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Smart Electric Wheelchair

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Abstract: The Smart Electric Wheelchair especially planned for elders and people with limited physical abilities. It integrates ultrasonic for precise edge, obstacle detection, securing fall deterrence and collision-free navigation. Included wellness sensor supervise moisture, body heat, rate of pulse in real-time, transmitting information for proactive user care and data will display on OLED. IoT-empowered web page services complete rotational movements-right, forward, left, reverse, turns with low delay remote control, path optimization. Exploratory outcomes confirm forward and backward object detection precision and consistent tracking, upgrading autonomy for physical disabilities. In case of emergency if the user presses the emergency push button the "Emergency" will display on Organic Light Emitting Diode and result will display on serial monitor. This procedure outperforms conventional models by integrating web-based operation, health oversight, safety and promoting quality of life and autonomy.

Keywords: Ultrasonic sensor, DHT11 sensor, Pulse rate sensor, ESP32, Web-page interface.

I. INTRODUCTION

The main motivation of Smart Electric Wheelchair is designed to enhance movement, protection, and everyday solace for physically impaired. These employs evolved hindrance espial sensing element to elude crashes during relocating in inside and out of door surroundings. The technology step detection supports to avoid collision by finding stairs or unexpected droplets. The wheelchair constantly screens the patient rate of pulse to encourage medical awareness. Humidity and temperature sensors measure body conditions to secure user fellow feeling It provides suave 360-degree spinning mobility, enable simple navigation in restricted and jammed spaces. In the middle of critical conditions, the patient able to press a committed push button for rapid help. An exigency alert is continuously showcased on the organic LED panel. The OLED screen deliver live data like sensing element readings along with device cautions. This ocular response helps patients and caretakers react immediately to emergency situations. This structure is developed with an approachable interface and user friendly.

II. LITERATURE SURVEY

M. Karthik et al. (2025) examined how **"**Solar-Powered Smart Wheelchair" incorporating renewable energy with intelligent mobility support. This research recommended a voice-controlled navigation system, enabling hands-free operation for physically impaired. The system integrated sensor-based safety features such as barrier detection and stability monitoring to enhance user safety. The study illustrated a user-friendly assistive mobility solution**,** energy-efficient that enhances independence and reduces manual controls.

A further contribution called development of a voice-controlled wheelchair process by Sumet Umchid et al. (2024). This proposed work aimed at enhancing movements for physically challenged persons and utilized speech-recognition technology to enable intuitive, hands-free movement control. This system integrated microcontroller-based processing to ensure accurate command interpretation and smooth wheelchair operation, demonstrated a cost-effective.

C. Kanmani Pappa et al. (2024) explored in their study "IoT-based smart wheelchair" that supports both voice and gesture control for improved user accessibility. The system integrated wireless communication, sensors, and microcontroller processing to enable seamless multi-modal navigation. It demonstrated a more flexible and responsive assistive mobility solution.

Authors Md. Nahidul Alam et al. (2023) who considered similar a smart electric wheelchair incorporated with a multipurpose health-monitoring system to improver user protection. This system integrated vital-sign sensors such as heart rate, temperature, and posture monitoring, enabling continuous real-time health tracking. This study brought out a comprehensive assistive solution that enhances mobility while providing essential medical monitoring for physically disabled users.

III. RESEARCH METHODOLOGY

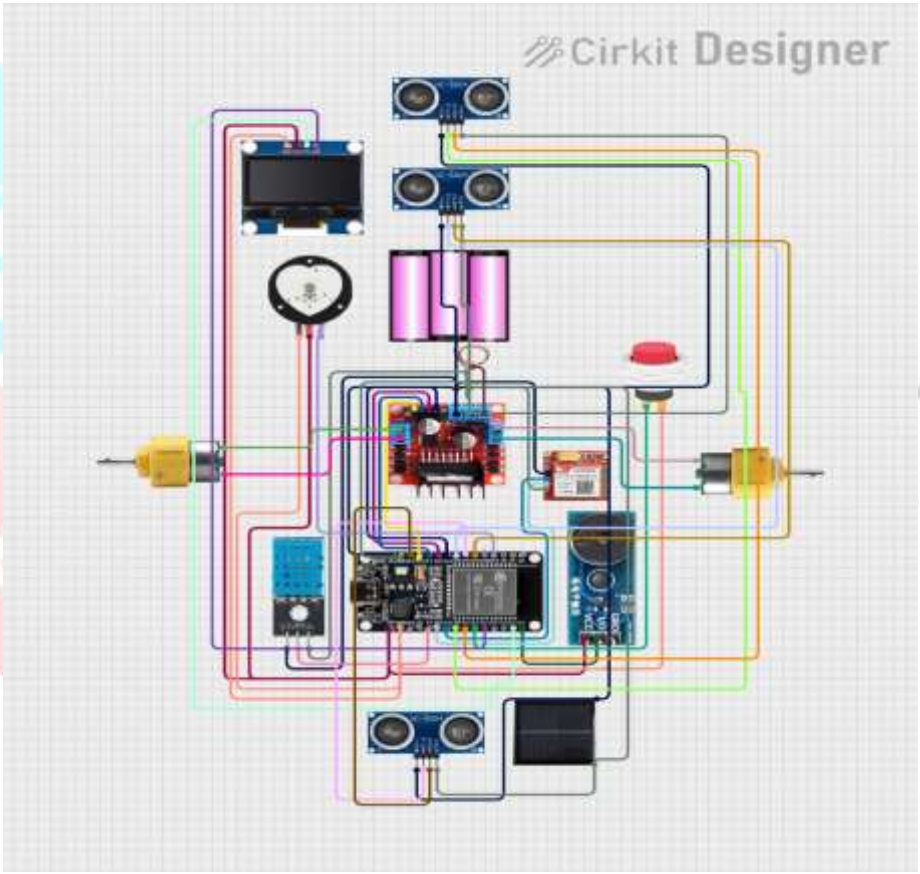

Figure1: Circuit Diagram

The above figure1 illustrates the circuit diagram of smart electric wheelchair. This technique unlocks with the progression of entire electronic module that employs the microcontroller ESP32. The sensing module ultrasonic is situated on several sides that are connected with the ESP32. Furnishing staircase detection together with obstacle detection during wheelchair travel. DHT11 and heart rate modules work all together to usually appraise the user vitality parameters. A digital humidity and temperature sensor is blended to track and observe well-being conditions for bodily deficiency. The duo DC motors are controlled by dual H-bridge L298N to assist 360-degree rotation such as forward, backward, right, left.

Energize batteries come up with an electric power converter. It confirms smooth and efficient performance of every single sensing element. Utilizing the I²C Inter-Integrated Circuit, the organic LED board exhibit information covering user vitals, system aware and span readings**.** Wi-Fi/GSM module is integrated to establish a web-page platform remote supervision and operation of wheelchair movement.

Navigation algorithms are encrypted into the ESP32 to examine sensing element estimation into controlled motor deeds, hearten self-directed motility. Sensor consequence is authenticated through restrained experiments by verifying both barrier sensing and vital-sign monitoring.

Web-based interface is tested to maintain it receptiveness and perpetual immediate updates**.** To appraising locomotion precision, security, and stability amassed information from motor behavior, sensors, and web page. These are analyzed to evaluate entire system performance, the field trials are performed on indoor and outdoor surfaces. All results are recorded to enhance the prototype and lead bright future intensification in smart mobility supportive organization. The below figure 2 illustrates working model of smart electric wheelchair which has been designed and figure 3 shows web-based interface which we have used for wheelchair control and its rotational movements.

Figure 2: Working Model

Figure 3: Web-Based Interface

IV. RESULTS AND DISCUSSION

The smart electric wheelchair demonstrated effective step edge sensing and detection of objects, securing user protection by reducing impacts and falls. Health monitoring sensors constantly tracked body moisture, heat level, rate of pulse furnishing instant user condition data, data will display on Organic Light Emitting Diode. The complete rotation capabilities controlled through a web page allowed smooth and responsive navigation with low latency**.** The data will present on serial monitor, when the user presses the push switch during an exigency**.** This primary point leads to build user uniqueness, protection, specifying assure for better activity. Particular disadvantage in wireless connectivity were noted, notify field for ongoing progress.

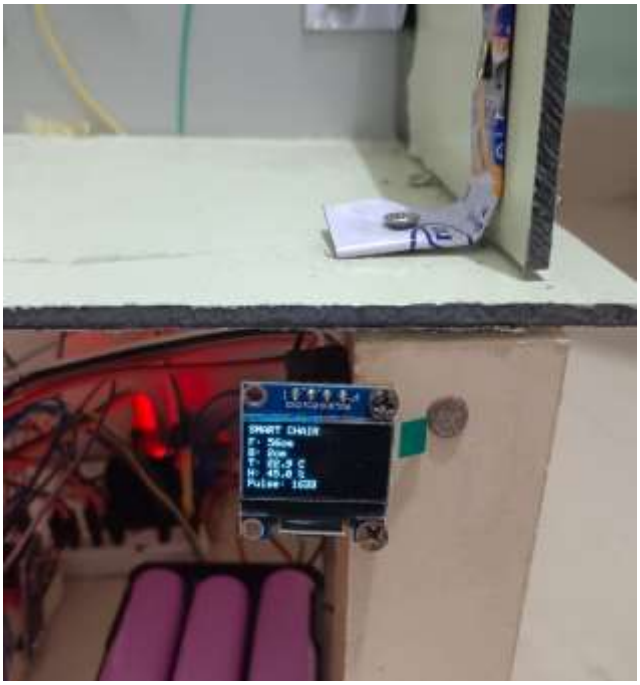

Figure 4: Patient Data

Figure 5: Emergency Notification

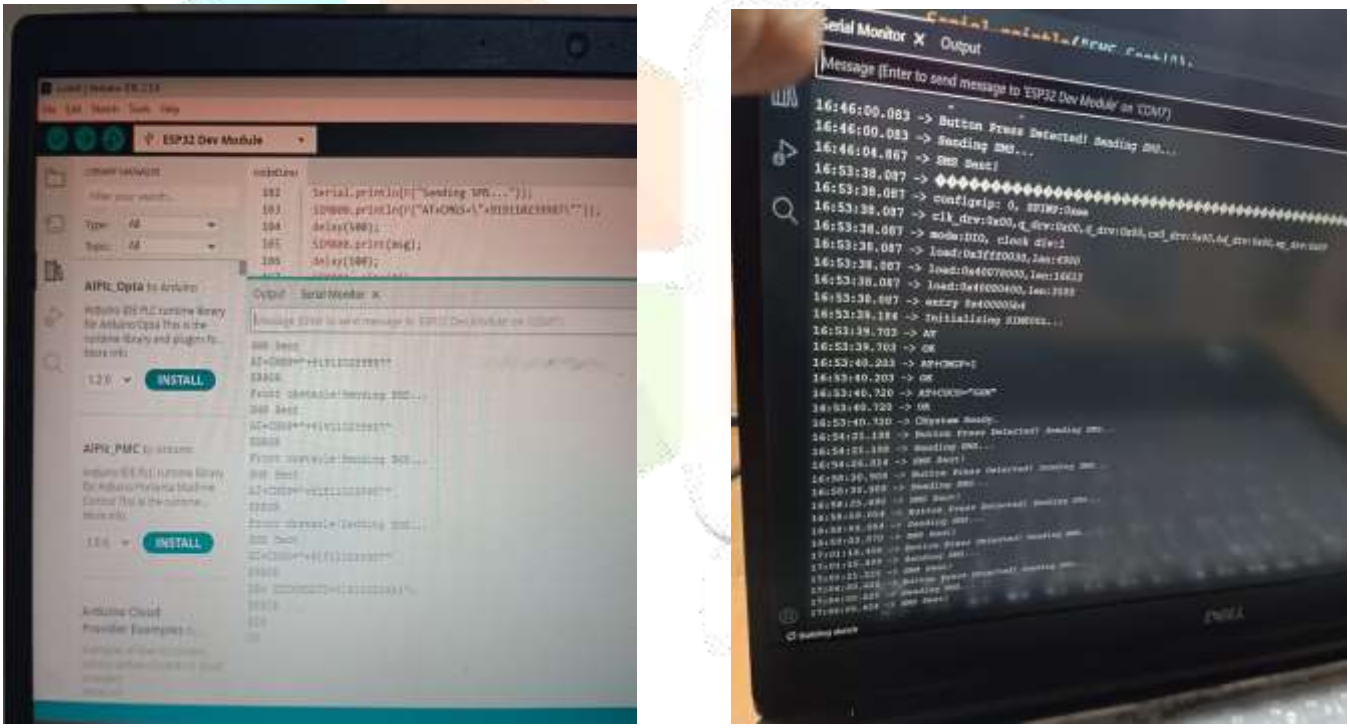

Figure 6: Output Display

V. CONCLUSION

The smart electric wheelchair efficaciously unites motility support along with real-time protection and also medical supervision. Obstruction recognition permits secure navigation by avoiding crashes and securing smooth mobility. Incorporated rate of pulse observing assists track the user's circulatory system constantly. DHT11 Humidity and Temperature sensors gives consciousness of ecological and well-being conditions. Entire sensor information is executed and exhibited in real time for rapid reply and special user concern. Generally, the structure improves autonomy, protection, and life quality for users.

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