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DESIGN OF AN INTELLIGENT ELECTRIC VEHICLE VISUALLY CHALLENGED PERSON

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ABSTRACT

Blind individuals now utilise a conventional cane to guide them as they go from one location to another. Even though the standard cane is the most widely used aid for the blind today, it is unable to assist them in identifying hazards from various degrees of obstruction. Within this framework, we suggest a novel intelligent system to assist those who are blind or partially sighted. Through the usage of this device, blind persons may walk around with the same confidence and ease as sighted people. The system is connected to a GSM- GPS module in order to pinpoint the blind person's position and create a wireless two-way communication channel. Additionally, it uses ultrasonic sensors to offer direction information and obstacle avoidance information. The system is further enhanced with a vibrator, an accelerometer sensor, and a beeper. The white cane is utilised in conjunction with the compact and lightweight system. The outcomes demonstrated that the blinds utilising this method could move securely and autonomously.

Key Words: AT commands, Microcontroller, Short Message Service (SMS), Global System for Mobile Communication (GSM), and Assistive Technology.

I.INTRODUCTION

One of the biggest problems that scientists are still dealing with globally is blind mobility. The World Health Organisation estimates that whereas blindness affects 0.4% of people in industrialised nations, it affects 1% of people in poor nations [1, 2]. The white cane is the most basic and common travelling aid used by blind people. Although technology has made it easier for those folks to go where they're going and identify impediments on the ground, it cannot ensure that they will be safe and free from all types of hazards. The notion of the white cane can be taken into consideration while expanding the help offered to blind individuals, thanks to the latest developments in assistive technology. People who are blind or visually impaired can choose from a variety of assistive devices available in the past [3]. One device that helps with some of the issues that blind and partially sighted persons face on a daily basis is the smartphone. These folks can compose and send emails, as well as listen to voicemails, thanks to their smartphones. Another illustration of an electronic help might be a laser or ultrasonic device. With this technique, energy waves are sent in front of the user, where they are reflected by objects and picked up by a sensor that is matched. Consequently, the time difference between the two signals is used to compute the distance to the obstruction. People with impairments, including the blind, can also benefit from wearable and portable assistive devices. While portable assistive devices needed continual hand involvement, wearable technologies provide hands-free engagement, or at least minimise the usage of hands when using the device. Devices that are truly worn on the body are what are referred to as wearable technology. Examples of such devices are assistive devices worn on the tongue [8–10], fingers and hands [4–7], wrist and forearm [12–13], head mounted assistive devices [11–12], vests and belts [12–13], and feet [13]. The white cane will remain the most popular assistive equipment for the blind notwithstanding efforts and the wide range of wearable technologies available. User acceptability is also fairly low. On the other hand, a number of initiatives were developed using various technologies, including as GPS, RFID, Ultrasonic, Laser, and GSM, to improve the methods that help blind people travel swiftly and securely in a new area [14, 15, 16]. In order to identify impediments, the laser cane emits invisible laser beams that subsequently produce a certain aural sound. Each unique audio signal on the laser cane denotes a different distance. The concept behind ultrasonic technology is similar to that of laser technology in that it uses various tones torepresent an object's distance. Every tone denotes a different separation from the impediment. Blind people utilise GPS systems to find and confirm the proper path. In order enable the user to read the information presented in Braille, the system was linked to a Braille display. RFID was also employed, however in order to navigate it needs RFID markers placed along the route. The goal of this work is to create an intelligent system that can support the blind and visually impaired on a cheap budget, without the need for assistance from sightedpeople. Because the system is GSM-GPS based, it benefits from the popularity and affordability of the GSM network. Furthermore, GSM-GPS modules are utilised in a variety of human activities, including vehicle navigation and navigation aids that direct blind pedestrians and enable them to avoid obstructions and arrive at their destination.

II.LITERATURE SURVEY

Many guiding devices have previously been created to help the sight impaired move about. In [17], the author suggested an RFID-based device to help blind people with supermarket shopping. The technology offers assistance just within the store and is dependent on the RFID tags that are positioned throughout the establishment. A different method described in [18] combines building maps, pertinent spatial data, and GPS position data to deliver instructions to specific areason a campus. A smart wheelchair system was presented in [19] that has sensors installed for related uses. The user can travel to a broad region using differential GPS position information provided by the system. The use of GPS technologyis growing among the visually impaired population. The Sendero system is one example of a system centred around GPS. The software in the system is compatible with all Braille note products. This technology is small enough to wear on a human andresembles a little computer. Similar to the othertechnologies, a GPS solution for street talk was alsounveiled. The user of the Street Talk GPS Solution may design a path to get from one place to another. A smart cane that uses inbuilt sensors for obstacle avoidance has attempted to achieve something akin to the earlier systems [15]. The ultrasonic sensor at the heart of the system is used to identify impediments and provide orders to the two-wheeledsteering axle. The blind follow the stick effortlessly and without conscious effort since they sense the steering command through the handle. Another method that makes use of an ultrasonic sensor intended to vibrate and tell the user how far away the identified items are. The ultrasonic sensor's distance from the obstruction and the vibrator's frequency are negatively correlated. An intelligent guiding stick with two DC motors, a microprocessor, and an ultrasonic displacement sensor was proposed by the author in [20]. Given that the aforementioned invention seeks to identify and steer clear of impediments or objects in front ofthe user, a fuzzy controller is needed to decide whether commands, such turning right, left, or stopping, will be carried out. An additional prerequisite is the placement of RFID tags in many locations to aid users in the event that the RFID is affixed to a blind person's body. RFID is often installed inside a bag that the user wears. The bag powers the device with energy and uses a speaker totell the user. If users are deaf or hard of hearing, there are gloves that vibrate on each finger; themeaning of the vibrations varies depending on the finger.

III.IMPLEMENTATION

Eight components make up the architecture of thesystem, as seen in the figure: an ultrasonic sensor, two buzz clicks, a PIC-P40 development board, an audio amplifier, a microphone amplifier, a GSM_GPS modem, and a vibration module. The three primary parts of the PIC-P40 developmentboard are the regulator circuit, the MAX232 Level converter, and the PIC16F877 microcontroller. The PIC16F877 microcontroller verifies all data received from other modules and transmits AT commands to the GSM_GPS modem. The PIC16F876A will send an SMS message to a predefined phone number with the blind's location in the event that the blind's stability changes. In the interim, the blind can turn on the microphone and audio amplifiers by calling a pre-programmed phone number. The Telit GM862-GPS modem, a quadband engine that runs on frequencies of 850MHz, 900MHz, 1800MHz, and 1900MHz, was utilised in this system. It accepts a SIM card and functions similarly to a mobile phone. The modem gets data in NMEA format from the GPS satellite, makes calls, and sends SMS messages.

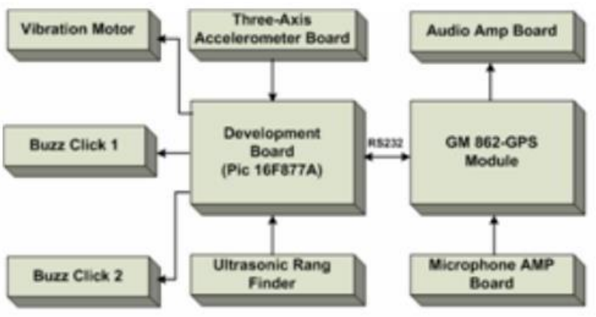

Fig 1: ARCHITECTURE DIAGRAM

IV.MODULE DESCRIPTION

The system is fully built, as seen in the picture, employing affordable assistive technology to provide blind people more freedom in their everyday lives. In addition to the PIC-P40 development board, other components used in various aspects of human activity, including navigation systems, are the ultrasonic sensor, MAX232, MAX2323 level convertor, PIC16F877 microcontroller, keypad unit, power supply, 3-axis acceleration sensor board, audio module, buzz click module, vibration module, and GSM_GPS module. Every component of the system has a distinct function that may be described as follows. The PIC- P40 development board is designed to interface PICmicrocontrollers with 40 pins to other embedded systems or PCs that have RS232 ports. It includes an RS232 connection and driver. Using the MAX232 and MAX2323 chips, the PIC16F877 microcontroller was utilised and integrated with the GSM_GPS modem. The signal is converted by both chips from RS232 voltage levels to TTL voltage levels and the other way around. The distance between the obstruction in front of the stick and the system is measured by the ultrasonic sensor. In order to achieve this, the sensor uses an ultrasonic transducer to send out bursts of ultrasonic acoustic energy and then listens for the echo that arises from an obstruction in the beam path. One can determine the distance of an obstacle by measuring the amount of time that has passed between the first transmission and the discovery of an echo. The ultrasonic sensor used in this project has serial, analogue voltage, and pulse width outputs as interface output types. Here, an analogue voltage output that is inversely proportional to the separation from an obstruction is utilised. With a 1- inch resolution, the data is acquired from 6-inches out to 254-inches. A speaker is connected with this data to notify the user when something gets in the way. Four rows and four columns make up the matrix-like layout of the keypad. In this article, the PIC16F877 microcontroller's PORTB is simply interfaced with 4 rows. The PIC microcontroller's job is to continually scan the four rows of pins RB4–RB7 of Port B, which are linked to the keypad, in order to identify and detect the pushed key. To enter a number pointing to a pre-defined mobile number, utilise the keyboard unit. The ultrasonic sensor's voltage is converted by the audio module into pulse width modulation, or PWM, which is then sent to a buzz click module. In order to allow the user to listen to the signal without using the external speaker, a headphone jack has been included. In this project, an additional module that integrates with the GSM_GPS module and has an audio amplifier and microphone was also utilised. Apart from the audio amplifier, a tiny DC motor driven by PORTD also contributes to the handle's shaking. An additional board used to monitor acceleration and force of gravity is the 3-axis acceleration sensor board. Based on the ADXL330 chip, which is a single monolithic integrated circuit, the board provides a comprehensive 3-axis acceleration measuring system. An analogue voltage proportional to acceleration is what the ADXL330 output signals are. In this project, the tilt in the X, Y, and Z axes is sensed using an ADXL330. If the X and Y axis readings go over a certain threshold, the handle vibrates, and if the blind person falls to the ground, the GSM_GPS module sends a text message. To summarise, the GPS module of the GSM sends the latitude and longitude data as an SMS message to a designated mobile number after receiving the data from the GPS satellite in NMEA format. Lastly, a diode bridge in the power supply circuit enables the user to power this system using both an AC and a DC power source. Any value between 6 and 15 V DC might be used as the system's input voltage. The LM317 adjustable voltage regulator and the 7805-voltage regulator are used to regulate voltage. The GSM_GPS module is powered by a 12-volt battery to accommodate all of the different components, and other circuits are powered by a 9-volt battery. The C programming language has been used to construct the system's software. Figure 3, Figure 4, Figure 5, Figure 6, and Figure 7 depict the system flowcharts. Module starting is shown in Figure 3. The PIC16F877 microcontroller is configured with ports C and D set as outputs and ports A and B asinputs. UART is configured with 8 bits, no parity,9600 kbps, and 1 stop bit. The microcontroller issues an AT instruction to the GSM_GPS modem to enable the system. Once the modem answers with OK, it issues another command to verify the SIM's existence and determine if the module is connected to the network or not.

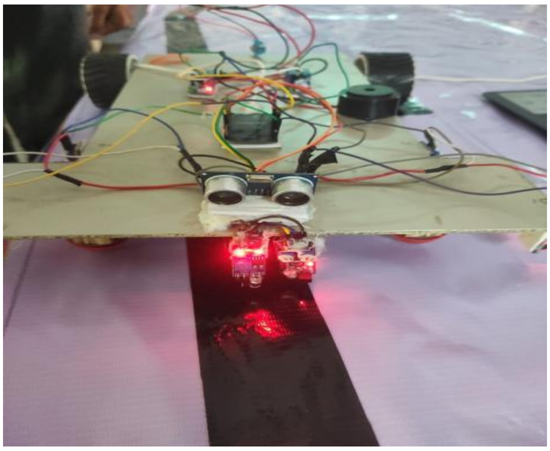

Figure 2 : Moves Forward Black Line

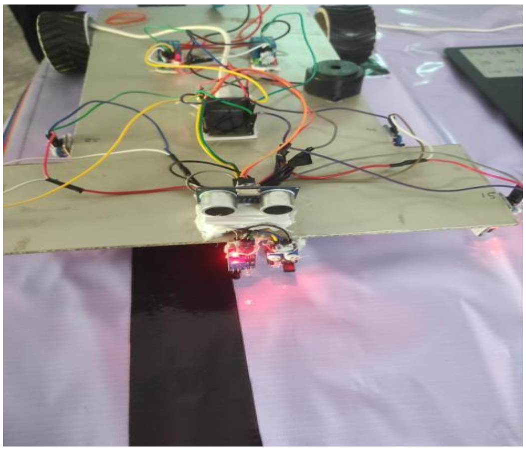

Figure 3: Motor Stops for edge

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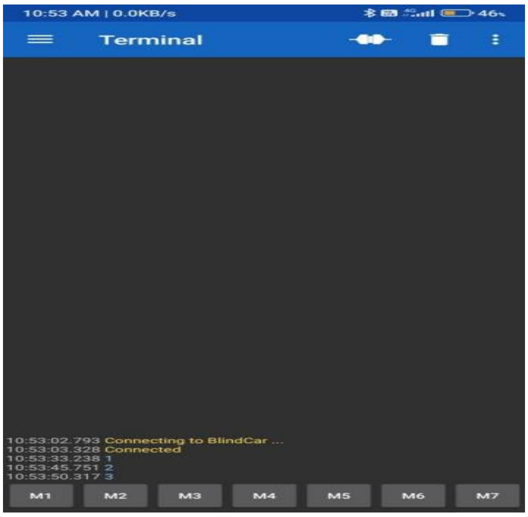

Figure: 4 Command the Stopping

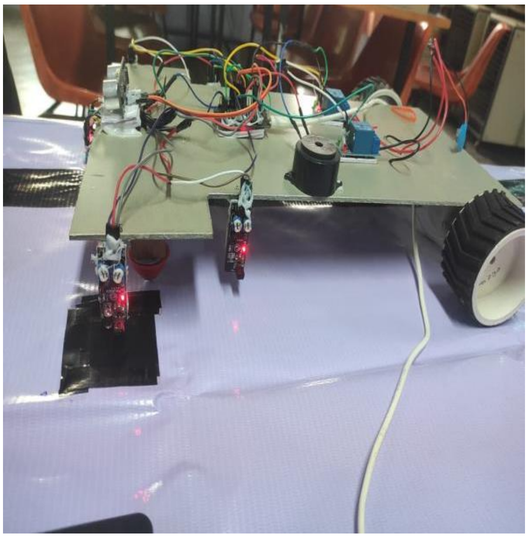

Figure: 5 Stop to Commanding Place

V.RESULTS AND DISCUSSION

Fig. Experimental outcomes three primary experiments have been used to assess the intelligent cane. We investigate the operation of the ultrasonic sensor in the first experiment. Three different kinds of ultrasonic sensors—the LV-Max Sonar EZ0, LV-Max Sonar EZ2, and LV-Max Sonar EZ4—were investigated for this test. Table 1 displays the collected data. Based on the beam width, the ultrasonic sensors' analysis is displayed in the table. The LV-Max Sonar EZ0 ultrasonic sensor was selected due to its ability to identify obstacles at low elevations. Compared to the others, this sensor's beam width is broader, making it more effective at detecting tiny things. The others were not let in because they could not distinguish between tiny and near items. The user is then informed of distance via a vibrator and beep. In the second experiment, the GSM-GPS module and the accelerometer sensor were tested to determine the blind person's location, create a wireless two-way communication link, and determine whether the blind person's stability has changed. Figure 9 illustrates how the device immediately sends a message with the blind's position to a predetermined phone number. The system sends this notification when stability shifts in the z direction.

VI.CONCLUSION

Our innovative intelligent system for guiding blind or partially sighted persons is provided in this paper, along with an explanation of how it may be used to help those people walk with the same confidence and ease as sighted people. To apply the features of the GSM_GPS module, we have created an additional module with a pic16f877 microcontroller and many sensor devices. The GSM module has been controlled by the system through the receipt of data from the sensing devices. The data from the accelerometer and ultrasonic sensors have been combined to help identify impediments and provide additional information about the blind's surroundings. We have attached the prototype of our system to the white cane handle in order to undertake evaluations of it. The device can let blind persons navigate freely, safely, and rapidly around barriers and dangerous areas, as demonstrated by the trial findings.

VII.REFERENCE

1. Chaudhry, M., Kamran, M., and Afzal, S., "Design and implementation of an RFID based blind friendly environment Speaking monuments." Electrical Engineering, 2008. Second International Conference on ICEE 2008, held on March 25–26, 2008, Page(s): 1–6.

2. “Wearable Assistive Device for the Blind,” by Velazquez. Wearable and Autonomous Biomedical Devices and System for smart Environment: Issues and Characterization, LNEE 75, Springer, pp ,331-349,2010. Lay- Ekuakille, A. & Mukhopadhyay, (Eds.), Chapter 17.

3. Shinohara. K “User – friendly technology design for blind people.” In ACM (2006), 293-294, Proceedings of the 8th International ACM SIGACCESS Conference on Computers and of Accessibility

4. “Design and Performance of a tactile shape display using RC Servomotors,” Wagner C., Laderman S., and Howe R. proceedings of the 10th Symposium on Haptic Interfaces for Teleoperator Systems and virtual Environments, Orlando, Florida, USA, pp. 354-355.

5. “Tactile feedback for endoscopic surgery,” Fischer H., Neisius B., and Trapp R. Interactive technology and the new paradigm for healthcare, Satava R, Morgan K, Sieburg H, Mattheus R, and Christensen J (Eds), IOS press, pp 114-117.

6. Summers, I. and Chanter, C. “Fingertip -based broadband tactile array.” In volume 112, pages 2118-2126, Journal of the Acoustical Society of America.

7. “Thermo pneumatic actuator for tactile displays and smart actuation circuitry,” Vidal F., Madueno M., and Navas R. pages 484-492 in proceedings of the SPIE International Symposium on Micro technologies for the new Millennium, Sevilla, Spain.

8. Tyler M., Bach-Rita P., Garcia Lara J., and Kaczmarek K. A technical comment states, “From perception with a 49-point electrotactile stimulas array on the tongue.” In vol. 35, no 4, pages 427-430, Journal of Rehabiliation Research and Development.

9. Kupers R., Gjedde A., Moesgaard S., and Ptito M. “Electrotactile Stimulation of the tongue reveals cross- modal plasticity in Congentially blind individual.” Brain, 128, 606-614 vol.

10. “A Wireless embedded tongue tactile biofeedback system for balance control,” Vuillerme N., Pinsault N., Chenu O., Fleury A., Payan Y., and Demongeot J.