# IOT BASED NAVIGATION SYSTEM FOR THE VISUALLY CHALLENGED

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***ABSTRACT***

***Blindness is frequently used to describe severe visual defects with full or partial vision impairment. Traversing of visually challenged is still tedious even with technological advancements. Hence, to aid them a prototype is developed using staircase and manhole method of upward and downward staircase tracking technologies. The proposed system of the project is a study that helps the visually challenged people to walk more confidently. The main objective of this project was to build up a low-cost prototype of a stick for visually impaired persons, for helping them in proper identification of manhole and staircases. In our project, the work is presented for the identification of the manholes and staircases for the visually impaired people using threshold-based system from data obtained through unique arrangement and placement of ultrasonic sensors for effective identification of manholes and staircases. We also trigger image based o-occurrence Matrix (GLCM) and SVM classifier. Furthermore, we present novel way of method to determine median based threshold value for identifying manholes using Grey Level extracting features from Grey Scale Images of ascending/descending staircases based on Binarization. The hybrid model not only informs the presence of manholes/staircases but also helps them to navigate by real time vibration and audio alert feedback.***

**Keywords:** Raspberry pi , UV sensors , SVM classifier, GLCM algorithm .

## 1. INTRODUCTION

In day to day life, visually impaired people face many challenges in their life. As visually impaired find difficult to travel from one place to another Monocular image based methods generally detect staircases by detecting non-ground plane regions and identifying pattern of concurrent lines resembling staircases in those regions. For example, proposed a Gabor filter based texture detection method to detect distant staircases.

They estimated the staircase pose by homograph search model extended this using motion stereo detected staircases only from RGB image by performing Hough transform to extract concurrent parallel lines in an edge map image resulting from Sobel operator optimally detected staircase in real time using stereo imagery to estimate ground plane and temporal consistency, but did not classify up/down stairs separately incorporated a stereo camera into the white cane and used actuators for guidance and distance feedback proposed an RGBD image-based detection approach of stairs, pedestrian crosswalks, and traffic signs, which achieved decent detection rate in the staircase detection, but did not handle the escalator detection.

Our main concern is to develop a smart walking stick using ultrasonic sensor which is used as navigational tool that will detect manhole and staircase in an environment. This paper reviews the performance of several tools, devices, boards ,techniques and methods (GCF,ML) used for manhole, pitfall detection and recognition of staircase and its working efficiency.

IOT sensors (UV, Infrared) are used to detect the obstacles and provide the alternate way to the visually impaired through GSM and also calculates the shortest distant to the destination for their convenience.

## 2. LITERATURE SURVEY

Technology is being developed day by day which can be used for betterment or to increase the comfort of people using those technologies. People who become blind either by accident or by birth will face many problems in their day to day life. Technology is paving way to provide aiding devices for the visually impaired people. Various papers have brought out the innovations used to betterment of visually impaired. Mobility of visually impaired people is restricted by their incapability to recognize their surroundings[13], to make wearable hurdle recognition system for creatively affected people react quicker, it should be prepared with innovative microcontroller to reduce computational complexness.

PIC 16F877A was selected to identify any change activated and produce the sound appears to be and oscillations. The PIC does not have an os and simply operates the system in its storage when it is switched on. PIC microcontroller is a little computer on a single incorporated routine which shops a set of guidelines. It includes a processer primary, storage, and automated input/output peripheral gadgets. PIC is an important factor in the suggested system which offers with a Microcontroller development system code which was set up in it. The system is presented by its little size and low cost when it is in contrast to other techniques that use individual micro-processor, input/output gadgets, and storage.

Combined indication microcontrollers are common, developing analogue elements required to control non-digital digital techniques. PIC microcontroller functions at +5 V which can be controlled using the volts regulator (L7805) which retains volts at +5 V if the feedback volts for it surpasses +5 V. The defect is that The PIC cannot run without using its amazingly

oscillator which is used to perform the development system code. Reference[14], The Deficiency of perspective is consistently used to explain serious recognizable problems with or without duplicating perspective.

Use of ultrasound evaluation assessment evaluation different way of generating digital strolling keep for the sightless is a technical growth. There is a great reliance for any kind of activity or strolling within place or out of the particular place, they use only their organic feelings such as get in touch with or sound for recognition or strolling .To get over all these problems of sightless individuals, need to create a venture by using simple available technological innovation. This strolling keep for sightless individuals which have several receptors, with the help of receptors it has possible to improve more functions to the strolling keep.

The functions are to identify the hurdle for occurrence security, it finds the item in suggestions up, down and front side part side aspect part aspect. The other indication placed near program tip of the strolling follow find the locations on the floor. Incorporate these receptors to the conversation history and execute processer. Discussion history in the different tracks; react for different receptors to offer the sound concept to the sightless individual by the presenter to conscious.

The demerits are it uses more number of receptors making it difficult for processing and Response time is high.[15]The last decades a variety of portable or wearable navigation systems have been developed to assist visually impaired people during navigation in known or unknown, indoor or outdoor environments.

There are three main categories of these systems: Electronic travel aids (ETAs), electronic orientation aids (EOAs), and position locator devices (PLDs). This paper presents a comparative survey among portable/wearable obstacle detection/avoidance systems (a subcategory of ETAs) in an effort to inform the research community and users about the capabilities of these systems and about the progress in assistive technology for visually impaired people.

The survey is based on various features and performance parameters of the systems that classify them in categories, giving qualitative–quantitative measures. Finally, it offers a ranking, which will serve only as a reference point and not as a critique on these systems. The demerit is that it offers a ranking, which will serve only as a reference point and not as a critique on these systems. Stereo cameras are a major drawback that needs to be fixed on the person's chest.

## 3. EXISTING MODEL

Visually impaired people face many challenges when moving in unfamiliar public places. Only few of the navigation systems for visually impaired people can provide dynamic interactions. Current navigation system focuses on designing a device for visually impaired people that help them to travel independently also it must be comfortable to use. The current method is used for guiding individuals who are blind or partially sighted. The existing method of detection of manhole consists of using tilt sensors, temperature sensors , overflow sensors, crack sensors and gas sensors mounted together that increases the count of the receptors. Moreover the current methods of detection of staircases utilize SIFT algorithm that has less efficiency in the detection

of the descending staircases. In the existing system , In order to recognize the manholes, the chip is programmed and embedded in the stick that also holds the code for detection of the staircases based on a bi-variant Gaussian mixture model; SIFT algorithm is considered for extraction of features.

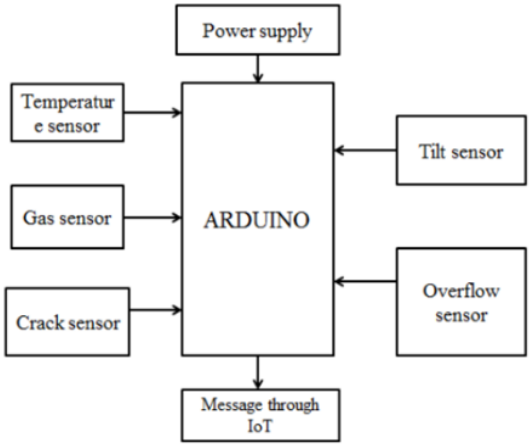


**Fig.1: Architecture of Existing System**

## 4. PROPOSED MODEL

In this project, we proposed to help the visually challenged people, a study that helps those people to walk more confidently is proposed. The main objective of this project was to build up a low-cost prototype of a stick for visually impaired persons, for helping them in proper identification of manhole and staircases. The proposed work is presented for the identification of the manholes and staircases for the visually impaired people using threshold-based system from data obtained through unique arrangement and placement of ultrasonic sensors for effective identification of manholes and staircases. It trigger image based method to determine median based threshold value for identifying manholes using Grey Level Co-occurrence Matrix (GLCM) and SVM classifier. Furthermore, we present novel way of extracting features from Grey Scale Images of ascending/descending staircases based on Binarization. The hybrid model not only informs the presence of manholes/staircases but also helps navigate them by real time vibration and audio alert feedback.

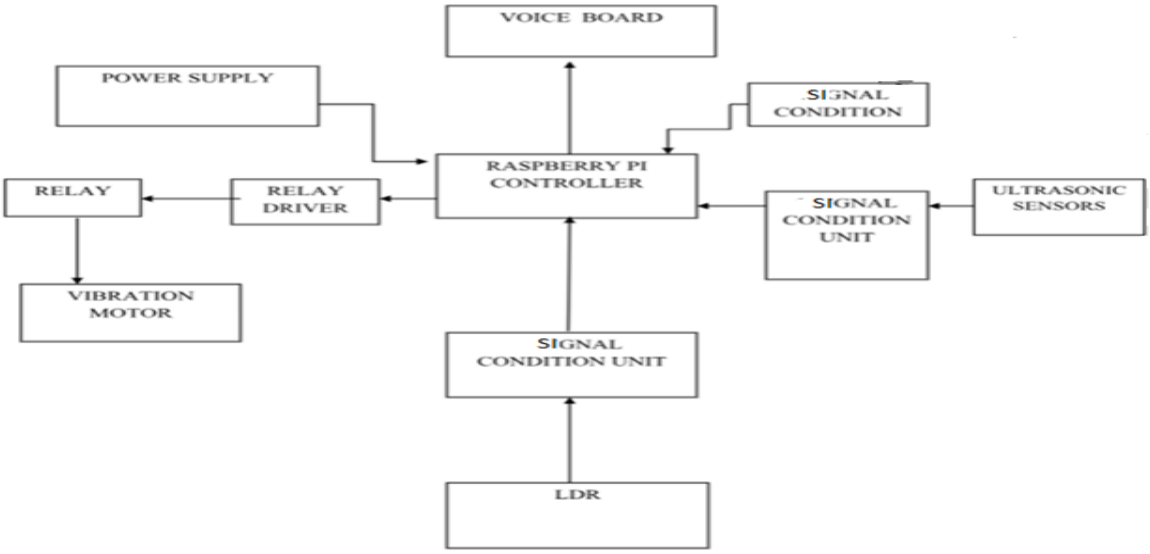


**Fig.2: Architecture of Proposed Model**

## 5. HARDWARES USED

### 5.1 POWER SUPPLY

This circuit is worn to renovate the AC to DC. It restrains of step down transformer, bridge rectifier, ripple filter, voltage regulator and line filter. Rationale of transformer is to step down the 230 VAC to 15VAC. This AC voltage is auxiliary rectified using bridge rectifier, the productivity of bridge rectifier is pulsating DC with small AC ripples. This AC ripples are then filtered using 1000uF shunt capacitor. Because the capacitor grounds AC signal and evade the DC, so the output across the shunt capacitor is pure DC. This DC voltage is unfettered, because change in primary of the transformer will change this DC voltage. So it needs to regulate the voltage. Here we use series voltage regulator is used to regulate the voltage. At last one 10uF shunt capacitor is used to filter the fluctuation due to switching of SCR's.

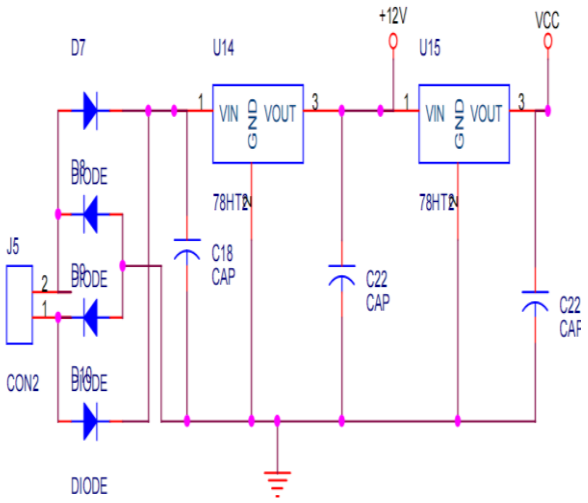


**Fig.3: Power Supply**

## 5.2 VOLTAGE REGULATOR

The LM7805 series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, HiFi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustable voltages and currents .

The LM7805 series is available in an aluminum TO-3 package which will allow over 1.0A load current if adequate heat sinking is provided. Current limiting is included to limit the peak output current to a safe value. Safe area protection for the output transistor is provided to limit internal power dissipation. If internal power dissipation becomes too high for the heat sinking provided, the thermal shutdown circuit takes over preventing the IC from overheating. Considerable effort was expanded to make the LM7805 series of regulators easy to use and minimize the number of external components. It is not necessary to bypass the output, although this does improve transient response.

## 5.3 VOLTAGE DIVIDER

Voltage divider restricting the resistance values between 1 k - and 100 k - for the sake of obtaining accurate voltage and current readings with your meter. With very low resistance values, the internal resistance of the ammeter has a significant impact on measurement accuracy. Very

high resistance values may cause problems for voltage measurement, the internal resistance of the voltmeter substantially changing circuit resistance when it is connected in parallel with a high-value resistor.


**Fig.4: Schematic diagram of Voltage Divider**

We are purposely restricting the resistance values between 1 k - and 100 k - for the sake of obtaining accurate voltage and current readings with your meter. With very low resistance values, the internal resistance of the ammeter has a significant impact on measurement accuracy. Very high resistance values may cause problems for voltage measurement, the internal resistance of the voltmeter substantially changing circuit resistance when it is connected in parallel with a high-value resistor. Connect the three resistors in series, and to the 6-volt battery, as shown in the illustrations. Measure battery voltage with a voltmeter after the resistors ,have been connected to it, noting this voltage on paper as well. It is advisable to measure battery voltage while it's powering the resistor circuit because this voltage may slightly from a no-load condition. The "free-form" method where all components are connected together with "alligator-" style jumper wire sis the least professional, but appropriate for a simple experiment such as this.

Breadboard construction is versatile and allows for high component density (many parts in a small space), but is quite temporary. Operations are read-modify-write operations. Therefore, a write to a port implies that the port pins are read, the value is modified and then written to the port data latch. Terminal strips a much more permanent form of construction at the cost of low component density. We saw exaggerated in the "parallel battery" experiment while powering a high-wattage lamp: battery voltage tends to "sag" or "droop" under load. Although this three-resistor circuit should not present a heavy enough load (not enough current.

Each resistor voltage drop will be some fraction or percentage of the total voltage, hence the name voltage divider given to this circuit. While the input voltage may vary over some permissible voltage range, and the output load may vary over some acceptable range, the output

voltage remains constant within specified voltage variation limits .This fractional value is determined by the resistance of the particular resistor and the total resistance. If a resistor drops 50% of the total battery voltage in a voltage divider circuit, that proportion of 50% will remain the same as long as the resistor values are not altered.

**5.4 POWER SUPPLY:**

Here in this project most of the operations are operated in 5V and 12V. So we use 230V/12V potential transformer and 7805 regulator for 5V. Power supply circuit consists of bridge rectifier, ripple filter, regulator and line filter. Bridge rectifier is constructed using 1N4007 diode. Ripple filter is build around 1000uF/25V.

**5.5 RELAY CONTROL:**

By using a level sensor we will get the level of feed water. This signal controls the feed water valve for maintaining a constant level. In our project we are using an ON-OFF control valve i.e. solenoid valve. The advantage of using ON-OFF control valve is

1. There is no dead time
2. There is no transfer lag.

**5.6 CIRCUIT DIAGRAM - DESCRIPTION:**

In this circuit transistor BC547 is used as a switch. The control signal is given to the base terminal of the transistor. The collector is attached to the relay coil. Relays are electromechanical devices. There are two types of relays.

1. Normally closed

2. Normally opened

We are using normally opened type relay. When the controller output from the PC is high the transistor will be in the ON state, so relay is energized. When the controller output from the PC is low the transistor will be in the OFF state, so relay is de-energized the valve will open. When the relay is de-energized the valve will close. So according to the controller output the valve will open or close and the level is maintained.

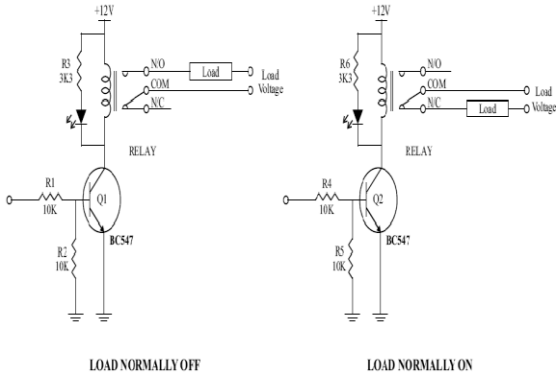


**Fig.5: Circuit Diagram**

### 5.7 LDR CIRCUIT:

The LDR circuit consists of

1. Voltage divider
2. Comparator
3. Switching circuit

### 5.7.1 Voltage Divider:

A potential or voltage divider provides a convenient way of getting a variable voltage from a fixed voltage supply.

In general, if two resistors with values $R_1$ and $R_2$ are connected in series across a supply voltage V and the voltages developed across each are $V_1$ and $V_2$ respectively, then, if I is the current flowing, we can say:

$$V_1 = I \times R_1 \ldots\ldots(1)$$

$$V_2 = I \times R_2. \ldots\ldots(2)$$

$$V = V_1 + V_2 = I\,(R_1+R_2). \ldots\ldots(3)$$

Dividing (1) by (3) we obtain:

$$\frac{V_1}{} = \frac{I \times R_1}{}$$

$$V \quad I\,(R_1+R_2)$$

Multiplying both sides by V gives:

$$V_1 = (R_1 * V)/ (R_1+R_2)$$

Similarly from (2) and (3) we get:

$$V_2 = (R_2 * V)/ (R_1+R_2)$$

**5.8 LDR DETAILS:**

The resistance of certain semiconductors such as cadmium sulphide decreases as the intensity of the light falling on them increases. The effect is due to the energy of the light setting free electrons from donor atoms in the semiconductor, so increasing its conductivity, i.e., reducing its resistance. There is a 'window' over the grid-like metal structure to allow light to fall on a thin layer of cadmium sulphide. Its resistance varies from 10MΩ in the dark to 1 kΩ or so in daylight. The photoconductive cell is a two-terminal semiconductor device whose terminal resistance will vary (linearly) with the intensity of the incident light. For obvious reasons, it is frequently called a photo resistive device. The photoconductive materials most frequently used include cadmium sulfide (CdS) and cadmium selenide (CdSe). The peak spectral response of CdS occurs at approximately 5100 A and for CdSe at 6150 A . The response time of CdS units is about 100ms and 10 ms for CdSe cells. The photoconductive cell does not have a junction like the photodiode. A thin layer of the material connected between terminals is simply exposed to the incident.

## 6. CONCLUSION AND FUTURE SCOPE

The proposed system helps for the precise identification of manholes and staircases and helps for the efficient and easier navigation through them. The key features of the proposed system are low cost, reliability and portability. It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety. It can be further enhanced by using VLSI technology to design the PCB unit. This makes the system further more compact. Also, use of active RFID tags will transmit the location information automatically to the PCB unit, when the intelligent stick is in its range. The RFID sensor doesn't have to read it explicitly.

**REFERENCES :**

1. Jerome Parquet, Thibault Desert, Olivier Bartoli, Marc Chaumont, "Detection of Manhole covers in High Resolution Aerial images of Urban Areas by combining Two Methods" IEEE Journal Earth Observation and Remote Sensing 2016,9 (5), pp.1802-1807.
2. Severine Cloix, Guido Bologna, Viviama Weiss, Thierry Pun and David Hasler proposed "Low -power depth- based Descending stair detection for smart assistive devices" EURASIP Journal on Image and Video Processing 2016.
3. Radhika, Payal G Pai, Rakshitha, Rampur Srinath "Implementation of Smart Stick for Obstacle Detection and Navigation" International Journal of Latest Research in Engineering and Technology (IJLRET) May 2016
4.S.Rangeetha, B.Rillvana Fathima, R.Sanjana, S.Nivetha Rajma "Arduino based Smart Walking Stick for Visually Impaired to Identify Bus Route" International Journal of Engineering Research & Technology (IJERT), April-2016.
5.V.N. Hoang, T.H. Nguyen, T.L. Le, T.H. Tran, "Obstacle detection and warning system for visually impaired people based on electrode matrix and mobile Kinect", Vietnam J.Comput. Sci., 2017.
6.Thiyagarajan Manihatty Bogan, Uma maheshwaran, Vehicle Tracking System- An Open Source Approach", International Conference on Vehicular Electronics and Safety(ICVES), December 16-17, IEEE 2014.
7.S.Y.Kim and K.Cho.(2013, April 6, 2017)., "Usability and design guidelines of smart canes for users with visual impairments," Int J.Design, vol.7, no.1, 2013.
8.Mohd Helmy Abd Wahab, Amirul A.Talib, Herdawatie A.Kadir Ayob Jahori, A.Naraziah, Roslina.M.Sidek, Ariffin A., "Smart cane: Assistive cane for visually impaired people", IJCSI, vol.8, July 2011.
9.D.Sekar, S.Sivakumar, P.Thiyagarajan, R.Premkumar, M.Vivek kumar, "Ultrasonic and Voice Based Walking Stick
for Blind People", International Journal of Innovative Research In Electrical, Electronics, Instrumentation and
Control Engineering, Vol. 4, Issue 3, March 2016.
10.Yuvan, D.Manduchi, "Dynamic nature environment Using a virtual white", in Computer vision and pattern recognition
CVPR 2005.
11.V. Filipe, F. Fernandes, H. Fernandes, A. Sousa, H. Paredes, and J. Barroso,''Blind navigation support system based on Microsoft Kinect,'' Proc.Computer. Sci., vol. 14, pp. 94–101, 2012.
12.T. Harada, Y. Kaneko, Y. Hirahara, K. Yanashima, and K. Magatani, ''Development of the navigation system for visually impaired,'' in Proc.26th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (IEMBS), Sep. 2004,pp. 4900–4903.
13.J. Burroughs, "X-10 home automation using the PIC16F877A," Lamp, vol. 10, article 10, 2010.

14.D.Dakopoulos and N. G. Bourbakis, "Wearable obstacle avoidance electronic travel aids for blind: a survey," IEEE Transactions on Systems, Man and Cybernetics C, vol. 40, no. 1, pp. 25–35, 2010.

15.N.G.Bourbakis and D.Kavraki, "Intelligent assistants for handicapped people's independence:Case study,"in Proc.1996 IEEE Int.Joint Symp.Intell.Syst.,Nov.4-,pp.337-344.

16.I.Varalakshmi,N.Priyadharshini" An Efficient Watermarking Framework Of AVI Videos Using DCT Technique " International Journal of Advance Engineering and Research Development ISSN:2348-4470 April 2018.

17.I.Varalakshmi "Privacy Preserving Data Analysis Technique" International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET), February 2014. ISSN(Print): 2347-6710 , ISSN(Online):2319-8753

18.Jayamoorthy,I.Varalakshmi,"Monitoring and Self-Transmitting Data Using Zone Routing Protocol in Ad-hoc Network towards Effective Mobility Management" International Journal of Computer Science and Mobile Computing (IJCSMC) Vol. 3, Issue. 4, April 2014 ISSN 2320–088X

19.I.Varalakshmi "SPPDT-Secure Privacy Preserving Data Transmission in Ad-Hoc Network" International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181, June – 2014

20.I.Varalakshmi, Sanjana ,Manju Barkavi "Botnet Detection using Iterative Filtering Algorithm in mobile Adhoc network" published in "International Journal for Research in Applied Science & Engineering Technology (IJRASET)", ISSN:2321 9653 Volume 4 Issue 4 – April 2016.

21.I.Varalakshmi , Pravin Kumar, "A Survey: Detection of Vulnerabilities occurred in Websites and its Possible Attacks" International Journal of Research and Development Organization (IJRDO) ISSN: 3967-0867 (Paper 10) Vol 2 Issue 3, March 2015.