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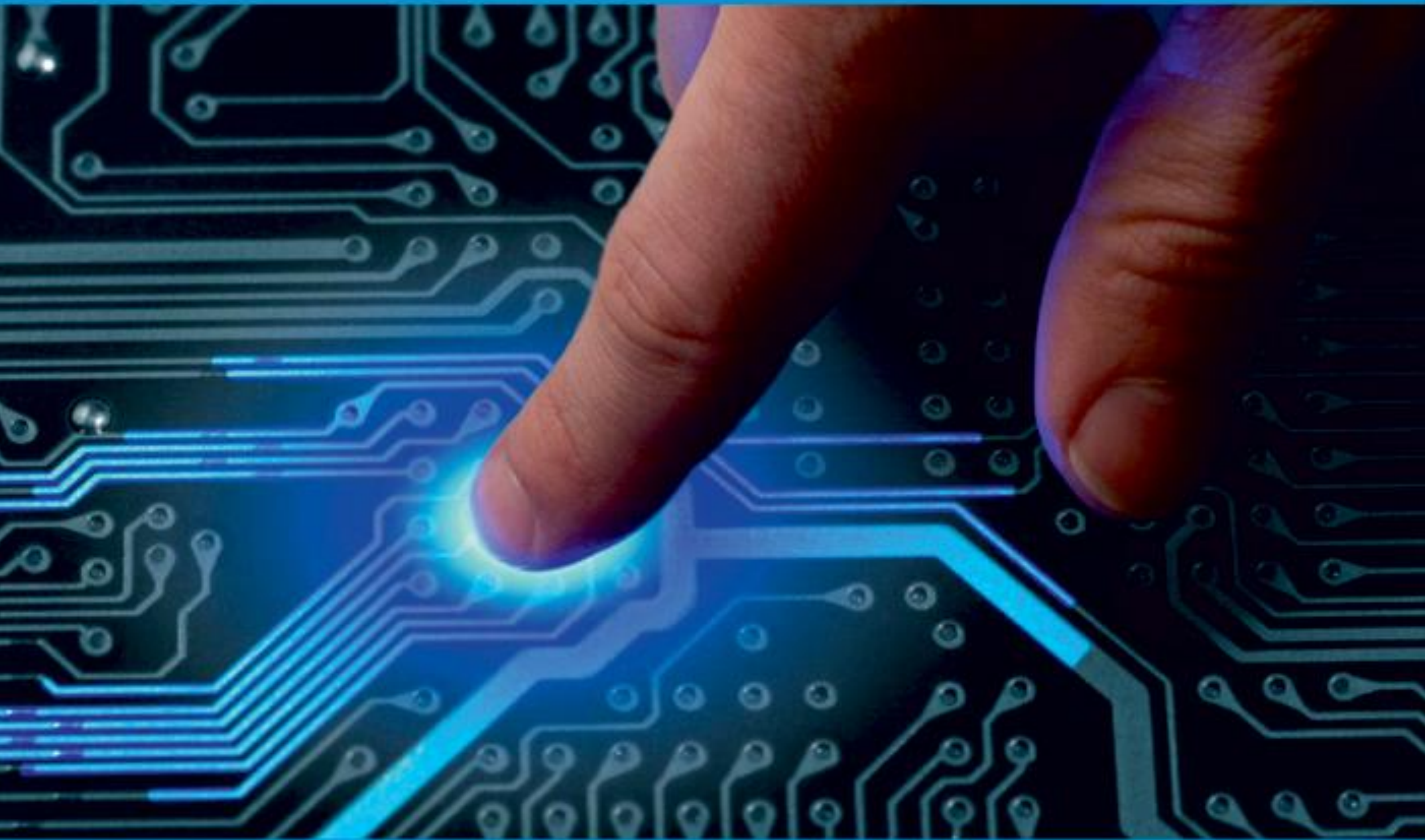

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Smart Locket for Blind Peoples

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ABSTRACT: The 2017 WHO Global Demographic Report reveals that 285 million people, constituting 4.25% of the world's population, experienced visual impairment by the end of 2016. Of these, 39 million are blind and 246 million have varying degrees of visual impairment. This impairment, whether from pregnancy, illness, or injury, significantly impacts daily tasks, especially independent navigation. While early diagnosis and treatment can prevent many cases of blindness, innovative solutions like guide dogs, navigation devices, and smart canes assist those unable to undergo treatment. This paper introduces a novel approach utilizing an Arduino ESP32 and a dedicated camera to provide smart vision aid for the visually impaired.

I. INTRODUCTION

Recently, the World Health Organization (WHO) published its 2017 Global Demographic Report. The report states that approximately 285 million of the world's population of approximately 7.338 billion have suffered from visual impairment since the end of 2016. Figure 1 shows this example. Percentage of visually impaired people in the world's total population. Among them, 39 million are blind and 246 million are visually impaired, accounting for 4.25% of theworld's total population.

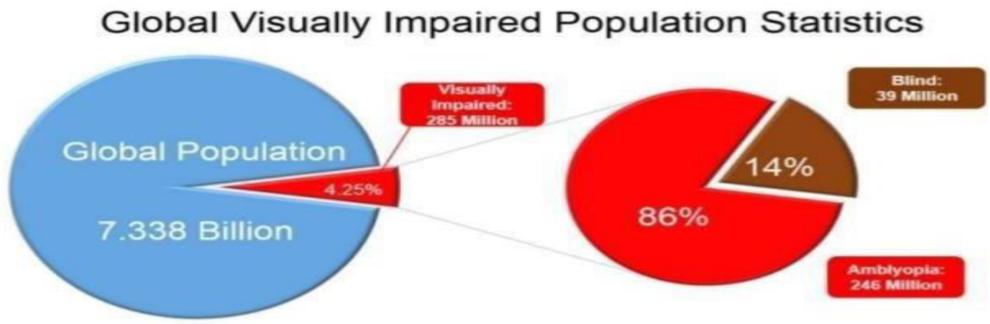

Fig. 1 Proportion of visually impaired people in the total worldpopulation

Whether caused by pregnancy, illness, injury or other causes, blindness can affect people's lives. For example, it is very difficult for visually impaired people to walk independently in unfamiliar and difficult places. Research shows that many people have poor eyesight but perform well in good lighting, and thisdamage can be repaired to some extent. Most cases of blindness can be prevented with early diagnosis and appropriate treatment. Therefore, guide dogs, navigation devices, smart canes, remote sensors (sonar or lasers), ultrasound, etc. are used to help people who cannot receive treatment. Many innovations have been developed using some recently It has been learned that systems use mobile phones as a bridge between users and remote online sites, but these resulted fromseveral irregularities. This paper depicts a technique to provide smart vision for visually challenged using a Aurdino ESP32 and its dedicated camera.

II. OBJECTIVE

System; It is based on a smart device (glasses) containing a camera, supersensor, voice assistant, headphones and some vibration motors.
The smart service is designed to reduce injuries to blind people due to forward collisions and falls while walking. On the other hand, when the person is not aware of the color in front of him, the system will automatically report the relevant information to the headset.

II. SYSTEM SPECIFICATION

1.1 AURDINO ESP32

- The ability to use Arduino ESP32 as a digital output using ultrasonic sensors paves the way for many applications, especially in the field of remote sensing and object detection. Ultrasonic sensors work by emittinghigh-frequency sound waves and measuring how long it takes for the sound to reflect off an object. This information can be used to calculate thedistance of the object with very high accuracy.
- To make digital output using an ultrasonic sensor with Arduino ESP32, you usually connect the sensor to the board's GPIO pins, configuring one pin as trigger and the other as echo. The pin sends short pulses to the ultrasonic sensor, which then starts emitting sound waves. The echo pin then measures the time it takes for the sound wave to return. You can determine the distance to an object by calculating the elapsed time and using simple math.
- This area is often used for many applications such as automatic door openers, security robots and even simple proximity devices. When a distance is exceeded, the Arduino ESP32 can generate a digital output signal that triggers an action such as turning on a light, sounding an alarm,or changing the behavior of the device.
- Using Ultrasound as a Digital Output A sensor with Arduino ESP32 needsto measure distance and then perform certain actions based on the calculated data. These features have broad applications in fields such asrobotics, automation, and the Internet of Things, allowing devices to interact with the proximity of objects in their environment. Additionally, the process can be extended by sending email notifications to registered email addresses using SMTP (Simple Mail Transfer Protocol). Here we will talk about how ultrasonic sensor works, how to connect it to ArduinoESP32 and then how to use email notification from SMTP server.

Working Principle of Ultrasonic Sensor:

Ultrasonic sensors work on the principle of echolocation, similar to the way bats and dolphins walk. They emit sound waves (ultrasound) and measure the time it takes for these waves to leave an object and return to the sensor. Thissensor has a sensor that converts electrical signals into sound waves (and vice versa). It works like this:

- Signal output: The Arduino ESP32 sends a short pulse (usually 10 microseconds) to the ultrasonic sensor pin. This pulse causes the sensor to start emitting ultrasonic waves.

- Sound emission: The ultrasonic sensor emits a burst of ultrasonic waves in all directions. These waves travel through the air and hit objects in their path. Whenthe ultrasonic does not hit an object the echo will return to the sensor. The sensordetects the return signal as an echo.

Timer: Arduino ESP32 starts the timer when sending a pulse and stops the timerwhen receiving an echo signal. The time it takes to activate and receive an echois proportional to the distance between the sensor and the object.
â Distance Calculation: Arduino uses the measured time and the speed of soundin air (approximately 343 meters per second at room temperature) to calculate distance. The formula for calculating distance is: distance (cm) = (time * speed of sound) / 2

Output: Depending on the distance, you can adjust the threshold. When the measured distance falls below or exceeds this threshold, the Arduino ESP32 generates a digital output signal that can be used to perform actions such as turning on a light, sounding an alarm, or sending an email notification.

Connecting Ultrasonic Sensor to Arduino ESP32:

To use the ultrasonic sensor with Arduino ESP32, you need to connect it correctly. Most ultrasonic sensors have four pins: VCC, Trig, Echo and GND. Here's how to connect it:

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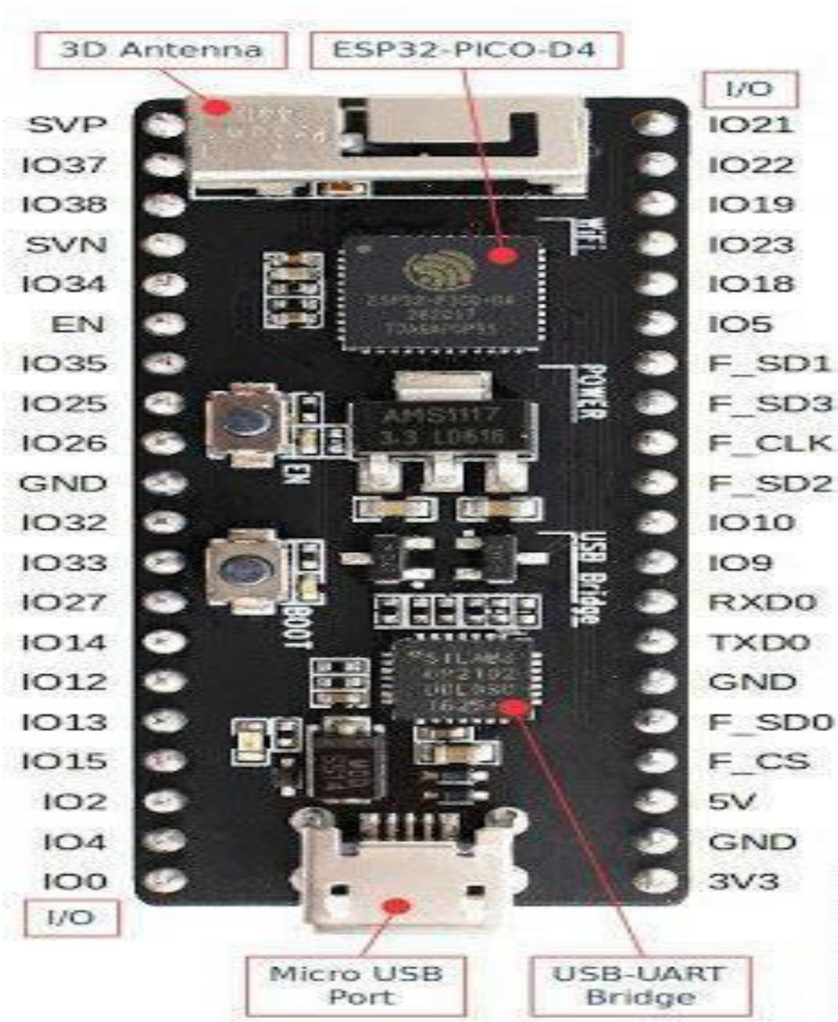
VCC: Connect this to the 3.3V or 5V output of the ESP32 (make sure you're compatible).
Trig: Connect this to one of the ESP32's output pins to send a trigger signal(e.g. GPIOx).
Echo: Connect this to another digital input pin of the ESP32 (such as GPIOy) to receive the echo signal.
GND: Connect this to the ground (GND) pin of the ESP32.

Before you start sending email alerts, you need to code the ESP32 to measure the distance using the ultrasonic sensor and get the output. You can do this by writing an Arduino diagram to set the pins, measure the distance, and check the default settings.



ULTRASONIC SENSOR

Ultrasonic sensors are based on measuring the properties of sound waves at frequencies above the range of human hearing. They are based on three physical principles: time of flight, Doppler effect and sound wave attenuation. Ultrasonic sensors are noninvasive because they do not require physical contact with their targets and can detect some clear or bright targets that would normally be limited to visible light. On the other hand, its measurements are quite sensitive to the temperature of the target.

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Fig. 3.2 HC SR04 Ultrasonic sensors

Ultrasonic sensors “are based on the measurement of the properties of acoustic waves with frequencies above the human audible range,” often at roughly 40 kHz [1)]. They typically operate by generating a high-frequency pulse of sound, and then receiving and evaluating the properties of the echo pulse.

MODES OF OPERATION Time of Flight - Reflection Mode

In reflection mode (also known as "echo gap"), the ultrasonic transmitter emits a short burst of sound in one direction. The blow ricochets off the target and returns to the receiver a short time later. The receiver records the length of this interval and calculates the distance r based on the speed of sound c:

$$r = c * t^2$$

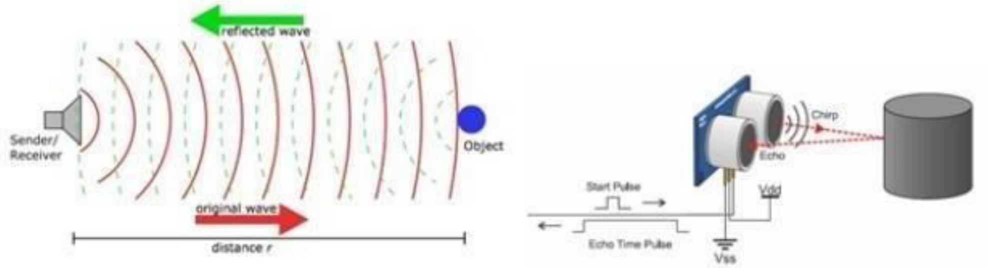

Fig. 3.3 Working model of Ultrasonic Sensor

Often separate transmitting and receiving sensors are placed close to eachother and mounted as a unit. (PING))) The following distance meters, Omega flow meters and Megaton high precision sensors are all made this way.) In this case, the distance will be twice the sensor-target distance. With proper coordination, a sensor can be used to send pulses and receive echoes. Note that it takes time for the sensor to change mode, making short-term measurements difficult.

PROJECT DESCRIPTION

Smart Padlock for the Blind is an important project to increase the safety andindependence of the blind. These new tools leverage the power of modern technology to provide instant visibility and emergency alert capabilities. The main components of the system include the Arduino ESP32 microcontroller, Ethernet connection for Internet access, ultrasonic sensor for anti-interference, speaker for feedback and the ability to communicate via SMTP server. system. This project description will provide an in-depth look at the process, description,and overall functionality of the smart lock designed to assist and empower the blind.

III. METHODOLOGY

The framework of the "Smart Padlock for the Blind" project is built on the integration of various hardware and software modules. Basic steps include: Hardware integration: Connecting hardware to create a unified system. Arduino ESP32 is the central control unit and ultrasonic sensors are used to detect the problem. The buzzer provides audio feedback and the Ethernet module providesnetwork connectivity.

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Software development: Program Arduino ESP32 to check sensor data, interpret distance measurement, activate voice alert when encountering problems and assist SOS system for emergency notification. Obstacle detection: The system continuously measures distance over time using ultrasonic sensors. If there is a problem with the decision, the system will activatethe buzzer to warn the user.

SOS system: With the SOS button or navigation system, an emergency email notification will be sent from the SMTP server when it occurs. The email containsthe user's current location and a preset message.

User interaction: Improve customer experience by making informed decisions regarding visual impairments and creating a control system that meets needs. .

Evaluation and feedback: Rigorous testing and user feedback to improve the accuracy and performance of the system.

Integration with existing technology: Compatible with smartphones and other devices to improve performance.

IV. BLOCK DIAGRAM

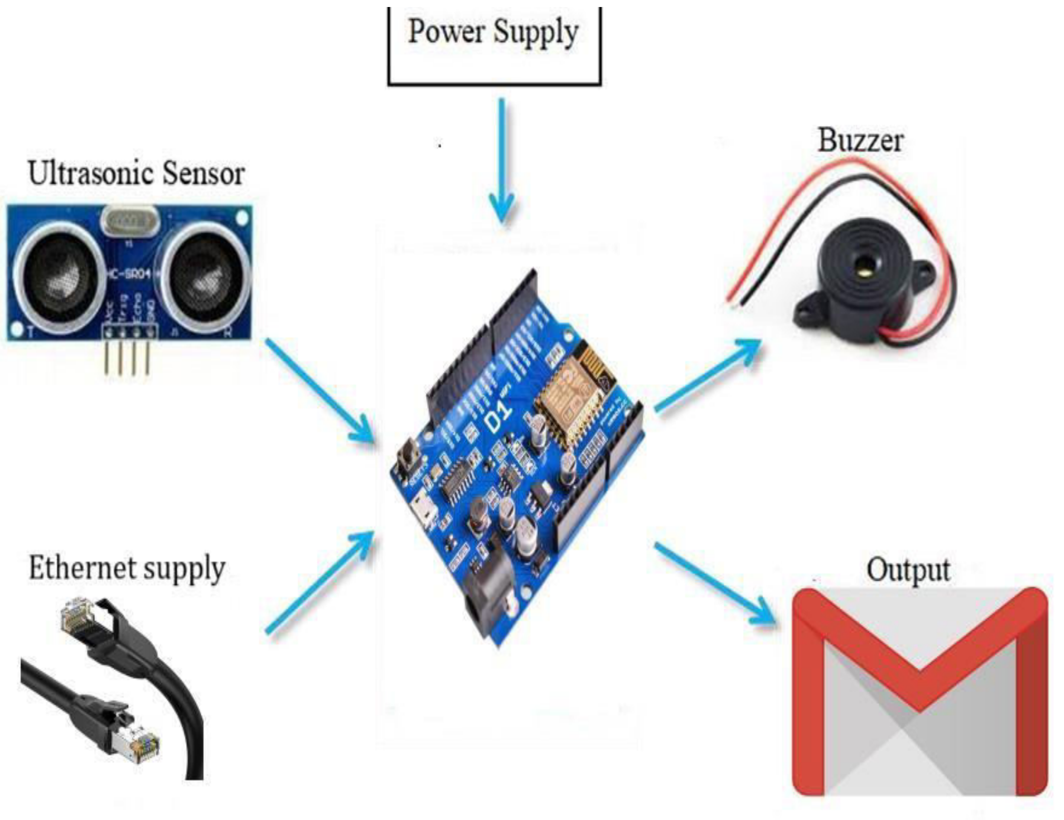

Fig. 5. Block diagram of proposed system

LAYOUT DIAGRAM

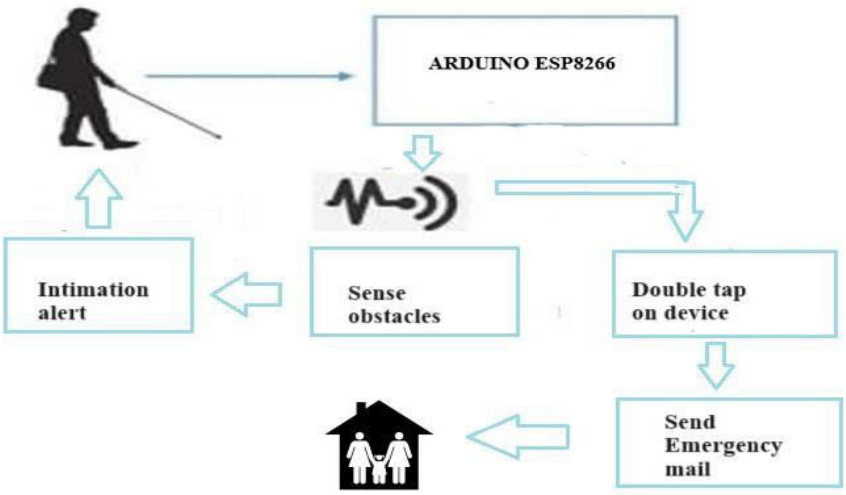

Fig. 5.1 Layout diagram of proposed system

V. CONCLUSION

The main purpose of the project is to create a walking guide that will help visually impaired individuals walk on their own in the environment. There are two main parts of the design process: interference and color detection. Impact detection is designed to indicate if there is a pre-existing problem in the environment. A color detector captures the object in situ. This project creates a holistic electronic model that can be used to guide the visually impaired. The distance between the problem and the user is calculated by analyzing the data from the ultrasonic sensor. The user is warned of obstacles and potholes by soundsignals coming from the headset.

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