Multipurpose Guide for Visually Impaired People using Raspberry pi

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Abstract: *A Smart electronic guide idea is formulated to give the different highlights of visually impaired individuals. The visually impaired and outwardly disabled individuals utilized brilliant electronic to identify the deterrent during their strolling in the city. The framework is proposed to give counterfeit vision and item identification progressively help by utilizing Raspberry Pi. It comprises of ultrasonic sensors, IR sensor, water sensor, fire sensor, GPS module, GSM and pictures to voice transformation. In proposed wellbeing observing, sensor is utilized to screen the medical problems of visually impaired individuals like pulse and temperature and so on. If there should arise an occurrence of any irregular location, the framework sends a call through GSM to the closest caretaking people. The proposed framework distinguishes an article around them and sends criticism as discourse, notice messages by means of headphones and furthermore gives route to explicit areas through GPS. The proposed framework is intended to give the ease and productive route .The deterrent discovery for the visually impaired individuals which gives a feeling of fake vision by giving data about the natural situation of the static and dynamic items around them, with the goal that they can walk autonomously*.

*Key Words***: *Raspberry Pi, Ultrasonic sensor, IR sensor, Water sensor, Fire sensor, Light Sensor, Heart beat Sensor, Temperature sensor, GPS, GSM and Image to Speech*.

1. INTRODUCTION

There are about 253 million people live with vision impairment, 36 million are blind and 217 million have moderate to severe vision impairment. 81% of people who are blind are aged 50 years and above (WHO estimation). The number of visually impaired people is expected to grow in the future due to various reasons. As a result, there is a need for a cost-effective system that can be used by blind people to walk easily and comfortably. A smart solution is proposed for blind people so that they can use this in their daily life. This paper proposes the design and development of a smart stick to help visually impaired people. For achieving dreams, goals, and objectives in life, independence plays an important role. Visually impaired individuals find themselves hard to go out independently. There are thousands of visually impaired people in this world who are usually in need of helping palms. For decades, the white cane has become a well-known attribute to blind people's navigation and later efforts have been made to enhance the cane by adding a different sensor. Blind people face the problem when they walk on the street or stairs using a white cane, but they have sharp hap tic sensitivity. The digital walking stick will assist blind people by supporting an extra handy manner of existence. There are numerous steering Structures for visually impaired travelers to navigate quickly and thoroughly against boundaries and different dangers faced. Commonly, a blind user has a white cane or a steerage canine as their mobility resource. With the advances of modern technology, many distinctive kinds of devices are support mobility of blind, known as Electronic Travel Aids (ETAs). Outdoor navigation depends on the Global positioning system (GPS) and maps support.GPS provides the current location of the user. The destination that a user wishes to reach is given as a voice input to the voice recognizer. By the information on the current location and destination, the maps provide the route to reach the destination in the form of audio output that can be received by a Bluetooth receiver. Thus this system will be much useful for the visually challenged people for easy navigation in unfamiliar surroundings. Blind stick is a special device used by visually disabled people for centuries. But in recent times Electronic Travel Aid (ETAs) with sensors and sound systems are designed for improved navigation of blind people. Here we proposed an advanced blind stick that allows visually challenged people to navigate using advanced technology like ultrasonic sensors & mobile application. We already know about traditional blind sticks [4]. But the question that comes into our mind is that how this system can give idea about the surrounding by using GPS system [14]. The advantage of our project is that it can detect any obstacle with the

help of ultrasonic sensors and it can provide correct location of obstacle by using the GPS System. Thus it will help blind people when they are walking outside from their home.

2. LITERATURE SURVEY

1**.** A Survey of Voice Aided Electronic Stick for Visually Impaired People. Author Name- Young Ho, Sung Jae Kang. Description- From this paper we got idea about latest technology like Graphics Positioning System (GPS) & Graphics System Messaging (GSM). Which will help for tracking the location & used for making module of smart stick for visually impaired people and it gives us idea about Voice message get from Android Phone to that blind person. [14].

2. Blind Navigation System Using Image Processing and Embedded System Author Name- Sacinah Jamaludin, Zul Azizi Hailani Description- We got idea from this paper for Navigation system has been developed which help to enhance mobility of blindness. This paper gives us idea for capturing live video of that person & grab video feed in front of blind person & this live video can be observe by admin itself. [4]

3. Smart Cane: Assistive Cane for Visually-impaired People. Author Name-AmirulATalib, MohdHelmy Wahab Description- We got idea from this paper for Voice message & Vibration when person detect obstacle with help of smart stick then blind person get aware to it by understanding Vibration alert & Voice message which comes from smart phone. [3]

4. Electronic Path Guidance for Visually Impaired People Author Name-Iwan Ulrich and Johann Borenstein Description- From this paper we got idea about the how range which is required for detecting obstacle or object from location of smart stick specific range is there we need to set threshold value if obstacle comes into that threshold range then it can detect successfully otherwise cannot. [4]

5. Use of Ultrasonic Sensors in the Development of an Electronic Travel Aid Author Name- Alex Harold and Chris Gearhart Description- From this paper we got idea about for capturing video image processing is required by making use of some algorithm & method we make some processes on image for capturing it and also live monitoring of that person is seen at admin side. All the processing data is stored on server side in serialized format.[5]

6. Automated Mobility & Orientation System for Blind or Partially Sighted people Author Name- Abdel Ilah_Nour Alshbatat Description- From this paper we got idea about GSM, GPS of sensor like Integrated Ultrasonic sensor, Accelerometer.[14]

3. METHODOLOGY

Raspberry pi is a SOC (System on Chip), that integrates several functional components into a single chip or chipset. The SC used in Raspberry Pi 2 is the Broadcom BCM2836 SOC Multimedia processor. The CPU of the Raspberry Pi contains an ARM Cortex-A7 900MHz processor which makes use of the RISC Architecture and low power draw. It is not compatible with traditional PC software. Therefore it has to be connected to a monitor separately and thus it is called as a mini computer. Raspberry pi has an on-chip DSP processor which is used to perform the floating point operations.

The raspberry pi uses AMBA (Advanced Microcontroller Bus Architecture) which is an on-chip interconnect specification for the connection and management of functional blocks in system-on-chip (SOC) designs. It facilitates development of multi-processor designs with large numbers of controllers and peripherals. The GPIO pins of the Pi differ by the model.

There are 40 pins, out of which there are 4 power pins and 8 ground pins. Rest of the pins is used as GPIO's. The networking capabilities of the Pi can be used as a wired Ethernet (IEEE802.3) or the wireless IEEE 802.11 Wi-Fi. Raspberry pi has an internal memory of 1GB RAM and external memory is extendable up to 64GB.

4. SMART ELECTRONIC MULTIPURPOSE AID FOR PROPOSED METHOD

Raspberry Pi is a microcontroller to connect various sensors which is programmable using python. It is single board, low cost computer. Power supply is an electrical device that can supplies the electrical power.5v supply is used Fig (1) Ultrasonic sensor senses the obstacles within few meters of range. There is a pair of eyes, Transmitter and Receiver, Transmitter transmits pulse signals with velocity v and Receiver receives the transmitted signals after time t (this is called Time of Flight). So, the distance will be (v*t)/2. IR sensor senses its surrounding by emitting or detecting infrared radiation, infrared sensors can also detect the heat emitted by the object and also can detect motion. Water sensor is an electronic device that is designed to detect the presence of water. A common

design is a small cable or device that lies flat on a floor and relies on the electrical conductivity of water is present through microcontroller to voice message. Fire sensor is thermistors usually have negative temperature co-efficient which means the resistance of the thermostat decreases as the temperature increase. Fire sensor is detecting the Flame through the microcontroller and send voice message. Light Sensor is useful at night. It alerts the people in the surrounding area that a blind person is walking and to allow space so that the blind person can walk easily. Heart beat sensor principle is photoplethysmography and designed to give digital output of heart beat when a finger is placed on it .when the heart beat detector is working, the beat LED flashes in unison with each heartbeat. This digital output can be connected to microcontroller directly to measure the beats per minute (BPM) rate. Temperature sensor is a device; to measure the temperature through an electrical signal it requires a thermocouple or RTD (Resistance temperature Detectors). T he working base of the sensors is the voltage that read across the diode. Heart beat and temperature sensor is monitor human health any abnormal condition message or call send to the near hospital, ambulance and take care person. Image to Speech technology is basically used for conversion of image file into voice or in audio form. This technology proposed to help the blind peoples. For this conversion does not require internet connection.
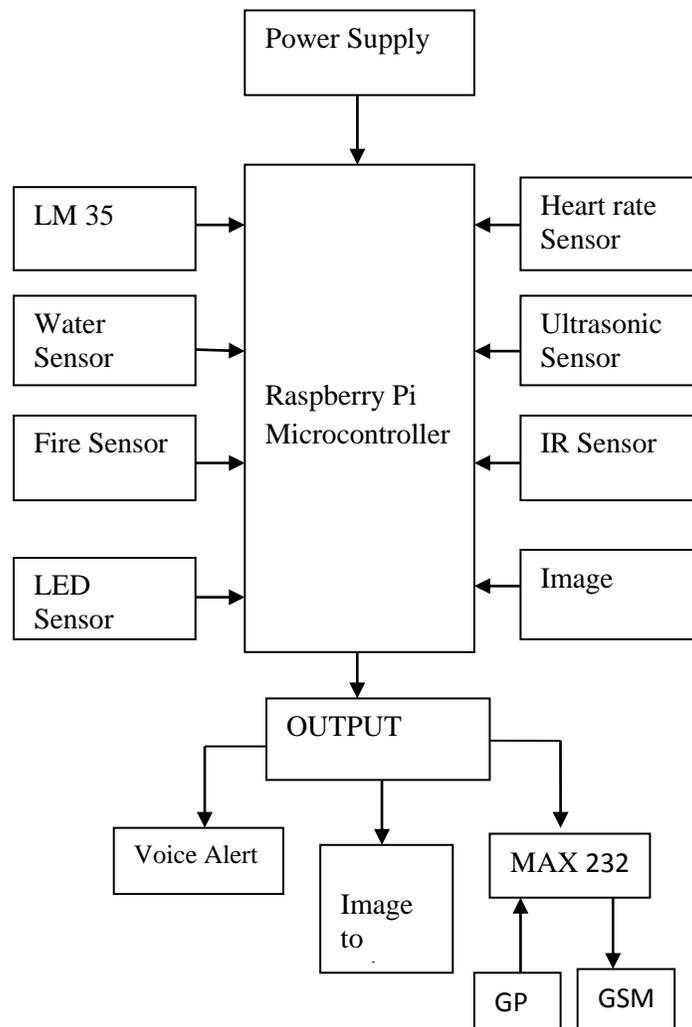

Fig-1 Block Diagram for proposed method

It is very easy to use, so the blind person can independently use this device. GPS module is used to know the current location where the blind person is present; he can also hear the audio message regarding the direction that is to be followed by the blind person. GSM module is used by the blind person to contact to mobile numbers stored in the microcontroller in case of any emergency. GPS is used for location identification and GSM is used for SMS ,Call service .This proposed method using raspberry pi so take live video send the take care person. Camera is used for capture the image.

4.1 Sensors

Ultrasonic sensor is works on the Principle of sonar and radar system which is used to determine the distance to an object. An Ultrasonic sensor generates the high –frequency sound (ultrasound) waves and range from 20KHZ to 200KHZ range and then listens for the echo. Ultrasonic Sensors use a vibrating device known as a transducer to emit ultrasonic pulses that travel in a cone-shaped beam. The range of an ultrasonic sensor is determined by the frequency of vibration of the transducer.

IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR Sensor. The IR Transmitter sends an infrared signal that, in case of a reflecting surface (e.g. white color), bounces off in some directions including that of the IR receiver that captures the signal detecting the object. Sensors are basically electronic devices which are used to sense the changes that occur in their surroundings. The change may be in color, temperature, moisture, sound, heat etc. They sense the change and work accordingly. In IR sensor the there is emitter and detector. Emitter emits the IR rays and detector detects it. The IR sensor basically consists of three components: IR LED (emitter), Photodiode (detector), Op-Amp.

A Fire detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. It is avoiding the fire accidence.

Water sensor is used to detect the presence of water. It is an easy-to-use, cost-effective. Presence of water pass the message to microcontroller and voice Output using speaker.

Heart Beat Sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the beats per minute (BPM) rate .It works on the principle of light modulation by blood flow through finger at each pulse.

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The normal human body temperature is often stated as 36.5–37.5 °C (97.7–99.5 °F).

4.2 Global positioning system

The network of 30 satellites constitutes the Global positioning system. These satellites are orbiting the earth at an altitude of 20,000km.Whenever the user is on the planet; at least 3 satellites determine the position of the user. These satellites then transmit the position and time at regular intervals, to the GPS receiver which is held by the user. These signal travel with a speed of light.

By using the information given by these satellites, the exact position of the user is determined. The determination of exact location is by a method called trilateration. The accuracy depends on the number of satellite above the horizon.   Accuracy of location is determined if there are more number of satellites.

4.3 Global system for mobile communication

The Global system for mobile communications is a system that is used for data communications between mobile networks. The structure of a GSM network consists of
1. Base station subsystem.
2. Network and switching subsystem.
3. GPRS core network.
4. Operations support system.

GSM consists of Subscribers identity module which is a detachable smart card containing the user's subscription information and phonebook. It considers the user's authentication using a preshared key and challenge response over the air encryption. It uses several cryptographic algorithms for security. GSM uses a variety of voice codec. It is based on linear predictive coding . GSM uses GPRS for data transmission like browsing the web. In practical use, it covers about 35 km.

4.4 Image to speech

Image to Speech technology is for this conversion does not require internet connection. It is very easy to use, so the

blind person can independently use this device. Camera capture the image compared to the stored images. The basically used for conversion of image file into voice or in audio form. This technology proposed to help the blind peoples.

Text-to-speech device consists of two main modules, the image processing module and voice processing modules. Image processing module captures image using camera, converting the image into text. Voice processing module changes the text into sound and processes it with specific physical characteristics so that the sound can be understood.

The block diagram of Text-To-Speech device, 1st block is image processing module, where OCR converts .jpg to .txt form. 2nd is voice processing module which converts .txt to speech. It recognizes numbers as well.Range of reading distance was 38-42cm.Character font size should be minimum 12pt.Maximum tilt of the text line is 4-5 degree from the vertical

5. CONCLUSION

The innovations behind visually impaired sticks are redesigning step by step. It identifies wet floors to abstain from slipping mishaps. It recognizes floor-level and knee-level deterrents utilizing Sensors.GPS tracker can be utilized for progressively precise Location. Pulse sensor and temperature sensor utilized for clinical reason and sense the heart bit and temperature sense least and most extreme level send message and Call through the neighbor and closest medical clinic utilizing GSM. Our model guarantees one thing that is making the errand of moving of a visually impaired individual simple and agreeable. The stick is additionally exceptionally light and convenient to convey. What's more, the segments or parts that we utilized in the stick are likewise effectively accessible and less in cost. In future, in the event that further improvement and speculation is done with the stick, at that point it will be a much increasingly compelling gadget for the future world. Content is separated from the picture and changed over to sound. It perceives both capital just as little letters. A shopping partner for the outwardly hindered individuals.

6. RESULT

Image to voice output
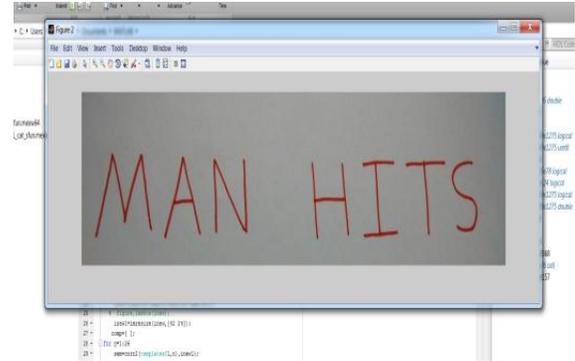
Fig 2. Capture image using camera
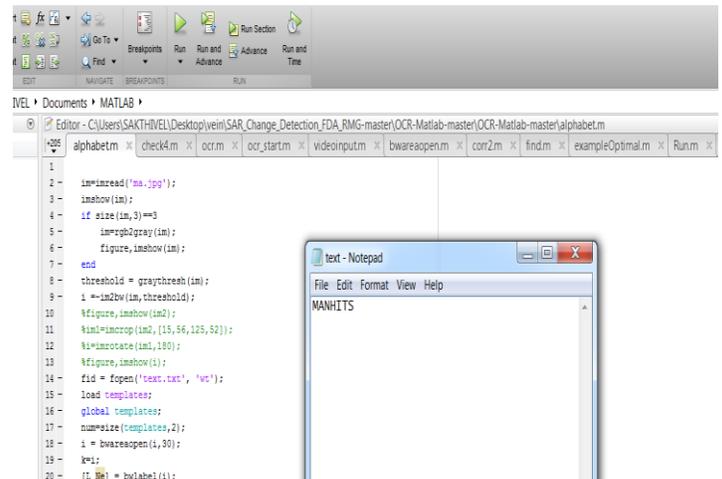
Fig 3.Image to text converter

Step1.Capture image
Step2.Image to Text using OCR
Step3.Text to Speech
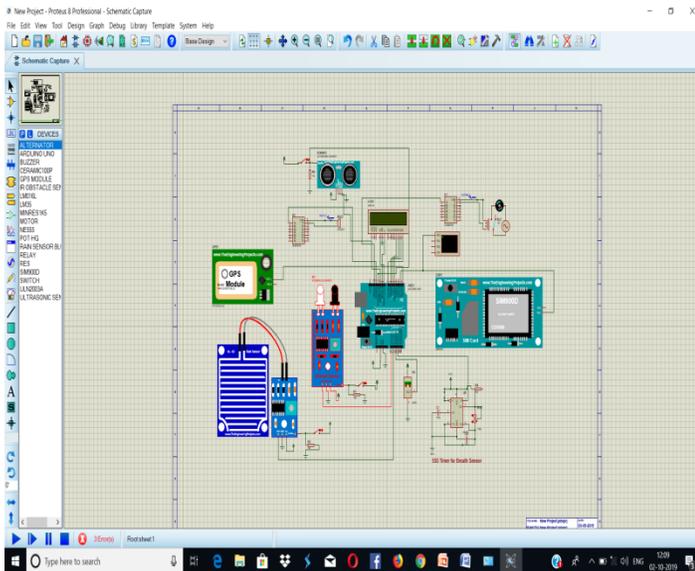
Fig 5. Simulation result for proposed method using protease software

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