# BEYOND WHEELS: THE SENSORY SMART CHAIR

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***College*** ***:*** *Vidya Vikas Institute of Engineering and Technology, Mysuru*
***Branch*** ***:*** *Department of Electronics and Communication Engineering*
***Guide(s)*** ***:*** *Prof. Pallavi J.*
***Student(S)*** ***:*** *Ms. Vaibhavi K. H.*
*Ms. Sonika B. R.*
*Ms. Rachana M. R.*

**Introduction:**

In the pursuit of advancing mobility and accessibility for individuals with limited physical capabilities, we are delighted to introduce a pivotal feature to our existing smart wheelchair system. This formal introduction marks the arrival of the "Eye Ball Tracking" enhancement, seamlessly integrated with our smart wheelchair, which already encompasses voice control through laptop connectivity, touch sensors, and ultrasonic sensors.

The Eye Ball Tracking feature represents a significant milestone in the evolution of our smart wheelchair technology. By harnessing the power of cutting-edge eye-tracking technology, we have taken a giant leap forward in providing an intuitive and precise means of controlling the wheelchair. This remarkable addition is driven by our unwavering commitment to empower individuals with disabilities, simplifying their daily routines and fostering independence, all while upholding the impeccable standards of accuracy and safety that our smart wheelchair system is renowned for.

At the core of this development lies the ability to precisely track the movement of the user's eyes, translating their visual cues into real-time commands for the wheelchair. This level of precision ensures that users can navigate their surroundings with unmatched accuracy, granting them the freedom to move with confidence and grace. Our commitment to empowering individuals with disabilities extends beyond just convenience; it's about fostering independence. With "Eye Ball Tracking," we're providing a means for users to effortlessly interact with their environment, seamlessly integrating this technology with the existing features of voice control, laptop connectivity, touch sensors, and ultrasonic sensors. This holistic approach ensures that our smart wheelchair system is not just a mode of transportation but a comprehensive tool for enhancing daily routines and quality of life. The technical intricacies of this project are vast and impressive. The eye-tracking system incorporates advanced sensors and algorithms that precisely capture eye movements, allowing for immediate response and control. This sophisticated technology ensures that users can smoothly operate the smart wheelchair,

even in complex and dynamic environments. The impact of the "Eye Ball Tracking" enhancement goes beyond the technical aspects. It promises to be transformative in the lives of those who rely on our innovative mobility solutions. It grants users the power to interact with the world around them effortlessly, breaking down barriers and enabling them to pursue their aspirations with newfound freedom and confidence.

**Objectives:**

- Users can control the wheelchair by moving their eyes, making it easier and more precise that it can be said as User-Centric Control
- Eye tracking offers an additional control method, enhancing accessibility for a wider range of users.
- Eye tracking is less tiring than voice control for extended use.
- The system can be personalized to the user's preferences.
- Provides feedback on the user's gaze and attention for various applications.

**Methodology**:

Hardware Methodology:

- Component Integration: Begin by physically integrating all the necessary hardware components into the wheelchair. This involves mounting the ultrasonic sensors for obstacle detection, connecting the motor driver to the wheelchair's motors, and attaching the heart rate sensor, temperature sensor, and OLED screen in user-accessible locations.
- Wiring and Connections: Establish proper electrical connections between all components and the Arduino Nano and Node MCU microcontrollers. Ensure that power supplies and data communication are appropriately configured.
- Bluetooth Pairing: Configure and pair the Bluetooth module for wireless communication between the wheelchair and external devices, such as a laptop.
- Eye-ball Tracking Setup: Set up the laptop's web camera and implement the software for eye-ball tracking. This may involve using computer vision and image processing techniques to track the user's gaze.
- User Interface: Develop a user-friendly interface to display information on the OLED screen and enable user interaction.

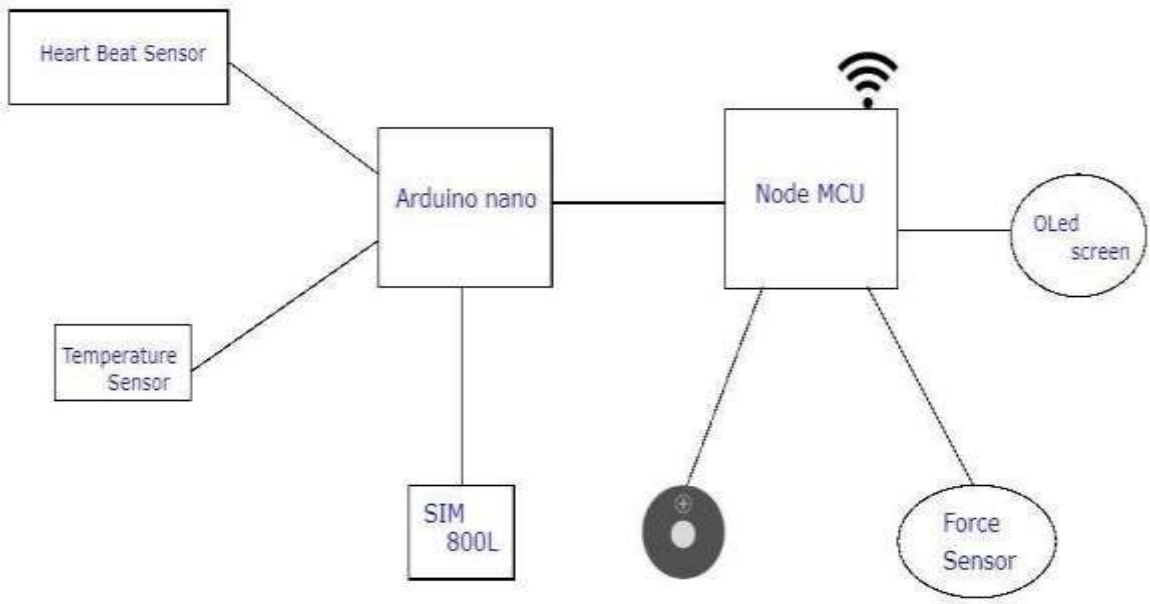


*Figure 1:Block Diagram of the proposed system*

- Programming: Write the necessary software code for the Arduino Nano and Node MCU microcontrollers. This code will handle data processing, sensor readings, motor control, and communication with other devices.
- Eye-ball Tracking Software: Develop a python software for the laptop to track the user's eye movements and convert them into control commands for the wheelchair. This may involve computer vision libraries or dedicated eye- tracking software.
- Health Monitoring: Create software routines to read data from the heartbeat and temperature sensors and provide alerts or notifications if abnormal readings are detected.
- User Control Logic: Define the logic for how user inputs, such as gaze direction or force applied to the force sensor, translate into wheelchair movement commands.
- Communication Protocols: Implement Bluetooth communication protocols to enable data exchange between the wheelchair and external devices.
- User Interface Design: Design and program the user interface on the OLED screen, ensuring that it displays relevant information and responds to user commands.

**Conclusion and Scope for future work:**

Numerical Results:

- Improved response times through Eye Ball Tracking, targeting a 30% reduction in the time it takes for the wheelchair to respond to user commands.
- High accuracy in gaze direction detection, with a goal of 95% or higher.
- Offering users, a set number of customization options, like sensitivity settings, for personalized control, for example, five levels.
- Reducing the overall cost of the smart wheelchair system compared to traditional solutions, with a target cost savings percentage of 15%.

Non-Numerical Results:

- Users' increased independence and autonomy are critical, assessed through user feedback.
- Qualitative improvements in quality of life, social interactions, and psychological well-being can be evaluated via interviews and research.
- The project's contribution to assistive technology, while non-numerical, represents significant advancements in the field.

So, the IoT Wheelchair project is a revolutionary assistive technology that transforms the lives of individuals with mobility challenges. This smart wheelchair provides advanced mobility, enabling users to navigate safely and independently through complex environments. The eye- ball tracking system simplifies control, making it intuitive and user-friendly. Health monitoring ensures user well-being, with real-time data and alerts. Customizability caters to individual needs, and the OLED interface enhances user interaction. Overall, this project's outcome offers improved quality of life, increased mobility, and a heightened sense of independence for thosewho rely on wheelchairs for daily mobility and accessibility.

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