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AI Based Insight Vibrator with Glove for Visually Challenged and Auditory Challenged Individuals

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Abstract-This study introduces a novel assistive tool designed to enhance the communication abilities and sensory experiences of those with physical limitations. Seeing one's environment is one of humanity's greatest abilities. You may see more clearly around you using Eyes because of AI (Artificial Intelligence) data. The most terrible agony a person may experience is losing their vision as a result of problems or a variety of life circumstances. With or without assistance, a blind person can live a free and independent life in a variety of ways. People with impairments are granted certain rights and assistance by several nations worldwide.Users of the Insight Vibrator with Glove can sense and interpret information by means of haptic feedback technology integrated into a wearable glove.The glove is equipped with sensors that translate ambient input into distinct vibration patterns. This innovative technique aims to empower individuals with physical limitations and encourage increased independence and communication by providing them with a more sophisticated knowledge of their surroundings. The study looks at the development, functionality, and design of the Insight Vibrator with Glove, with a focus on how it could help those with physical limitations.

1.INTRODUCTION

The inability to see and hear can significantly impair one's mobility and interpersonal communication. But thanks to recent technological advancements, it is now possible to construct aids that help people with visual impairments regain some degree of freedom. One such device that employs ultrasonic vibrations to provide sensory information about the environment is a third eye for the blind. For blind people, ultrasonic vibrators attached to a glove's fingertips act as a third eye. The glove's back has an ultrasonic sensor that collects data and sends it to a microprocessor, which then uses it to operate the vibrators. Ultrasonic waves are produced by the sensor and are detected by it when they bounce off surrounding objects. The microcontroller then modifies this data.Subsequently, the vibrations are transmitted to the user's fingertips by means of the microcontroller. glove. When a blind person wears the glove, the ultrasonic sensor in it sends a signal, which reflects off nearby objects and returns to the sensor. After receiving this information from the sensor, the microcontroller makes use of it to produce vibrations. These vibrations are sent to the glove's fingertips, giving the wearer a sense of the items around them. For instance, if a wall is close by, the wearer will sense it strongly through vibrations in their fingertip tips. For example, the wearer will feel vibrations in the tips of their fingertip tips if a wall is nearby. The glove has sophisticated sensors that constantly monitor its surroundings and give the user feedback on data in real time via haptic and audio signals.The purpose of the glove is to improve the mobility and spatial awareness of those who are blind or visually impaired.Through the conversion of positional information into vibrating signals, this novel technology seeks to provide users with a previously unheard-of degree of autonomy in navigating their environment.

2. LITERATURE SURVEY

2.1 Ultrasonic Vibrator Glove for Enhanced Mobility and Safety in Visually Impaired Individuals

Vishnu Sonwane,Rudra Bhandari,Omkar Bhanji et al,. 2023, This paper examines the design, manufacture, and practical application of an ultrasonic vibrator glove meant to assist the visually impaired. The glove combines state-of-the-art parts, including an Arduino UNO board, haptic

motor, and ultrasonic sensor, to provide tactile feedback and real-time obstacle detection. This innovation significantly increases the mobility, independence, and safety of blind individuals. By combining haptic vibration and ultrasonic detection, the glove breaks beyond traditional limitations and provides users with a natural way to see and comprehend their surroundings. Through rapid obstacle detection and perceptive vibrations, the Ultrasonic Vibrator Glove redefines the tactile experience and helps blind people navigate their environment more successfully.

2.2 Smart Glove for the Disabled

Hrishikesh P Athreya, G. Mamatha, et al, 2021, This paper shows people with disabilities can live regular lives with the aid of smart gloves. They exclusively communicate with others by gesturing and making facial expressions. This will facilitate their communication because they typically find it difficult to interact with others.It facilitates the conversion of hand gestures into voice and text. This makes it easier for regular people to comprehend what he or she is saying and respond appropriately. Through the use of motion sensors, this device is able to identify and comprehend each user motion. To recognize hand gestures, an accelerometer and flex sensor are coupled to a smart glove.

2.3 Computer Vision-based Assistance System for the Visually Impaired Using Mobile Edge Artificial Intelligence

Jagadish K. Mahendran, Daniel T. Barry, et al, 2021, This paper shows that Visual aid systems are still significantly limited by sensor capabilities, form factor, battery power consumption, processing resources, and the usage of conventional computer vision algorithms, even with major recent advancements. Deep learning challenges in computer vision are too difficult for current visual assistance systems to handle well. We demonstrate the design and implementation of a unique visual assistance system on a low-power, low-cost mobile computing platform that uses point cloud processing and deep learning to accomplish advanced perception tasks.

2.4 Design of the Smart Glove to Aid the Visually Impaired

Pavan L P, Vinayaka S K, Chetan S, et al,. 2020, This paper shows that for the blind, finding everyday objects can be a challenging undertaking. This research aims to create a smart glove that guides the hand of a visually impaired person toward a desired object in an indoor setting using Deep Neural Networks (DNN) and an object tracking algorithm. The user's hand is guided by micro-vibrating motors in the smart glove. A Universal Serial Bus (USB) camera located on the glove's palm provides real-time video feed to the Raspberry Pi for processing. Additionally, the camera has a built-in microphone.

2.5 An Affordable Hand-glove for the Blind using Ultrasonic Sensors

Abhishek Kanal, Prajakta Chavan, et al,. 2017, This paper shows the use of a blind person's assistive glove is discussed in this work. This glove's technology works by assisting the blind or visually impaired in identifying objects within a 100-centimeter radius in either direction on the glove. This glove informs its wearer with a loud beep and strong vibrations whenever it detects an object within 100 cm. Compared to comparable gloves that use technology that cost nearly ten times as much as the glove described in this paper, one of the glove's main USPs is how inexpensively it is made.

2.6 Third Eye for the Blind, An Innovative Wearable Technology Using NI Myrio

Ibtisam, Dr. V.K Annapurna, et al, 2021, This paper shows that people who are visually impaired typically rely on outside assistance from humans, trained canines, and specialized technology devices. The challenge with blinds is figuring out where they want to go. People who are able to see aid the blind. The World Health Organization (WHO) estimates that 10% of individuals with visual impairments are blind or visually impaired and require assistance from others to go around. The goal of the current project is to use touch and sound among other senses to help blind people get past obstacles.

2.7 Third Eye for the Blind Person

S B Totade, Prof P V Raut, et al,. 2022, The This paper shows that Arduino-based third eye, also known as extra vision for the blind, is a hardware and software project that uses ultrasonic waves from an ultrasonic sensor to vibrate and identify objects for the user. The buzzer is used to create this vibration. The stick that blind people need to walk for extended periods of time has an impact on this project. Carrying a stick is a serious issue for weak persons. This is a wearable device designed to help the weak and blind walk more effortlessly. Instead of needing to hold anything in their hands while walking, they can wear our creation.

2.8 Smart Navigation System for Typhlotic Persons

R.Anitha, M.Divya, G.Keerthana, et al,. 2021, This paper shows that the wearer will feel vibrations in the tips of their fingertip tips if a wall is nearby. The glove has sophisticated sensors that constantly monitor its surroundings and give the user feedback on data in real time via haptic and audio signals.The purpose of the glove is to improve the mobility and spatial awareness of those who are blind or visually impaired.Through the conversion of positional information into vibrating signals, this novel technology seeks to provide users with a previously unheard-of degree of autonomy in navigating their environment.

2.9 Ultrasonic Vibrator Glove

Dr. V. Rama Krisha Sharma, Akash Reddy Singi Reddy, et al, 2022, This paper demonstrates how you can use your eyes to see the world around you. The worst pain a person can experience is losing their vision from problems or a variety of life circumstances. A blind person can live his life freely in a variety of ways, either with or without assistance. Many nations throughout the world offer additional advantages and resources to assist those with disabilities. Offering an Ultra Sonic Glove with a low-cost module is one such way to assist the blind in preventing deadly collisions and frequent runs-ins with nearby objects.

2.10 Third Eye for Blind Ultrasonic Vibrator Gloves

Rakesh Narvey, Rahul Sagwal, et al,. 2020, This paper explains on ultrasonic vibrator gloves for this study. With the use of this technology, people who are blind or visually challenged can identify objects that are 1.5 meters or less away from them in any direction on the glove. A beep and vibrations are generated by the glove to inform the wearer when an object within 1.5 meters is detected. The beeping sound will get louder the closer the user gets to the item. This glove has the advantage of having a manufacturing cost that is nearly ten times lower than other technologies used for the same purpose.

2.11 A wearable ultrasonic obstacle sensor to assist the blind and visually impaired

K. Bala Subramanian, S.M Kalaivanan, V. Diana Earshia, et al,. 2015, This paper suggests a way to create electronic gloves that facilitate communication between the deaf and the blind. They communicated with each other by using sign language, which is incredibly challenging to learn and comprehend due to its 6,000+ movements. The model communicates the letters with 26 hand gestures and the numbers with an additional 10 motions. By writing text on the Liquid Crystal Display (LCD) screen and waving their hand, this will enable deaf people to interact with others. For the blind to be able to hear and speak, the text takes on language.

3.HARDWARE DESCRIPTION

The Components used in this project are

- Arduino UNO
- ESP32 cam module
- Jumper wires
- Ultrasonic sensor
- Buzzer
- Vibrator motor
- Breadboard

3.1 Arduino UNO

One of Arduino's standard boards is the UNO. Then, UNO is an Italian word for" one." To distinguish the original release of Arduino software, it was given the designation UNO. also, it was Arduino's first USB board to be released. It's regarded as a strong board that's applied to numerous different operations. The Arduino UNO board was created byArduino.cc.The Arduino UNO microcontroller is erected around the ATmega328P. In discrepancy to other boards, like the Arduino Mega board,etc., it's simple to use. The board is made up of securities, fresh circuitry, and digital and analog input/ affair(I/ O)pins.Six analog leg inputs, fourteen digital legs, a USB harborage, a power jack, and an ICSP(In- Circuit periodical Programming) title are all included in the Arduino UNO. The Integrated Development Environment, or IDE, is the base for its programming. It's compatible with offline and onlineenvironments.Every Arduino board that's available uses the sameIDE.The Arduino board is connected to the computer using a USB connection and the USB harborage on the board. In addition to serving as the power source and periodical harborage, the string interfaces with the board. Because of its binary functionality, it's exceptional and simple to use indeed for inexperiencedusers.The Arduino UNO board has twenty legs for input/ affair. Six PWM legs, six analog legs, and eight digital I/ O legs are included in these 20pis.The PWM legs can be used for palpitation rangemodulation.The Arduino UNO's demitasse oscillator operates at a frequence of 16MHz.Moreover, an Arduino WiFi module is erected within it. This Arduino UNO board is erected on the ATmega328P microprocessor and integrated WiFi ESP8266module.The Arduino board's input voltage ranges from 7V to 20V. The external power force is automatically used to power the Arduino UNO. It's also able of using USB power.

3.2 ESP32 cam module

Based on ESP32, the ESP32-CAM is a compact camera module with minimal power consumption. It includes an inbuilt TF card slot and an OV2640 camera.Numerous clever Internet of Things applications, including WiFi picture uploading, QR identification, and wireless video monitoring, are

compatible with the ESP32-CAM.Individuals allMore GPIO, quicker Wi-Fi, more CPU cores, Bluetooth 4.2 compatibility, and Bluetooth Low Energy support are all included. The ESP32 also has an integrated temperature sensor, a built-in hall effect sensor, and touch-sensing pins that can be used to wake it from deep sleep.

3.3 Jumper wires

Put simply, jumper wires are cables that may be used to link two locations without the need for soldering because they have connection pins on either end. Quite simple. In actuality, jumper wires are among the most basic items ever created. There are several colors of jumper wires, however the colors are essentially meaningless. This suggests that a black and a red jumper wire are theoretically identical. Nonetheless, you can use the colors to discern between other connection types, such ground and power.

3.4 Ultrasonic sensor

The ultrasonic detector presently being used in this design has the capability to calculate the distance of any objects in their way with high delicacy. This detector is most generally used as it has lower hindrance with the noise in the terrain. The medium of the detector is simple, it gives out an electronic burst and also calculates the time to hear back the echo. The echo palpitation range is used to calculate the distance of the object or the handicap. The Ultrasonic detector used in HC- SR04.

3.5 Buzzer

An electronic gadget known as a buzzer emits sound when an electrical signal is applied to it. It is frequently utilized in many different applications, such as game consoles, alarm clocks, and musical instruments. The buzzer is made up of a piezoelectric transducer, which transforms electrical energy into sound waves through mechanical vibrations. Usually, the transducer consists of a tiny ceramic disk positioned between two metal plates. A sound wave is produced by the buzzer's disc vibrating at a particular frequency when an electrical signal is delivered to it. The frequency of the electrical signal sent to the buzzer determines the frequency of sound that it emits.The resonance frequency of the majority of buzzers is usually between a few and several kilohertz. Changes in the electrical signal's frequency can be made to adjust the buzzer's sound pitch. Applying a voltage to buzzers directly, via a transistor, or via another switching device, will activate them.

3.6 Vibrator motor

A DC motor with an offset (non-symmetric) mass coupled to a shaft is called an eccentric rotating mass vibration motor, or ERM for short. Sometimes, people refer to it as a pager motor.The motor moves because of the asymmetric centripetal force of the offset mass as the ERM rotates, which generates a net centrifugal force.

3.7 Breadboard

An electronic circuit's semi-permanent prototype is constructed using a breadboard, solderless breadboard, or protoboard. Breadboards are reusable since they don't require soldering or track destruction, unlike perfboards and stripboards. Because of this, breadboards are also well-liked by kids and are used in technology education.

4 . SOFTWARE DESCRIPTION

4.1. ARDUINO DEVELOPMENT ENVIRONMENT

A software library from the Wiring design is available in the Arduino IDE that offers vibrant common input and affair operations. The cyclic superintendent program uses the GNU toolchain, which is included with the IDE. The executable legislation is transformed by the Arduino IDE using avrdude into a hexadecimal-decoded textbook train, which is then loaded into the Arduino board using a firmware haul program. Only Windows 7 or later operating systems are compatible with the Arduino IDE Windows compiler. An error message stating "Unrecognised Win32 operation" appears while attempting to upload or confirm software on Windows Vista and earlier versions. Drug users can use interpretation 1.8.11 or copy the "Arduino builder" executable from interpretation 11 to their PCs in order to run the IDE on PCs older than 14 years. Processing is an open-source programming language and platform that can be used to create plates, robustness, and commerce. Processing was first intended to be a software sketchbook and a tool for teaching computer programming concepts visually. However, it has now developed into a tool for producing polished, high-quality art. The Arduino is the one who runs the Arduino IDE software. Its goal is to introduce

programming to artists and other non-programmers who have no prior experience with software development. It provides a law editor with functions like syntax pressing, brace matching, and automatic indentation. Additionally, programs may be made and uploaded to the board with only a single click. Editing production lines or starting programs via the command-line interface are rarely required. Though third-party programs like Ion make it possible to make it on the command line if needed. The "Wiring" C/C library, which is a component of the same-named design that comes with the Arduino IDE, simplifies a number of basic input/ affair tasks. For Arduino, there are fifteen C/C software.

4.2. EMBEDDED C LANGUAGE

It is used to program microcontrollers and processors in industries like as automotive, consumer electronics, industrial automation, aerospace, and medical applications. It is suitable for developing programs that need to establish a direct connection with the hardware because it is a low-level language with direct hardware access. Its smaller memory footprint in comparison to other languages makes it ideal for usage in memory-constrained applications. Additionally, embedded C can be used to create dependable and efficient software.

PYTHON LANGUAGE

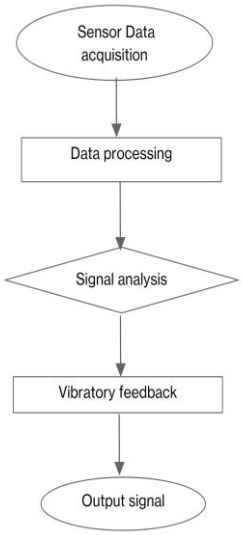
Python is a general-purpose, high-level programming language. With a strong emphasis on indentation, its design philosophy prioritizes code readability.Python uses garbage collection and dynamic typing. It works with many different programming paradigms, including procedural, functional, and object-oriented programming.Because of its extensive standard library, it is frequently referred to as a "batteries included" language.Python is one of the most widely used programming languages and is frequently cited in the machine learning community.

5. METHODOLOGY

This project is an Internet of Things solution that uses the YOLO obstacle detection algorithm, an ESP32 CAM board, and an Arduino Uno. When an obstruction is detected, the ultrasonic sensor measures its exact distance, which is subsequently sent to the ESP32 CAM board. The barrier is captured on camera by the ESP32 CAM board, which then sends the image and distance measurement to a server. For accurate identification and real-time object classification, machine learning methods like YOLO are used. By guaranteeing a smooth data transfer from the sensors to the web server and, eventually, to the user's device, the entire experience is tailored to make it easier for the visually impaired user to get about.The Yolov4 method is used to examine the image that was obtained from the ESP32 CAM board.The image's objects are categorized, and the number of obstacles found overall is noted, along with each obstacle's name and closest obstacle's distance. The web server's speech assistance feature can be used to customize the language, loudness, gender, and pitch of this output. Furthermore, a buzzer sound alerting the visually handicapped to an approaching collision is raised in the speech output when the distance to the closest obstacle is less than 30cm.

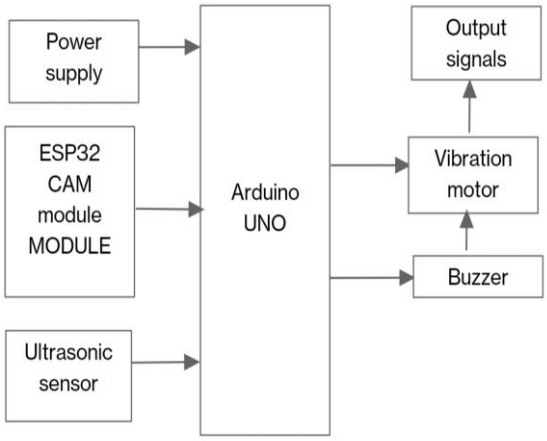
YOLO ALGORITHM

Identifying one or more items within a picture and categorizing each object in the image are two difficult aspects of object detection in computer vision. This is a difficult task because it has to successfully localize and classify objects in order to anticipate the right item class.YOLOv3, a sophisticated real-time object detection algorithm, surpasses current benchmarks in accuracy. It improves upon earlier iterations of the YOLO (You Only Look Once) algorithms, which were known for their accuracy and speed.A deep neural network is used by the YOLOv3 method to categorize objects in real-time photos. Compared to many other object detection techniques, it is faster since it is a single-stage object detection model that finds objects in a single network run.YOLOv3 is used in this project to analyze the photos that the ESP32 CAM board takes. The image's objects are identified by the algorithm, which then groups them into various categories. The user is then given an output containing the names of all things discovered, their distances from one another, and the total number of objects detected.



6. DESIGN AND IMPLEMENTATION

All things considered, this device offers a complete solution to help visually impaired people navigate, and the system architecture guarantees the device's dependable and effective operation.



7. RESULT

Every sensor and module was tested separately, and the results were noted for each. The ultrasonic sensor was tested first. The code was transferred to the Arduino Uno microcontroller board and the device was programmed using the Arduino IDE environment. The object is detected by the ultrasonic sensor, which also determines the distance in centimeters.The ESP32 microcontroller, to which a camera module is connected, was then put to the test. Its function is to take a picture and transmit it to the server for object detection. With the aid of this gadget, they will be able to recognize obstacles and navigate on their own.

8. CONCLUSION

In conclusion, new opportunities for enhancing the quality of life for those who are visually impaired have been made possible by the development of technologies like the Internet of Things. This project serves as an illustration of how IoT technology may be used to create creative solutions that make it easier and safer for the blind to navigate their environment.The device created for this project makes use of output, computer vision algorithms, and ultrasonic sensor to identify and categorize environmental barriers and give the user feedback in real time.The system is quite accurate and dependable since it uses the YOLOv3 algorithm for object identification and categorization. It is further improved by the user's ability to personalize the speech output to their tastes. In conclusion, this projects solution that combines output, computer vision, and ultrasonic sensor to give visually impaired people a thorough comprehension of their environment and safe navigation.

REFERENCE

1. Vishnu Sonwane,Rudra Bhandari,Omkar Bhanji "Ultrasonic Vibrator Glove for Enhanced Mobility and Safety in Visually Impaired Individuals", 2023

2. Hrishikesh P Athreya, G. Mamatha "Smart Glove for the Disabled", 2021

3. Jagadish K. Mahendran, Daniel T. Barry "Computer Vision-based Assistance System for the Visually Impaired Using Mobile Edge Artificial Intelligence", 2021

4. Pavan L P, Vinayaka S K, Chetan S "Design of the Smart Glove to Aid the Visually Impaired", 2020

5. Abhishek Kanal, Prajakta Chavan "An Affordable Hand-glove for the Blind using Ultrasonic Sensors", 2017

6. Ibtisam, Dr. V.K Annapurna "Third Eye for the Blind, An Innovative Wearable Technology Using NI Myrio", 2021

7. S B Totade, Prof P V Raut "Third Eye for the Blind Person", 2022

8. R.Anitha, M.Divya, G.Keerthana, “Smart Navigation System for Typhlotic Persons", 2021

9. Dr. V. Rama Krisha Sharma, Akash Reddy Singi Reddy,"Ultrasonic Vibrator Glove", 2022

10.Rakesh Narvey, Rahul Sagwal"Third Eye for Blind Ultrasonic Vibrator Gloves", 2020

11.K. Bala Subramanian, S.M Kalaivanan, V. Diana Earshia "A wearable ultrasonic obstacle sensor to assist the blind and visually impaired", 2015