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MULTI-FUNCTIONAL BLIND STICK BY USING SOLAR CHARGING SYSTEM

U. Sreenivas[1], E. Drakshayani[2], D. Basha[3], M. Harsha Vardhan[4], Y.S. Jhansi[5], P. Bhavana Naik [6]

[1]*Associate Professor/ Dept. of EEE, Srinivasa Ramanujan Institute of Technology, Andhra Pradesh*
[2, 3,4,5,6] *UG Student/ Dept. of EEE, Srinivasa Ramanujan Institute of Technology, Andhra Pradesh*

Abstract - *For many visually impaired individuals, navigating through the world can be a difficult and daunting task, as they often encounter obstacles and challenges that sighted individuals may take for granted. The multifunctional blind stick project seeks to provide a solution to these challenges by offering a device that can aid visually impaired individuals in their mobility, navigation, and daily activities. Our proposed system employ several sensors like ultrasonic sensor, infrared sensor, moisture sensor for obstacle detection and various modules like RF module, GPS and GSM modules are used for finding the misplaced stick and tracking the location of the blind person. All these sensors and modules are connected to the Arduino Uno microcontroller. The solar panels in our proposed system are used to charge the blind stick apart from regular power supply. Additionally, the multifunctional blind stick project has the potential to improve the quality of life for visually impaired individuals by enhancing their independence and reducing their reliance on others for assistance. The device can help users to navigate unfamiliar environments, travel more confidently, and access information about their surroundings, which can help them to feel more empowered and self-reliant*.

Key Words: **Solar Panels, Arduino UNO ATmega 328 microcontroller, Ultrasonic sensor, Moisture sensor, IR sensor, RF module, GPS and GSM modules**.

1. INTRODUCTION

Visually impaired individuals face a range of difficulties in their daily lives, including challenges related to mobility, access to information, and social interaction. These difficulties can impact their quality of life and limit their independence. According to the World Health Organization (WHO), there are approximately 285 million visually impaired individuals worldwide, with 39 million of them being completely blind. Visually impaired individuals often face difficulties with mobility, as they may encounter obstacles or hazards that are not easily visible to them. This can make traveling outside the home challenging and may limit their ability to participate in daily activities. Additionally, visually impaired individuals may have difficulty accessing information, particularly if it is presented in a visual format. This can make it challenging to read books, newspapers, or signs, and may limit their ability to engage with the world around them.

Given the challenges faced by visually impaired individuals, there is a pressing need for assistive technologies that can help them to navigate the world with greater ease and independence. The multifunctional blind stick is one such technology that has the potential to improve the lives of visually impaired individuals by providing enhanced mobility, navigation, and access to information.

1.1 OBJECTIVE

The main objective of this project is to increase the operating period of blind stick by charging with the help of solar energy unit in addition to regular power supply unit and to help the blind people to walk without the help of others.

2. PROPOSED SYSTEM

The proposed system for the multifunctional blind stick is a device that incorporates multiple functions to aid visually impaired individuals in their daily activities. The device is designed to be compact and portable, making it easy for users to carry with them wherever they go. The device is designed to have a long battery life, allowing users to use it for longer time with the help of solar charging unit without needing to recharge it frequently. The device is equipped with sensors that can detect obstacles in the user's path, such as stairs, or other hazards. The sensors can provide feedback to the user through vibrations or audible alerts. The device includes GPS and GSM module that allows the user to send messages to their family members or friends in case of emergency. It also includes RF module to find the misplaced stick.

2.1 BLOCK DIAGRAM

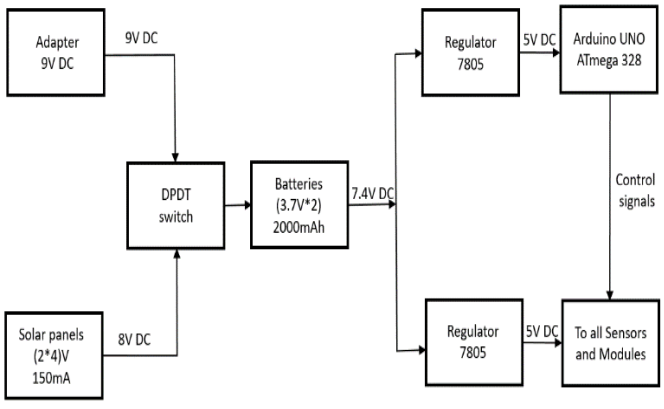

Fig-1: Power Supply Unit of Proposed System

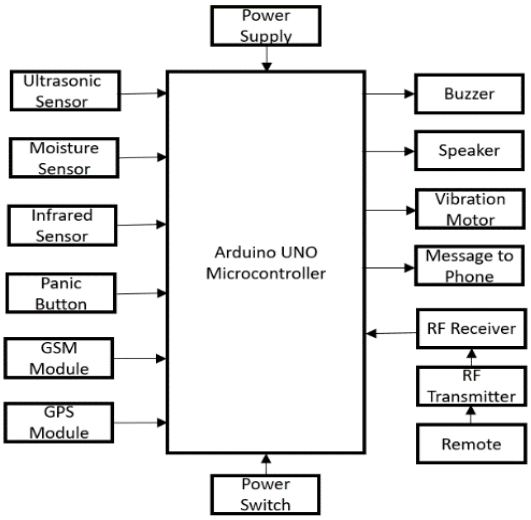

Fig-2: Block Diagram of Control unit of Blind Stick

From Fig-1, we can understand that all sensors and modules will be under the control of the microcontroller. A 9V DC adapter can charge the batteries. Apart from this, the batteries can even be charged by Solar charging unit. From the batteries, the supply will be given to Arduino Uno, which, in turn feeds all the sensors and modules connected to it. The regulators are used to regulate the voltage to 5V.

2.2 METHODOLOGY

The multi-functional blind stick consists of several components including solar panels for charging, ultrasonic and infrared sensors for obstacle detection, and a moisture sensor for detecting wet or slippery surface, a GPS module for location information, and a GSM module for sending alerts or notification. The stick also include a vibration feedback system, a built-in speaker for audio alerts, and a customizable grip to fit individual needs.

2.3 COMPONENTS

a) Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328. The control of all sensors, modules, switches will be under this micro controller. It takes the input from various sensors and triggers the output devices. It has 14 digital input/output pins, 6 analog input pins, a 16 MHz quartz crystal, a USB connection, and a power jack. It can be programmed using the Arduino software and is used to control various components in the system.

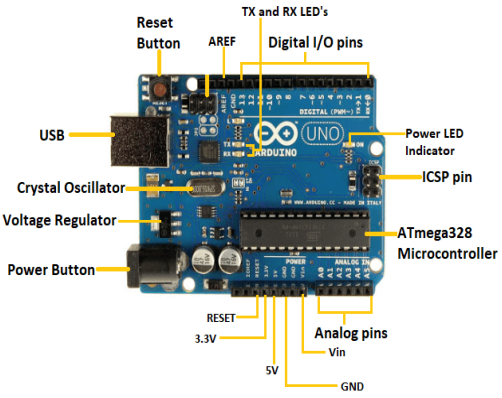

Fig- 3: Arduino Uno

b) Solar panels

Two solar panels of 4V are used in this project to charge the batteries apart from regular power supply. Solar technologies convert sunlight into electrical energy either through photovoltaic (PV) panels or through mirrors that concentrate solar radiation. This energy can be used to generate electricity or be stored in batteries or thermal storage.

Fig-4: Solar Panel

c) Ultrasonic sensor

An ultrasonic sensor is used to detect obstacles in the path of the user. It emits high-frequency sound waves from a transmitter and detects their echoes with the help of a receiver.

Fig-5: Ultrasonic Sensor

d) Speaker

A speaker is used to provide audio alerts to the user. Whenever an IR sensor detects the obstacle the relay, which is connected to it, is tripped which in turn activates the speaker and gives alerts.

Fig-6: Speaker

e) Moisture sensor

A moisture sensor is used to detect wet or slippery surfaces. It senses the moisture content in the surface and sends a signal to the Arduino Uno to provide feedback to the user.

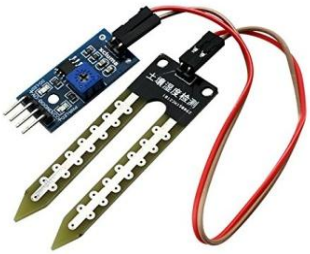

Fig-7: Moisture Sensor

f) Vibration motor

A vibration motor is used to provide haptic feedback to the user. When the moisture sensor detects the presence of water in the path, it trips the relay connected to it and as soon as the relay is tripped, the controller makes the vibration motor output high, which in turn makes the motor to vibrate.

Fig-8: Vibration Motor

g) Infrared sensor

An infrared sensor is used to detect the obstacle below the one feet like stairs. It senses the infrared radiation emitted by the heat source and sends a signal to the Arduino Uno to provide feedback to the user.

Fig-9: Infrared Sensor

h) RF Module

It consist of an RF Transmitter and RF receiver. This module is used to find out the misplaced stick. The RF receiver, which is mounted on the stick, receives the signal from the RF Transmitter when the button is pressed and gives a beep sound with the help of a buzzer attached to it.

Fig-10: RF Module

i) GSM Module

A GSM module is used to send SMS alerts to the caretaker or family members in case of an emergency. It requires a SIM card and a cellular network to function.

Fig-11: GSM Module

j) GPS Module

A GPS module is used to provide location information of the blind person to the concerned people of the blind person. It communicates with the Arduino Uno using serial communication and can provide latitude, longitude, altitude, and time information.

Fig-12: GPS Module

k) Batteries

Two 3.7V rechargeable Li-ion batteries are used to provide the power supply to the Arduino Uno, which in turn feeds all the sensors and modules connected to it. These batteries can be charged by regular power supply using a 9V DC adapter or by using solar panels.

Fig-13: Batteries

l) Relay Module

Relay is an electromechanical device that uses an electric current to open or close the contacts of a switch. Two single-channel relay modules are used here one for Vibration motor and the other for speaker.

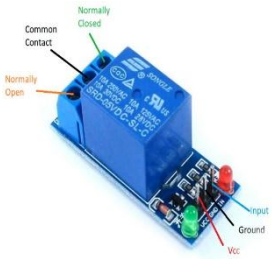

Fig-14: Single channel relay

3. EXPERIMENT AND RESULTS

The experimental setup for the multifunctional blind stick is shown in Fig-15, 16.

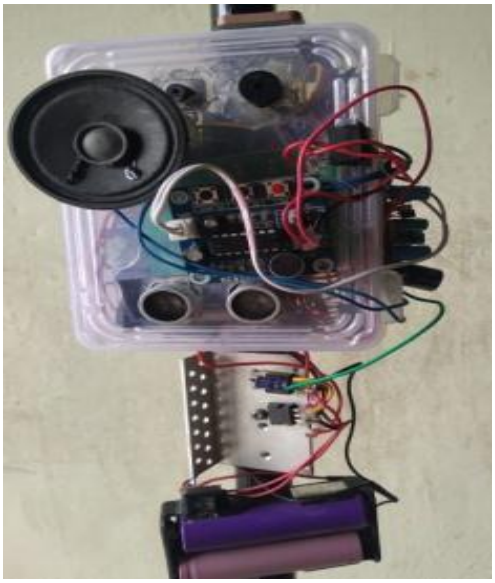

Fig-15: Experimental Setup

Fig-16: Prototype Model

3.1 RESULTS

Fig -17, 18 shows the results for the conducted experiment. Fig -18 shows the messages sent to the coordinates of the blind person. It consists of location of the blind person.

Fig-17: Working of Kit

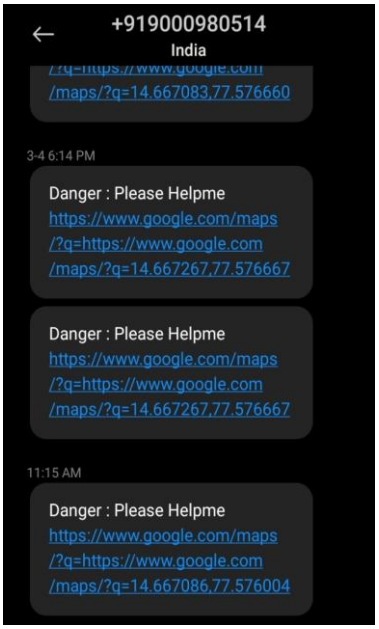

Fig-18: Alert Messages to the Coordinates of the Blind Person

4. CONCLUSION

The multifunctional blind stick is a device that has been designed to assist visually impaired people in their mobility and navigation. It combines various technologies such as ultrasonic sensor, Moisture sensor, GPS, voice assistance, and to provide enhanced functionality and convenience to the user. By providing real-time feedback about the user's surroundings, obstacles, and destinations, the multifunctional blind stick enables visually impaired individuals to navigate their surroundings with greater ease and confidence. Furthermore, the addition of solar panels in the design provides a sustainable energy source, making it more eco-friendly for the user. This is particularly important for visually impaired individuals who may not have easy access to a reliable power source.

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