

ULTRASONIC ELECTRONIC AID FOR VISUALLY IMPAIRED PEOPLE

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Abstract—Blindness is a quantitative term that describes the clinical condition whereby individuals have no light perception as a result of total vision loss. This paper is intended to provide overall measures object detection, and send information related to blind. Vision is the primary sense for spatial information [1], and blindness drastically impedes the ability to navigate in the environment. One of the challenges in the design of navigation aids is to convey information to the blind user in an efficient and intuitive manner. The proposed method presents a prototype model and a system to provide smart Electronic Travelling Aid (ETA). It help blind people to find obstacle free path. Also track current position of the blind person and inform the family members using IOT technology. The shoe comprises of microcontroller, vibratory circuit, battery and sensor. It also need a secured network connection for IOT application. The spectacles comprises of ESP8266, ultrasonic sensors, battery and buzzer. It also provides gyroscope falling detection using android phone.

Keywords—Blindness, Electronic Travelling Aid, gyroscope, ESP8266, ultrasonic sensors, vibratory circuit, IOT technology

I. INTRODUCTION

Vision is the primary sense for spatial information [1], and blindness drastically impedes the ability to navigate in the environment. Blindness is a qualitative term that describes the clinical condition whereby individuals have no light perception as a result of total vision loss. Blindness also refers to those who have so little vision that they have to rely predominantly on other senses as vision substitution skills. On the other hand, visual impairment is a

qualitative term used when the condition of vision loss is characterized by a loss of visual functions at the organ level, such as the loss of visual acuity or the loss of visual field. Whereas, vision loss is used as a general term that includes both blindness (total loss) and low vision (partial loss) diagnosed either on the basis of visual impairment or by a loss. The current position of blind people is tracked and informed to the family members using IOT technology. IOT represent the idea of connecting physical object that contain sensing, networking and computing capabilities with other object and services through the internet IOT. This system also provides the gyroscope fall detection by using android phone. The SMS is send to inform the family members whether the blind person experience.

II. SYSTEM ARCHITECTURE

The implemented system consist of micro controller (ESP8266) as a main processing unit for the entire system and all the sensors and devices can be connected with the microcontroller to retrieve the data from them and it processes the analysis with the sensor data and updates it to the internet though Wi-Fi module connected with it. Each shoe is mounted with ultrasonic sensor with vibratory circuit (vibration motor) and a battery. The spectacle has ESP8266, ultrasonic sensor, buzzer and a battery.

A. Block diagram

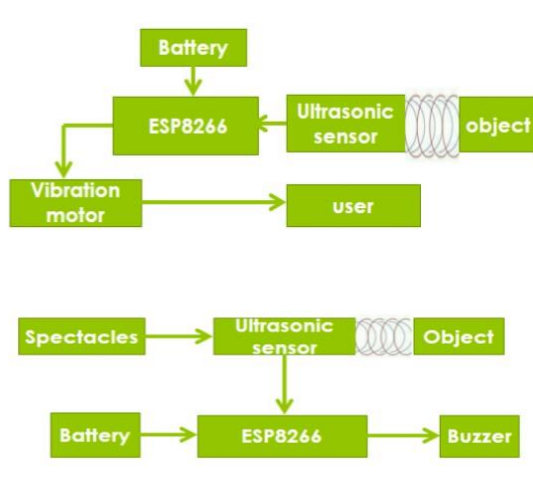


fig:(a) block diagram for shoes
(b) block diagram for spectacles

A. Wi-Fi module



Fig-2 ESP8266

Here we used ESP8266 Wi-Fi module which is having TCP/IP protocol stack integrated on chip. So that it can provide any microcontroller to get connected with Wi-Fi network. ESP8266 is a programmed SOC and any microcontroller with a supply voltage of 3.3 voltages. The module is configured with AT commands and the microcontroller should be programmed to send the AT commands in a required sequence to configure the module in client mod. The module can be used in both client and server modes.

C. Ultrasonic sensor

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control

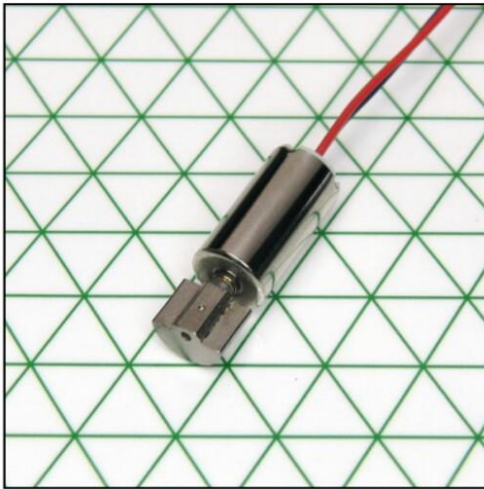
circuit. The basic principle of work: (1) Using IO trigger for at least 10us high level signal, (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. (3) IF the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time × velocity of sound (340M/S) / 2.



Fig-3 Ultrasonic sensor

D. Vibration Motor

Vibration Motor is used to provide the vibration when the ultrasonic sensor detects the obstacle around the path. Body Diameter: 6 mm [+/- 0.1] Body Length: 12.2 mm [+/- 0.2] Counterweight Radius: 2.9 mm [+/- 0.1] Counterweight Length: 4.5 mm [+/- 0.1] Rated Operating Voltage: 3 V Rated Vibration Speed: 12,000 rpm [+/- 2,400] Typical Rated Operating Current: 85 mA Typical Normalised Amplitude: 3.5 G.



6mm Vibration Motor - 12mm Type
Shown on 6mm Isometric Grid

Fig-4 vibration motor

E. Buzzer



fig-5 Buzzer

*Specifications: Rated Voltage : 6V DC
Operating Voltage : 4 to 8V DC Rated
Current* : $\leq 30mA$ Sound Output at 10cm* :
 $\geq 85dB$ Resonant Frequency : $2300 \pm 300Hz$
Tone : Continuous Operating Temperature :
 $-25^{\circ}C$ to $+80^{\circ}C$ Storage Temperature :
 $-30^{\circ}C$ to $+85^{\circ}C$ Weight : 2g *Value applying
at rated voltage (DC). It is black in colour
With internal drive circuit , Sealed structure ,
Wave solderable and washable , Housing
material: Noryl T has applications in*

Computer and peripherals , Communications equipment , Portable equipment , Automobile electronics , POS system , Electronic cash register.

F. IOT technology

Internet of Things (IoT) comprises things that have unique identities and are connected to the Internet .The focus on IoT is in the configuration, control and networking via the Internet of devices or “Things” that are traditionally not associated with the internet Eg: pump, utility meter, car engine. IoT is a new revolution in the capabilities of the endpoints that are connected to the internet. IOT uses protocols such as CoAP (Constrained Application Protocol). MQTT (Message Queue Telemetry Transport). XMPP (Extensible Messaging and Presence Protocol). 6LoWPAN (Low power Wireless Personal Area Networks).

III. RESULT AND DISCUSSION

A prototype, smart rehabilitative shoes and spectacles has been designed and developed to facilitate safe navigation and mobility of blind individuals. The system has been designed for individuals with visual loss requiring enhancement. The design criteria behind the system’s development were set to correlate with the 10 features of the ideal mobility aid. Obstacle avoidance is addressed, navigational guidance or way finding is addressed, user friendliness and good battery life is addressed. Fall detection is provided using gyroscope technology in android phone. Head level to bottom level obstacles can be detected.

IV. CONCLUSION

This paper presented a novel solution for visually impaired people. IT provides solution for the following:

1. It detects all levels of obstacles.
2. It provides fall detection.
3. Provides direction and obstacle guidance'
4. Track current position using IOT.

Due to these advantages the this ETA is easy to use.

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