GSM the longitude and latitude of the stick is tracked which help to sent the message to the rilatives in a emergency situation. Keywords: Blind, Walking Stick, Alert, e-SOS, Camera, WIFI.

I. INTRODUCTION

According to a report by World Health Organization (WHO) and International Agency for Prevention of Blindness (IAPB) nearly 285 million persons around the world are visually impaired. However a more astonishing fact is that out of these 285 million people, 39 million people are completely blind. They played an essential role in our decision to come up with the very notion of an advanced blind stick. Owing to amount of strain which is being subjected to our eyes, the probabilities in enhancement of number of blind people are bound to rise. The purpose of this blind stick would be to make blind people more independent, [1]. In fact, it will give positive dimensions to their life. The traditional obstacle detection methods are obsolete and need considerable modifications, [2].In this project, we were expected to button on his stick which will enable the process of live streaming system. (Here, live streaming indicates the nearby environment of the blind person) The streaming signal with location is sent to his family member's Android phone via an Android application. An e-SOS is Morse coded distress signal. In simple words, SOS is distress call/ emergency signals which the blind person sends to his family member.





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- A. Objective Of Project
- 1) To survey various techniques used for blind stick analysis.
- 2) To study different hardware and software (python) for blind stick analysis.
- *3)* To calculate the distance of the camera and traffic signal recognition.
- 4) To analyze the emotions of the person who is not able to this Beautiful world.
- 5) Study Raspberry-pi controller different features and used them effectively.
- 6) Develop a model which is easily available for visually impaired person to improve their living.

II. LITERATURE SURVEY

Sr. no.	Year of	Title of paper	Objective of paper	Modifications in our Project
	Publication			
1.	2012	Advanced embedded	To aid communication for physically	We developed a smart stick that
		chatter Box for	challenged people. This paper details	useful not only for blind people but
		physically challenging	how to build a device which can speak	also for physically challenged person,
		persons	out the text given to it by a speaker and	Even old age people can able to use it
			helpful for a dumb people as a mouth to	very efficiently.
			them and its LCD Display act as a ear to	
			Deaf people by making them to	
			understand what other people saying	
			them.	
2.	2014	A Survey of Voice	They used GPS and GSM system and	In our project we use GPS System for
		Aided Electronic stick	ultrasonic sensor with Bluetooth earpiece	Location alerting and sharing For
		for visually impaired	in Designing the electronic stick.	giving an instruction we used
		people		headphones in place Bluetooth
				earpiece.
				we use main Raspberry-pi controller
				for image processing and for further
				operations.

3.	2015	MEDICO STICK	To develop wireless communication future	We used Raspberry-pi instead of
		An Ease to Blind and	using DTMF Device that help blind and	microcontroller Raspberry-pi is a
		Deaf	deaf person to walk on street fearlessly.	mini computer or mini CPU which
				works on LINUX OS and can handle
				multiple program running
				simultaneously.
4.	2015	Design of	To Develop a cost effective system which	We Design smart stick using
		communication	can give voice to voiceless people with	Raspberry-pi which perform Image-
		interpreter for Deaf	help of smart gloves.	processing required for further
		and Dumb people		operation related to blind person.
5.	2017	Smart stick for	By using Arduino UNO controller and	In our project we detect Traffic light
		visually impaired	ultrasonic sensor if sensor sensed properly	with the help of Camera and using
		people	and object detected blind person notified	image processing, location tracking if
			about the object with the help of vibration,	the person is lost using GPS and
			blind person location Tracking using GSM	family member know about the exact
			and GPS module.	location through the link on e-mail.



Volume 8 Issue V May 2020- Available at www.ijraset.com

6.	2018	Smart electronic	By using Arduino UNO Controller &	As compare to this model we use
		walking stick for	ultrasonic sensor they developed a smart	Raspberry pi 3B+ controller for the
		blind people	walking stick. In this model also used	effective purpose and we used the
			temperature sensor heart beat sensor for	GSM and GPS Technology for
			monitoring physical condition, Also used	location sharing.
			water sensor for detection of water, sensor	
			sensed water if it is present and notify the	
			person.	
7.	2018	Advanced Electronics	Advanced electronic are employable in	In our project we develop a smart
		Based Smart Mobility	assisting the visually impaired society in	stick which is easily operate by
		Aid for the Visually	various ways. first idea is object detection	visually impaired person and
		Impaired Society	and alert system. The obstacle detection is	mounting various sensors and using
			done using ultrasonic sensor. If the blind	different modules for the welfare of
			person feels uncomfortable with obstacle	the blind person. Traffic light
			detection technology, he can switch to	detection using Image processing and
			SOS based video call technique to get help	Headphones, family member get
			from his family member or any friend.	exact location on e-mail.
8.	2019	Electronics stick for	In this paper, they make an electronic	In our project we used a Raspberry-pi
		visually impaired	smart stick for blind people using Arduino	controller which support image to
		people with Buzzer	UNO and also used Ultrasonic sensor for	voice conversion. For the traffic
		Alert	object detection up-to 20 meters. If the	light detection we used IR Sensor
			obstacle is in range then buzzer start	instead of Ultrasonic sensor, U.S
			giving alert, when the person click on the	Used to measure latitude and
			switch then it will be stopped.	longitude.

III. FLOWCHART





A. System Block Diagram

IV. BLOCK DIAGRAM



Fig.5.1 : Block Diagram Of Project

- B. Block Diagram Description
- *Camera:* A USB webcam is a camera that connects to a computer, usually through connect it in to a USB port on the machine. The video is fed to the computer where a software application lets you able to view the pictures and also transfer them to the Internet with the help of IOT.



2) Raspberry PI: This system uses Raspberry pi controller, it is a small processing device which works as computer at relatively low cost. Blind people face difficulties in detecting obstacles and walking on the street. The system is intended to provide artificial vision and real time assistance via GPS by making use of Raspberry Pi Controller. The system consists of GPS module, sensors and the feedback is received through audio via Headphones. The proposed system detects camera which is used to click the picture and using image processing person is able to know the actual traffic light position to cross the road successfully.





3) GPS: GPS is a satellite navigation system used to determine the ground position of an object. Today, GPS receivers are included in many commercial products, such as smart phones, automobiles exercise watches, and GIS devices.



4) SOS Button: It is simply a push button which will involve in switching the mode of operation of the system.



5) Other Peripherals: Other components include power bank, resistors and earphones as hardware peripherals and mobile application.

C. Block Diagram Of Power Supply

Our circuit requires 5V and 9V DC regulated supply it can built around step-down transformer with rectifier and regulator or battery based also. If circuit is connected to power lines the step down transformer or battery supply is required. But for other transmission line it is only battery based, because it cannot drive the transformer.

Power supply mainly consist of four stages namely transformer, rectifier, filter, and regulator. Transformer is step down transformer which steps down the 230V AC input supply to 15V AC at its secondary. This 15V AC is rectified by bridge rectifier consisting of four diodes, which converts the AC output into DC output. The next stage consisting of capacitor, which removes the ripple present in DC output. Capacitor is used as filtering capacitor. Last stage of power supply is the regulator stage. Regulator(IC 7805) IC gives the regulated DC output from the unregulated supply.



Fig 5.3: block diagram of power supply

1) Power Supply Simulation: The basic step in the designing of any system is to design the power supply required for that system. The steps involved in the designing of the power supply are as

Follows,

- *a)* Determine the total current that the system sinks from the supply.
- b) Determine the voltage rating required for the different components.





A ADDIECT CLIMET

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Transformer selection we required 12V for relay min Input for 7805 = Drop across IC 7805 + Required Output voltage = 3 V + 5V = 8 VSo at Input of 7805 we required 8 V with margin Consider drop across diode 0.7V so 2 diode conducts drop is 1.4 V = 1.4 V + 8 V= 9.4 V So at secondary we required 10 V For filter capacitor design $C = (I_1 * t_1)/V_r$ V_r = ripple voltage $I_1 = load current$ T₁= time during which the capacitor being discharge by load current $\Theta_1 = \sin - 1 [(E_{0 \min})/(E_{0 \max})]$ So unregulated power supply is design for 10 V V_r = ripple voltage 10% of output voltage $V_r = 1.0 V$ $E_{0 \text{ min}}/E_{0 \text{ max}} = (10-0.7) / 10+0.7$ = 9.3 / 10.7 $\Theta_1 = \sin{-1} [9.3/10.7]$ $= 60^{\circ}$ Frequency 50 Hz $T_1 = 1/50 = 20 \text{ ms}$ T for $360^\circ = 20$ ms For $180^{\circ} = 10$ ms For $60^\circ = 20 \text{ms} * (60^\circ/360) = 3.4 \text{ms}$ For bridge $T_1 = [\text{time for } 90^\circ + \text{time for } \theta_1]$ = 5ms + 3.4ms= 8.4ms I_1 = load current supplied to various IC $I_1 = (O/P \text{ current of atmega16} + O/P \text{ current of max232} + \text{ Current } \text{ req. For display + o/p current}$ of L298 + o/p current of ULN 2803A) $= 40ma + 30ma + 15.2 ma + 1.35ma + 100 \mu a$ =87ma $C = (I_1 * t_1)/V_r$ = (87 ma * 8.4 ms)/ 1 V = 727.86 μ f So we select 1000 μ f capacitor For diode design $PIV = V_m$ $V_m = E_{0 max} + 2 V_f$ = 10.7 + 1.4 V= 12.1 V $I_0 = I_1/2$ = 87 ma/2= 43.5 ma Peak repetitive current $I_{fm} = [I_1 (t_1+t_2)]/t_2$ $T_2 = time \text{ for } 90^\circ \text{ - } time \text{ for } \theta_1$ = 5ms - 3.4ms =1.2ms



 $I_{fm} = 87ma(\ 8.6ms + 1.2ms) / 1.2ms.$ =710.5ma From above specification diode 1N4007 is selected PIV =100V I = 1A



Fig.6 : Circuit Diagram

A. Pin Connection Of Raspberry-Pi





Fig.6.1.1: Raspberry-pi interfacing with webcam



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Fig.6.1.2 : Raspberry-pi connection with GPS



Fig.6.1.3 : Raspberry-pi connection with GPIO Pins



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Fig.6.1.4 : Raspberry-pi connection with power supply

VI. SYSTEM SPECIFICATIONS

- A. Hardware And Software Requirement
- 1) Hardware Requirement

Table 1	:- List of Hardware	•
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Components	Rating	Quantity
Raspberry pi 3b+		1
San-disk memory card	16gb	1
GPS		1
GPS Antenna		1
Samsung WEB Cam		1
Registers	10k	2
Switch		2

2) Software Requirement

Table 2 :- List of Software

1. Win32DiskJmager	
2. SD Card Formatter	
3. VNC Viewer	



- 3) Programming Languages
- *a) Python:* Python is one of those rare languages which can claim to be both simple and powerful. You will find yourself pleasantly surprised to see how easy it is to concentrate on the solution to the problem rather than the syntax and structure of the language you are programming in.

Features of Python

- *i)* Simple: Python is a simple and minimalistic language. Reading a good Python program feels almost like reading English, although very strict English! This pseudo-code nature of Python is one of its greatest strengths. It allows you to concentrate on the solution to the problem rather than the language itself.
- *ii) Easy to Learn:* As you will see, Python is extremely easy to get started with. Python has an extraordinarily simple syntax, as already mentioned.
- *iii) Free and Open Source:* Python is an example of a *FLOSS* (Free/Libré and Open Source Software). In simple terms, you can freely distribute copies of this software, read its source code, make changes to it, and use pieces of it in new free programs. FLOSS is based on the concept of a community which shares knowledge. This is one of the reasons why Python is so good it has been created and is constantly improved by a community who just want to see a better Python.
- *iv) High-level Language:* When you write programs in Python, you never need to bother about the low-level details such as managing the memory used by your program, etc.
- *Portable:* Due to its open-source nature, Python has been ported to (i.e. changed to make it work on) many platforms. All your Python programs can work on any of these platforms without requiring any changes at all if you are careful enough to avoid any system-dependent features. You can use Python on GNU/Linux, Windows, FreeBSD, Macintosh, Solaris, OS/2, Amiga, AROS, AS/400, BeOS, OS/390, z/OS, Palm OS, QNX, VMS, Psion, Acorn RISC OS, VxWorks, PlayStation, Sharp Zaurus, Windows CE and PocketPC! You can even use a platform like Kivy to create games for your computer *and* for iPhone, iPad, and Android.
- *vi) Interpreted:* This requires a bit of explanation. A program written in a compiled language like C or C++ is converted from the source language i.e. C or C++ into a language that is spoken by your computer (binary code i.e. 0s and 1s) using a compiler with various flags and options. When you run the program, the linker/loader software copies the program from hard disk to memory and starts running it. Python, on the other hand, does not need compilation to binary. You just *run* the program directly from the source code. Internally, Python converts the source code into an intermediate form called byte codes and then translates this into the native language of your computer and then runs it. All this, actually, makes using Python much easier since you don't have to worry about compiling the program, making sure that the proper libraries are linked and loaded, etc. This also makes your Python programs much more portable, since you can just copy your Python program onto another computer and it just works!
- *Object Oriented:* Python supports procedure-oriented programming as well as object-oriented programming. In procedure-oriented languages, the program is built around procedures or functions which are nothing but reusable pieces of programs. In object-oriented languages, the program is built around objects which combine data and functionality. Python has a very powerful but simplistic way of doing OOP, especially when compared to big languages like C++ or Java.
- *viii) Extensible:* If you need a critical piece of code to run very fast or want to have some piece of algorithm not to be open, you can code that part of your program in C or C++ and then use it from your Python program.
- *ix)* Embeddable: You can embed Python within your C/C++ programs to give scripting capabilities for your program's users.
 - b) PHP: PHP means Personal Home Page, but it now stands for the recursive backronym PHP: Hypertext Preprocessor. PHP code may be embedded into HTML code, or it can be used in combination with various web template systems, web content management system and web frameworks. A script is a set of programming instructions that is interpreted at runtime. A scripting language is a language that interprets scripts at runtime. Scripts are usually embedded into other software environments. The purpose of the scripts is usually to enhance the performance or perform routine tasks for an application. Server side scripts are interpreted on the server while client side scripts are interpreted by the client application. PHP is a server side script that is interpreted on the server while JavaScript is an example of a client side script that is interpreted by the client browser. Both PHP and JavaScript can be embedded into HTML pages.



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A PHP file can also contain tags such as HTML and client side scripts such as JavaScript.

- HTML is an added advantage when learning PHP Language. You can even learn PHP without knowing HTML but it's recommended you at least know the basics of HTML.
- Database management systems DBMS for database powered applications.
- For more advanced topics such as interactive applications and web services, you will need JavaScript and XML.

VII. ENCLOSURE DESIGN

A. Hardware In Off Condition



Fig. 8.1.1: System Hardware

B. Real Time Model



Fig. 8.1.2:Real Time Model



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C. Hardware In Running Condition



Fig. 8.1.3: System Output

VIII. CONCLUSION

Our main aim in this whole project is to provide an assisting system to fully or partially blind people to navigate from one place to other using real-time video streaming technology and conventional sensor based technology. For further research, we can use hard-core image processing and IOT in the system to detect obstacles and decide the best path on its own.

IX. FUTURE SCOPE

All about our research we take care about one problem that is Visual disability. To make a solution we did this low cost Project. We believe that this project will spread all around Society and convert disable to able. This is our hope, to consider this stick as smart eye for the visual impairments





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X. APPLICATION

Easy communication for blind people with the normal people. For blind people to communicate, navigate and live their life efficiently. Raspberry pi, GSM and e-SOS switch applications



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