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# GPS-Enabled Blind Stick Using Ultrasonic Technology

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**ABSTRACT-** This paper presents a GPS tracking system for an ultrasonic blind stick. People with visual impairments have historically used sticks to detect obstructions in their path. But the person using this stick has to deal with a number of issues because it is inefficient in a number of ways. Giving visually challenged people a better navigational aid is the aim of this initiative. Thanks to the use of sensors, object recognition is made easier with the ultrasonic blind walking stick than with the regular walking stick. The data on his present location is provided by his GPS system.In the event that the blind person loses track of where they put their stick, the system has an additional sophisticated tool to assist them. Blind Stick the ultrasonic blind stick with GPS tracking device is described in the paper's abstract. Historically, those who are blind or visually challenged have utilized a stick to detect obstructions in their path. However, there are a number of inefficiencies with this stick, and the user must deal with a number of issues. Better navigational aids for the blind and visually handicapped are the aim of this study.
Because it uses sensors to facilitate object identification, the ultrasonic blind walking stick is far more sophisticated than the conventional walking stick.
Information about his present location is provided by his GPS system. One other cutting-edge feature built into the system will assist blind people in finding their stick in the event that they misplace it.

**KEYWORDS-** GPS-Enabled, Blind Stick, Ultrasonic Technology, Visually challenged

## I. INTRODUCTION

By examining and analyzing earlier systems, we were able to design a new system that would be able to address the shortcomings of the older ones. Therefore, we offer a better solution to the mentioned problem by utilizing the technologies that are now in use. There are great deals of blind persons in society who struggle to do even the most basic tasks, which puts lives in danger when traveling. These days, it is essential to give blind individuals security and safety. To yet, not many tools have been created to assist the blind. In addition to light and water sensors, the blind stick has an embedded Ultrasonic sensor.

First, our suggested project makes use of an ultrasonic sensor to find obstructions without touching it using ultrasonic waves. The sensor transmits this data/8 to the microcontroller upon detecting obstructions. After processing this data, the microcontroller determines whether the obstruction is sufficiently close. When an impediment is far away, the circuit accomplishes nothing. However, a buzzer is activated by the microcontroller if an obstruction is in near proximity.
Additionally, it detects water, and when it does, the buzzer will sound differently to inform the blind person.
An additional feature is that it enables the blind individual to discern whether the room is dark or light.
An additional sophisticated component of the system is added to assist the blind person in finding their stick in the event that they misplace it.
To locate the misplaced stick, an RF-based wireless remote is utilized.by pressing the remote button sounds a buzzer on the stick. Aids with the blind person's stick finding.
Therefore, this approach enables visually impaired individuals to detect obstacles and locate a stick if it is Misplaced. A blind person can identify any barrier in front of them using an ultrasonic sensor.
Its detection range is 2 to 450 cm, so if there's an obstruction within that range, it will notify the blind user. To determine if there is water in the path, a water sensor is employed. In order for the individual to know where the stick is, the buzzer will sound and they will be made aware of it. An additional feature is the GPS system, which can be used to track the whereabouts of a blind person.

## II. HELPFUL HINTS

The primary goal is to make it easier for those who are visually impaired to navigate utilizing advance technology. In this technology controlled world, where people strive to live independently, this project proposes an ultrasonic stick for blind people to help them gain personal independence. Since this is economical and not bulky, one can make use of it easily.

## III. OBJECTIVE

The primary aim is to facilitate easy navigation for visually impaired individuals using advanced technology. In a world

reliant on technology where independence is highly sought after, this project presents an ultrasonic stick for the blind to promote personal autonomy. Its affordability and compact design enable convenient utilization.The primary aim is to facilitate easy navigation for visually impaired individuals using advanced technology. In a world reliant on technology where independence is highly sought after, this project presents an ultrasonic stick for the blind to promote personal autonomy. Its affordability and compact
design enable convenient utilization.

## IV. LITERATURE SURVEY

S.Chew [1] the "Blind spot," a smart white stick amalgamating GPS technology and social networking to aid visually impaired individuals in maneuvering public spaces. While the ultrasonic sensor detects obstacles and alerts the user, the efficiency of GPS in pinpointing obstacle locations remains limited compared to the precision of the ultrasonic sensor in gauging obstacle distances.

Osama Bader AL-Barrm and JeenVinouth [2] proposed a system employing ultrasonic sensors to detect obstacles along three directions. This system includes a microcontroller, buzzer, DC vibration motor, GPS, and an SMS messaging system. The buzzer and vibration motor activate upon obstacle detection, providing warnings. However, despite its ability to cover multiple directions, the system's accuracy in detecting obstacles may be limited.

Another study by Jayant, Pratik, and Mita [3] suggested a smart stick assisted mobility system for visually impaired individuals, relying on normal ultrasonic sensors and an ATMEL microcontroller. This system, powered by rechargeable batteries and programmable via an ATMEL AVR microcontroller, initiates vibrations and buzzer alerts upon obstacle detection. While it covers a distance of up to 3 meters and offers a foldable design for portability, its single-direction detection coverage might compromise accuracy in obstacle detection.

A paper [4] describing an ultrasonic blind walking stick presents an innovative tool designed for the navigation of visually impaired individuals. Integrated with GPS tracking and ultrasonic sensors capable of detecting light and water, this stick identifies obstacles through ultrasonic waves. Upon sensing obstacles, the microcontroller processes the data, triggering a buzzer alert if the obstacle is within proximity.

Additionally, it detects light/darkness and water, providing different alerts for the blind user.

Benjamin et al. [5] developed a smart stick using laser sensors to detect obstacles and downward curbs, signaling detection through a high-pitched "BEEP" using a microphone. While its design is straightforward and intuitive in detecting obstacles, it lacks cognitive and psychological support, offering only beep alerts without guidance.

Central Michigan University [6] devised an electronic cane for the blind, integrating RFID chips in street signs and store fronts, with the cane reading and relaying contextual information to the user.

Additionally, it includes an ultrasound sensor to detect objects in front of the stick tip, enhancing Environmental awareness.

## V. METHODOLOGY

### *A. Block Diagram*

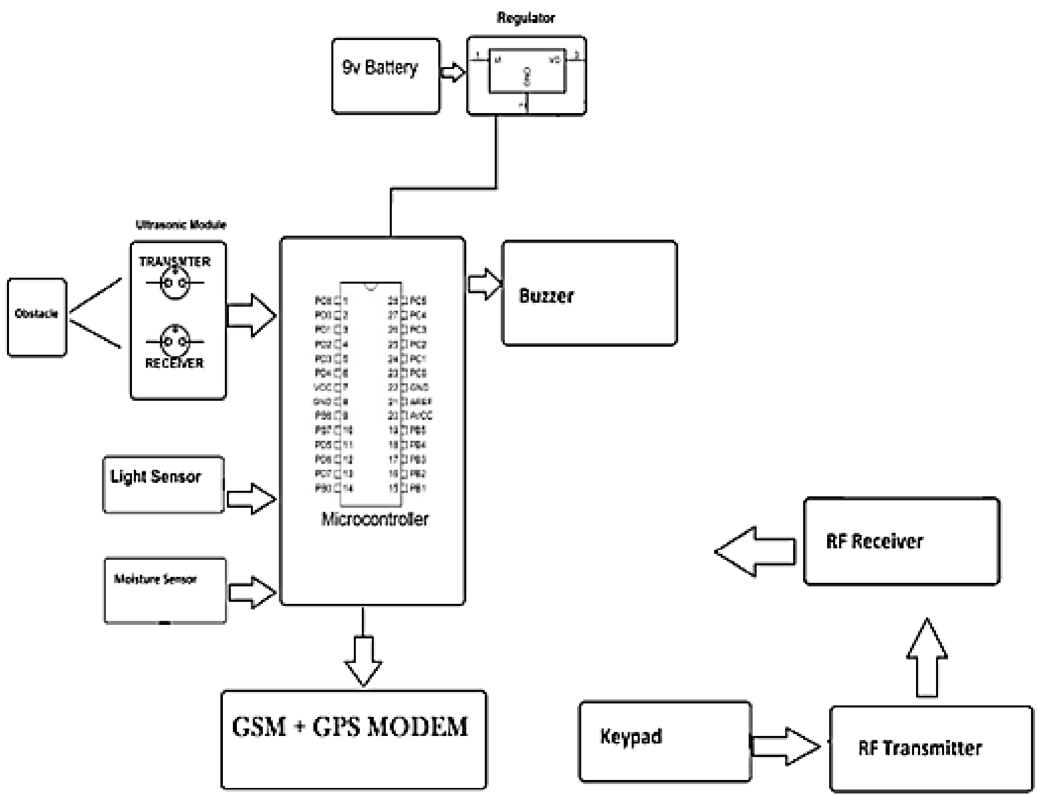


Figure 1: System Block Diagram

***B. Microcontroller***

The Arduino Nano 3.0 Microcontroller facilitates environmental control through receiving various input signals (Digital/Analog) and influencing its surroundings by regulating lights, relays, and other devices. Programming for the microcontroller is accomplished using Arduino software

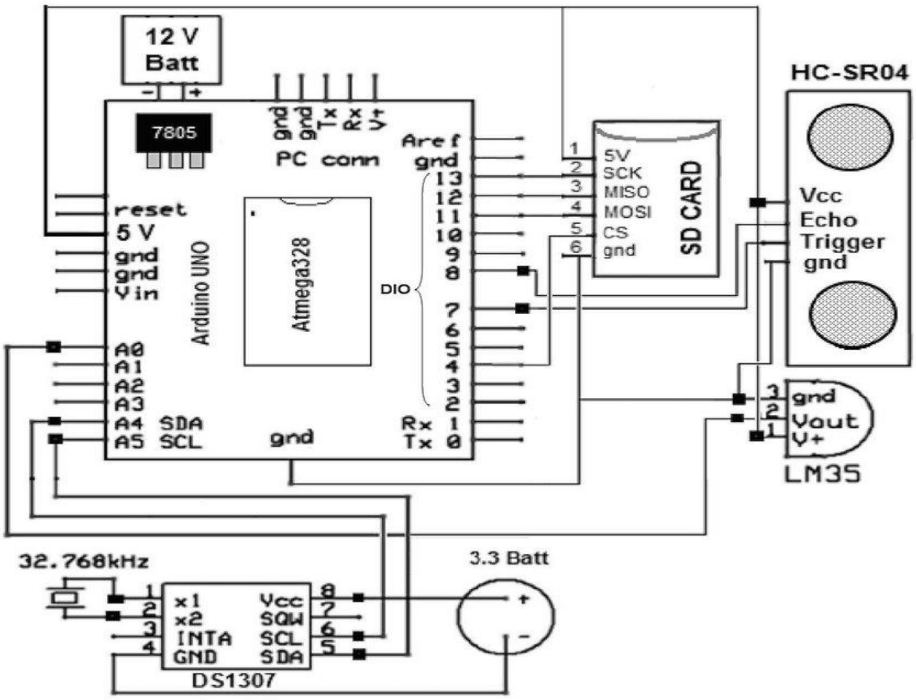


Figure 2: Arduino Nano 3.0

This unit comprises five sensors:

- Ultrasonic Transducers (HC-SR04): These sensors generate, detect, and process ultrasonic signals, operating beyond human hearing frequencies. They serve various applications such as sonic rulers, proximity detectors, movement detectors, and liquid level measurement.

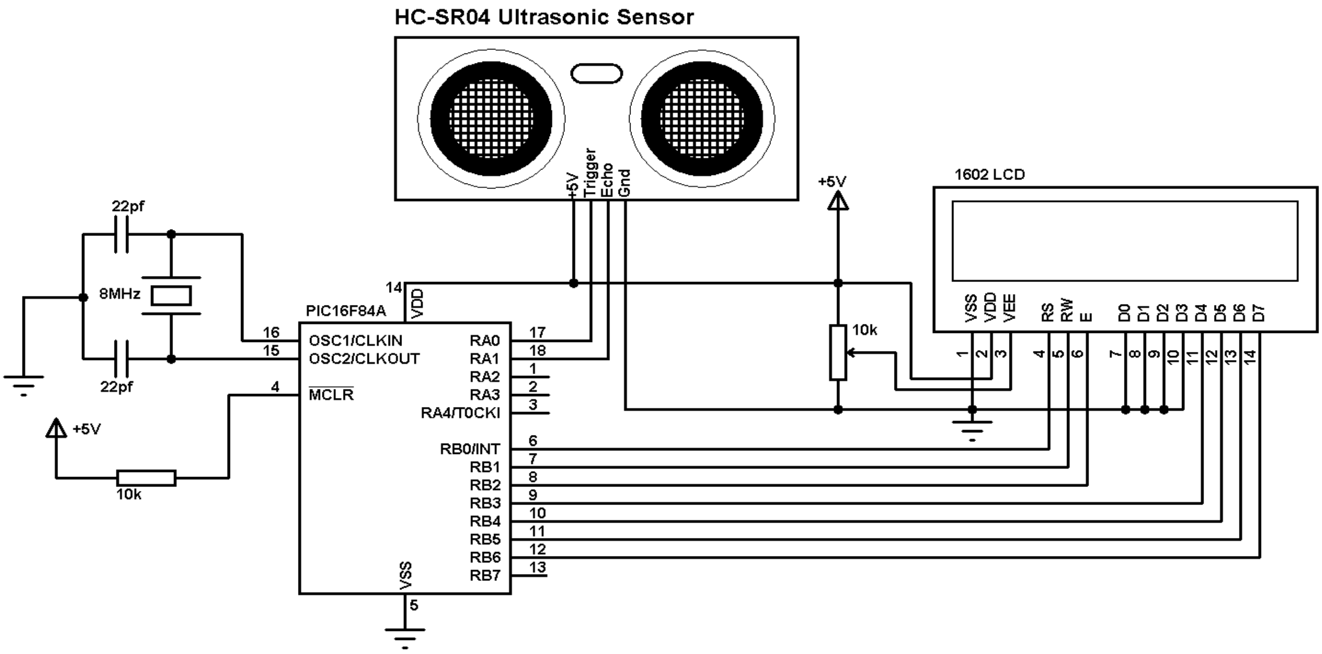


Figure 3: Ultrasonic Sensor Module

The HC-SR04 Ultrasonic Sensor Module (Figure 3) offers non-contact measurement between 2cm to 400cm with a ranging accuracy of up to 3mm. Its modules include ultrasonic transmitters, receivers, and control circuits. The operational principle involves triggering with a high-level signal for at least 10us, sending eight 40 kHz signals, and measuring the time taken for the signal's return to determine distance

- IR Sensor: Positioned at the lower side of the stick, the IR sensor detects small obstacles like pits, staircases, or stones on the ground. Upon detecting these obstacles, it signals the Arduino, prompting voice instructions and activating a buzzer to alert the visually impaired individual.
- Water Sensor: Located at the stick's base, this sensor detects wet surfaces to prevent slipping accidents. Upon contact with a wet surface, it triggers the Arduino to produce a voice alert and activate a buzzer, warning the user about the wet floor.
- LDR Sensor (Light Dependent Resistor): The LDR changes its resistance concerning the ambient light intensity. During low light conditions (night), it exhibits high resistance. It activates an LED connected parallel to it, functioning as a flashlight, making the visually impaired person easily noticeable by others.
- Buzzer: This transducer converts electrical energy into mechanical energy, typically operating within theaudible frequency range (20 Hz to 20 kHz). In this project, it alerts the blind person about obstacles by emitting sounds proportional to the obstacle's distance.

GPS and GSM System: The GSM modem, upon receiving a message, triggers the microcontroller to process the message using a specific keyword. The system then retrieves the stick's location from the GPS modem and transmits it via the GSM modem to respond to the sender's inquiry. In emergency situations, pressing the emergency button prompts the microcontroller to access the GPS location and send SMS messages to all saved numbers. Additionally, if the microcontroller receives a predefined "codeword" from the GSM modem, it retrieves and transmits the last location from its memory to the required recipient.

ESP8266: This component serves as a high-integration wireless SOC (System on Chip), offering Wi-Fi capabilities within constrained spaces and power limitations. It hosts applications or offloads Wi-Fi networking functions, ensuring minimal space and cost requirements. The ESP8266EX boots directly from an external flash, integrating cache for improved system performance in various applications.

## VI. CONCLUSION

The reviewed studies demonstrate various techniques for developing ultrasonic blind sticks for visually impaired individuals. This paper aims to familiarize readers with the advancements made in creating smarter and more helpful walking aids. By analyzing related literature, this study identifies the need for continuous modification and improvement in smart stick technology. The expected simulation results encompass ultrasonic sensors, water sensors, and ESP8266 integration within a single microcontroller.

This wide survey helps in shortlisting essential aspects from each project, aiding in the design approach.

## CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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