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Ultrasonic Spectacles for Blind Person

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Abstract: *The ultrasonic spatial code line for blind people using Node MCU, web camera, ultrasonic sensor, and output of speaker is an innovative system designed to aid visually impaired individuals in navigating their environment independently and safely. The system works by using a combination of hardware components and software algorithms to provide real-time spatial feedback to the user. The system consists of a Node MCU microcontroller, which acts as the central processing unit and controls the flow of data between the various components. A web camera is used to capture a live video feed of the user's surroundings, which is then processed using image recognition algorithms to identify and locate obstacles in the environment. An ultrasonic sensor is used to measure the distance between the user and any obstacles detected in the video feed. This information is then used to generate a tactile feedback map that is transmitted to the user via a speaker output. The tactile feedback map consists of a series of vibrations that correspond to the location and distance of the obstacles in the user's environment. The ultrasonic spatial code line is a critical need for blind individuals who struggle with navigating their environment independently. The system provides a practical solution that can help improve their quality of life by enabling them to move around more safely and confidently. Additionally, the system is relatively low-cost and easy to implement, making it accessible to a broader range of individuals.*

Key Word: *Electronic Travel Aid – Visual Impairment- Machine learning – Navigation Aid - Mobility – Ultrasonic spectacles – Blind navigation;*

I.INTRODUCTION

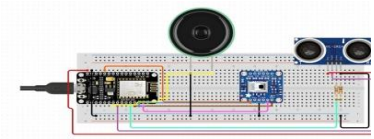
I believe you are asking about an ultrasonic spatial code line for blind people. An ultrasonic spatial code line is a system that uses ultrasonic sensors to create a tactile feedback map for blind or visually impaired individuals to navigate an environment more easily. The system works by emitting high-frequency sound waves from a set of sensors placed along a path or route. The sound waves bounce off objects in the environment and are then detected by the sensors. The system then converts this information into a tactile feedback map that can be felt by the user through a handheld device or a set of vibrating pads placed on the ground. This system can provide blind individuals with important spatial information about their environment, including the location of obstacles, changes in elevation, and the direction of travel. It can also help them to navigate unfamiliar environments more confidently and independently. There are several existing systems that use similar components to create a spatial code line for blind people, including the Blind Aid system and the Ultrasonic Walking Stick. These systems use ultrasonic sensors, cameras, and haptic feedback devices to provide navigation assistance to visually impaired individuals, helping them navigate their environment independently.

II.BACKGROUND WORKS

a. Machine Learning:

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and its algorithms help to learn the way that humans learn, gradually improving its accuracy. It is a method where the target and goal is defined with the steps to reach by algorithm and machine itself by training and gaining experience. Machine learning is a well growing technology which makes computers learn automatically from historical past data. Machine learning uses various algorithms for building mathematical models and making predictions using historical data or information. Machine Learning is an application of AI that enables system to learn and improve from experience without being explicitly programmed. Machine Learning focuses on developing computer programs that can access data and use it to learn from themselves. Currently, it is being used for various tasks such as image recognition, speech recognition, email filtering Facebook auto-tagging, recommender system, and many more. Machine Learning techniques are Supervised, Unsupervised, and Reinforcement learning.

b. Block diagram:



c. Components

Hardware Required

- NODE MCU ESP8266
- SPEAKER
- ULTRASONIC SENSOR
- WEB CAMERA

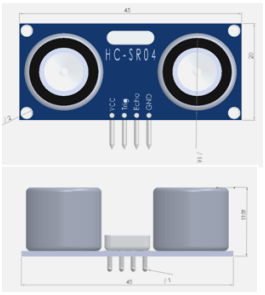
Node MCU Esp8266:

New Wireless module with CH340 USB-UART, Node Mcu is WIFI IoT (Internet of Things) development board based on ESP8266. Node Mcu is a tiny board, based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board. It's aLua based firmware for Wi-Fi-SOC (Systems-On-Chop) ESP8266 Wi-Fi module.

Speaker:

The ISD1820 Recording Module Voice Board is the real easy way to add Voice Recording (and Playback) to your project. The Module can be operated directly by using the 3 Push-Buttons or with every microcontroller (ex. Arduino). A microphone is implemented directly on the board, and you can connect any 8 Ohm Speaker. Your recordings are saved even without power due to the non-volatile storage on theISD1820.

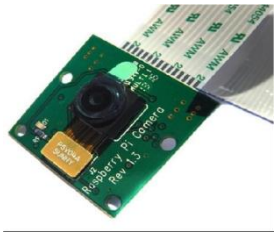
Ultrasonic Sensor:



An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.

High-frequency sound waves reflect from boundaries to produce distinct echo patterns.

Web Camera:



The 5MP Raspberry Pi 3 Model B Camera Module with Cable equips flexible cable for attaching with Raspberry Pi 3 Model B. The 5MP camera module is perfect for small Raspberry Pi projects which have very little space allowance just boot up the latest version of Raspbian and you are good to go!!! The high-definition 5MP camera delivers outstanding photos but can also shoot video, ideal for drones or a CCTV project. The lightweight camera module allows for it to be used in more practical roles, such as a hidden camera or even a camera for a Pi-phone, for example.

III.WORKING PROCESS

The working of the system can be broken down into the following steps:

Ultrasonic sensor data acquisition: The ultrasonic sensor mounted on the system is used to measure the distance between the user and surrounding objects. The sensor transmits a high-frequency sound wave that bounces off the object and returns to the sensor. The time it takes for the wave to return is used to calculate the distance.

Image processing: A web camera mounted on the system is used to capture images of the surrounding environment. These images are processed using image processing algorithms to detect the objects present in the environment and their locations.

Tactile feedback map generation: The distance information obtained from the ultrasonic sensor and the object location information obtained from the image processing algorithms are combined to generate a tactile feedback map. The map is a representation of the environment and includes information about the location of the user, nearby objects, and any potential obstacles.

Output to the speaker: The tactile feedback map is output to the speaker, which provides auditory feedback to the user. The feedback is in the form of a sound or a voice message that informs the user about the surrounding environment and any potential obstacles.

User interaction: The user interacts with the system by listening to the feedback provided by the speaker and using it to navigate their environment. The feedback provides the user with information about the location of nearby objects, any potential obstacles, and the direction in which they need to move. The Ultrasonic Spatial Code Line for blind people works by using ultrasonic waves to detect the distance between the user and surrounding objects, processing this information to generate a tactile feedback map, and outputting the feedback to the speaker. The user interacts with the system by listening to the feedback and using it to navigate their environment.

IV.CONCLUSION

In conclusion, the Ultrasonic Spatial Code Line for blind people is a crucial technology that can provide a reliable and effective solution for visually impaired individuals to navigate their environment independently. With the advancements in modern technology, the use of ultrasonic sensors, web cameras, microcontrollers, and speakers have made it possible to create an affordable and efficient system for the visually impaired population. The proposed system for the Ultrasonic Spatial Code Line for blind people using Node MCU, web camera, ultrasonic sensor, and output of the speaker is a promising solution that can help visually impaired individuals navigate their environment with ease. The system is portable, lightweight, and affordable, making it accessible to a larger population of visually impaired individuals. However, it is important to note that while technology can provide solutions, it is not a complete substitute for human assistance and guidance. It is essential to understand the limitations of the technology and ensure that it is used in conjunction with human guidance and support. The Ultrasonic Spatial Code Line for blind people is a significant step towards promoting independence and autonomy for visually impaired individuals and should be further explored and developed to meet the needs of this population.

References

1. *H. Kim, J. Lee, S. Jo, and J. Cho, "A Spatial Audio-BasedNavigationAidSystemfortheBlind usingUltrasonicSensorsand Loudspeakers,"IEEE Transactions onConsumer Electronics, vol. 61, no. 2, pp. 168-174, May2015.*
2. *N.M.Khan,M.A.Bhuiyan,andM.A.Hossain,"UltrasonicSpatialCodeLineforBlindNavigation:ALowCost Approach," International Journal of Scientific &EngineeringResearch,vol.6,no.5,pp.287-291,May2015.*
3. *M.A.Azam,M.A.Hossain,andS.K.Biswas,"DevelopmentofaPortableNavigationSystemfortheVisually Impaired People," International Journal ofEngineering & Technology, vol. 4, no. 5, pp. 553-558, Oct-Nov2014*
4. *M. Bhatti, A. Raza, M. N. Naeem, and S. S. Rathore,"DevelopmentofaCostEffectiveNavigationSystem forthe Visually Impaired using Ultrasonic Sensors," IEEESensors Journal, vol. 17, no. 6, pp. 1839-1845, March2017.*
5. *Khosravi, M.Taheri,andH.Sharifzadeh,"DesignofanUltrasonic Spatial Code Line for Blind People,"International Journal of Advanced Computer Scienceand Applications, vol. 6, no. 10, pp. 68-73, October2015.*
6. *J. Huang, L. Liu, Y. Liu, and J. Huang, "An Ultrasonic-basedNavigationSystem forVisuallyImpairedPeople,"IEEEAccess,vol.6, pp.4355-4364, January2018.*
7. *H. A. Bakar, N. H. B. M. Arshad, and N. A. M. Ludin,"Development of a Navigation System for Blind Peopleusing Ultrasonic Sensors," 2018 IEEE Conference onSustainable Utilization and Development in EngineeringandTechnology(CSUDET),KualaLumpur,2018, pp.1-6.*
8. *S.Sarkar,S.K.Chattopadhyay,andP.Misra,"Smartphone-based Audio Navigation System for theVisually Impaired using Ultrasonic Sensors," IEEEConsumer Electronics Magazine, vol. 5, no. 2, pp. 53-59,April2016.*
9. *M. V. B. Prasad and K. V. Kumar, "Ultrasonic BasedNavigation System for Visually Impaired," 2016 IEEEInternational Conference on Wireless Communications,Signal Processing and Networking (WiSPNET),Chennai,2016,pp. 1787-1791.*
10. *S.S. Chavan,P.S.Thakare,andA.M.Sonar,"Ultrasonic Code Line Based Navigation System forVisually Impaired People," 2019 4th InternationalConference on Internet of Things: Smart Innovation andUsages (IoT-SIU),Pune,India, 2019,pp.1-5.*