International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 05 | May - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Tamil Tesla For Disabled Persons Using IOT with Tamil Voice Recognition

[1] Dr. N. Nirmal Singh / M.E PhD
Department Of ECE,
DMI College Of Engineering, Chennai
nnirmalsingh@gmail.com

[2] S. Abner
Department Of ECE,
DMI College Of Engineering, Chennai
abnerjavandavid2001@gmail.com

[3] J. Jenin
Department Of ECE,
DMI College Of Engineering, Chennai
jenin280201@gmail.com

[4] S. Sanjay
Department Of ECE,
DMI College Of Engineering, Chennai
samkamlesh205@gmail.com

Abstract-The system utilizes an Arduino microcontroller, integrating multiple sensors such as ultrasonic, IR sensors, and a servomotor, along with a DF Player speaker for voice guidance in Tamil. The ultrasonic sensor detects obstacles in the robot's path, providing real-time data to avoid collisions. In addition, three IR sensors are placed at key positions to further monitor the environment and ensure safety by halting the robot or guiding it away from obstacles. The robot is controlled via an IoT platform, allowing users to issue commands for movement such as forward, backward, left, right, and stop. The motor driver controls the wheels based on the received commands, while the servo motor adjusts the ultrasonic sensor's angle to enhance obstacle detection. A DF Player speaker provides audio feedback in Tamil, guiding the user with instructions such as "Move Forward," "Turn Left," or "Stop." An LCD screen displays the system's status and relevant information to the user. The combination of advanced sensor integration, real-time processing, and user-friendly voice guidance offers an effective and reliable solution for visually impaired individuals, enabling them to navigate safely and independently. This innovative design ensures not only mobility but also enhances the overall safety and autonomy of visually impaired users.

1.INTRODUCTION

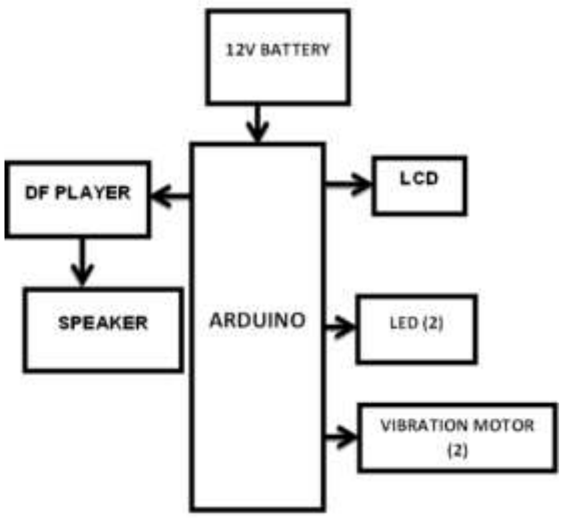
The robot for blind individuals is an advanced mobility aid designed to enhance independence and safety using an Arduino as the central controller. It integrates ultrasonic sensors for obstacle detection, IR sensors for environmental monitoring, a servomotor for adjustable sensing angles, and a DF Player speaker for Tamil voice guidance. The robot processes real time sensor data to navigate safely, stopping or changing direction to avoid collisions. Users can control movements via an IoT platform, with commands processed by the Arduino to drive the robot forward, backward, left, right, or stop through a motor driver. The LCD screen provides visual feedback on system status, complementing the voice instructions. This efficient integration of sensors and IoT technology ensures a seamless and reliable navigation experience for visually impaired individuals, empowering them with enhanced mobility and situational awareness. This focuses on enhancing mobility, independence, and safety for visually impaired individuals through an intelligent robotic assistant. This system integrates real-time obstacle detection, IoT-based remote control, and voice-guided navigation in Tamil, making it accessible and user-friendly. The robot can be deployed in various environments such as homes, offices, hospitals, and public spaces to assist individuals in navigating safely without human assistance. It offers adaptability by using ultrasonic and IR sensors to detect obstacles, ensuring real-time responsiveness and preventing collisions. The IoT integration allows remote monitoring and control, expanding its usability for care givers or family members. Additionally, the project has the potential for future enhancements, such as AI-based path planning, GPS integration for outdoor navigation, and advanced speech recognition for voice commands. With its scalable design, the robot can be modified to accommodate different terrains and user preferences, making it a valuable assistive technology for the visually impaired community.

2.LITERATURE SURVEY

"A Transferable Adaptive Domain Advers arial Neural Network for Virtual Reality Augmented EMG-BasedGesture Recognition." Author Ulysse Côté-Allard, Gabriel Gagnon-Turcotte Year :2021 Description: —Within the field of electromyography-based (EMG) gesture recognition, disparities exist between the offline accuracy reported in the literature and the real-time usability of a classifier. This gap mainly stems from two factors: 1) The absence of a controller, making the data collected dissimilar to actual control. 2) The difficulty of including the four main dynamic factors (gesture intensity, limb position, electrode shift, and transient changes in the signal), as including their permutations drastically increases the amount of data to be recorded. Contrarily, online datasets are limited to the exact EMG-based controller used to record them, necessitating the recording of a new dataset for each control method or variant to be tested. Consequently, this paper proposes a new type of dataset to serve as an intermediate between offline and online datasets, by recording the data using a real-time experimental protocol. The protocol, performed in virtual reality, includes the four main dynamic factors and uses an EMG-independent controller to guide movements. This EMG-independent feedback ensures that the user is in-the-loop during recording, while enabling the resulting dynamic dataset to be used as an EMG-based benchmark. The data set is comprised of 20 able-bodied participants completing three to four sessions over a period of 14 to 21 days. The ability of the dynamic dataset to serve as a benchmark is leveraged to evaluate the impact of different.

EMG-based Multi-User Hand Gesture Classification via Unsupervised Transfer Learning Using Unknown Calibration Gestures Author: Haojie Shi , Xinyu Jiang ,Chenyun Dai Year :2024 Description: —The poor generalization performance and heavy training burden of the gesture classification model contribute as two main barriers that hinder the commercialization of EMG-based human-machine interaction (HMI) systems. To overcome these challenges, eight unsupervised transfer learning (TL) algorithms developed on the basis of convolutional neural networks (CNNs)were explored and compared on a data set consisting of 10gesturesfrom35subjects. The highest classification accuracy obtained by COR relation Alignment (CORAL)reaches more than90%, whichis10% higher than the methods without using TL.

3.BLOCK DIAGRAM



BLOCK DIAGRAM DESCRIPTION

The robot for blind individuals is designed to enhance mobility and independence using an Arduino micro controller as the central controller. This system integrates ultrasonic sensors, IR sensors, a servo motor, and a DF Player speaker for voice guidance in Tamil. The ultrasonic sensor detects obstacles in the robot's path, enabling it to make informed decisions about navigation. The IR sensors, placed at the front, left, and right, monitor the environment for obstacles and provide real-time data to ensure safety by stopping the robot or guiding it away from potential collisions.

4.HARDWARE AND SOFTWARE DESCRIPTION

INTRODUCTION TO ARDUINO: Arduino is an open-source electronics platform based on easy to-use hardware and software. Arduino boards are able to read inputs- light on a sensor, a finger on a button, or a Twitter message-and turn it into an output- activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

FIG :1 ARDUINO UNO.

Arduino Uno is a microcontroller board based on the ATmega328P(datasheet). It has14digitalinput/output pins (of which 6 can be used as PWM outputs), 6analoginputs, a16MHzquartzcrystal, a USB connection, a power jack, an ICSP header and are set button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

5.ULTRASONIC SENSOR SOUNDWAVES:

Sound is a mechanical wave travelling through the mediums, which may be a solid, or liquid or gas. Sound waves can travel through the mediums with specific velocity depends on the medium of propagation. The sound waves which are having high frequency reflect from boundaries and produces distinctive echo patterns. Sound waves are having specific frequencies or number of oscillations per second. Humans can detect sounds in a frequency range from about 20Hz to 20KHz.However the frequency range normally employed in ultra sonic detection is100KHz to 50MHz. The velocity of ultrasound at a particular time and temperature is constant in a medium. W=C/F(or)W=CT Where

W=Wavelength,

C=Velocity of sound in a medium,

F=Frequency of wave,

T=Time Period

5.1 ULTRASONIC SENSOR:

Ultrasonic detection is most commonly used in industrial applications to detect hidden tracks, discontinuities in metals, composites, plastics, ceramics, and for water level detection. For this purpose the laws of physics which are indicating the propagation of sound waves through solid materials have been used since ultrasonic sensors using sound instead of light for detection. An ultra sonic sensor is an instrument that measures the distance to an object using ultrasonic soundwaves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency soundwaves reflect from boundaries to produce distinct echo-patterns.

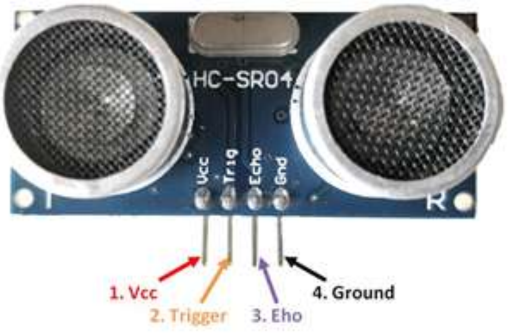


FIG :2 ULTRA SONIC SENSOR

5.2 SENSORFEATURES:

Operating voltage: +5V

Theoretical Measuring Distance: 2cm to 450cm.

Practical Measuring Distance:2cm to 80cm

Accuracy: 3mm

Measuring angle covered: <15°

Operating Current: <15Ma.

Operating Frequency:40Hz.

6.LIQUID CRYSTALDISPLAY(LCD)

Screen is an electronic display module and find a wide range of applications. A 16x2LCDdisplay is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

FIG:3 LIQUID CRYSTAL DISPLAY

6.SOFTWARE REQUIREMENTS

EMBEDDED-C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software. Embedded-C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.

7.CONCLUSION AND RESULTS:

In Conclusion, The propose robotic system for visually impaired individuals integrates ultrasonic sensors, IR sensors, a servomotor, an IoT platform, a DF Player speaker, and an LCD display to provide safe and efficient mobility assistance. The obstacle detection and navigation module ensures real-time scanning and autonomous movement, utilizing ultrasonic and IR sensors to identify barriers and guide the user away from potential collisions. The IoT-based user control and feedback module enables users to control the robot remotely, with voice prompts in Tamil and an LCD screen displaying status updates for enhanced accessibility. Additionally, the real-time safety and guidance module ensures continuous monitoring, instant alerts, and immediate response to environmental changes, using sensor-driven decision-making and audio-visual notifications. By combining autonomous navigation, remote operation, and real-time feedback, this robot significantly enhances mobility and independence for visually impaired individuals. The system's intelligent design ensures seamless movement, precise obstacle detection, and an intuitive interface, allowing users to navigate safely and confidently. Furthermore, the Tamil voice guidance system provides clear instructions, making the robot more user-friendly for local populations. The LCD screen complements voice alerts by displaying status updates, adding an extra layer of assistance. Overall, this robot provides a comprehensive mobility aid that not only helps visually impaired users move independently but also ensures their safety through smart navigation and real-time monitoring. By integrating advanced sensor technology, IoT capabilities, and user friendly feedback mechanisms, this robotic system offers a practical and innovative solution to enhance accessibility and quality of life for visually impaired individuals.

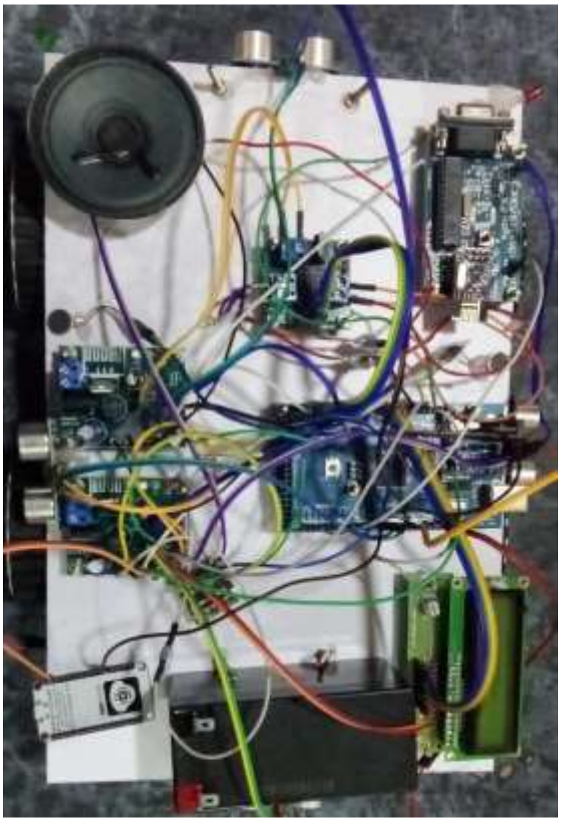


FIG: 4 OUTPUT RESULT

8.FUTURE ENHANCEMENT

Future enhancements for this robotic system can focus on AI-based obstacle recognition, enabling the robot to differentiate between objects like walls, humans, and moving vehicles using computer vision and machine learning. Integrating GPS and GSM modules would allow real-time location tracking and emergency alerts, ensuring added safety for users. Additionally, incorporating LiDAR sensors could improve precision in obstacle detection an depth perception. Voice recognition can be added to enable hands-free control, allowing users to navigate using verbal commands. Enhancing IoT capabilities with a mobile app could provide an intuitive interface for remote operation, including route planning and live tracking. Battery optimization techniques such as solar charging or power efficient motor drivers can improve energy efficiency and prolong operational time. Further, the robot's design can be enhanced with a more compact and light weight structure, making it easier to carry and use in diverse environments. These improvements would make the robot more intelligent, efficient, and adaptable to varying user needs.

9.REFERENCES OR BIBLIOGRAPHY

[1] M. Zheng, M. S. Crouch, and M. S. Eggleston, "Surface electromyography as a natural human machine interface :Are view," IEEE Sensors J., vol. 22, no. 10, pp. 9198–9214, May 2022.

[2] A. Holobar and D. Farina, "Non invasive neural interfacing with wear able muscle sensors: Combining convolutive blind source separation methods and deep learning techniques for neural decoding," IEEE Signal Process. Mag., vol. 38, no. 4, pp. 103–118, Jul. 2021.

[3] H. Xuand A. Xiong, "Advances and disturbances in sEMG-based intentions and movements recognition: Are view," IEEE Sensors J., vol. 21, no. 12, pp. 13019–13028, Jun. 2021.

[4] K. Li, J. Zhang, L. Wang, M. Zhang, J. Li, and S. Bao, "Are view of the key technologies for sEMG-based human-robot interaction systems," Biomed. Signal Process. Control, vol. 62, 2020, Art. no. 102074.

[5] T. Bao, S. Q. Xie, P. Yang, P. Zhou, and Z.-Q. Zhang, "Toward robust, adaptive and reliable upper-limb motion estimation using machine learning and deep learning–A survey in my electric control," IEEE J. Biomed. Health Inform., vol. 26, no. 8, pp. 3822–3835, Aug. 2022.

[6] S. Jiang, P. Kang, X. Song, B. P. Lo, and P. B. Shul, "Emerging wear able interfaces and algorithms for handgesture recognition: A survey," IEEER ev. Biomed. Eng., vol. 15, pp. 85–102, 2022.

[7] B. Zhu, D. Zhang, Y. Chu, Y. Gu, and X. Zhao, "SeNic: An open source dataset for sEMG-based gesture recognition in non-ideal conditions," IEEE Trans. Neural Syst. Rehabil. Eng., vol. 30, pp. 1252–1260, 2022.

[8] C. Chen, Y. Yu, X. Sheng, D. Farina, and X. Zhu, "Simultaneous and proportional control of wrist and hand movements by decoding motor unit discharges in real time," J. Neural Eng., vol. 18, no. 5, 2021, Art.no. 056010.

[9] X. Jiang, K. Nazarpour, and C. Dai, "Explain able and robust deep forests for EMG-Force modelling ," IEEEJ. Biomed. Health Inform., vol. 27, no. 6, pp. 2841–2852, Jun. 2023.

[10] X. Liet al., "Decoding muscle force from individual motor unit activities using a twitch force model and hybrid neural networks," Biomed. Signal Process. Control, vol. 72, 2022, Art. no. 103297.