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# A Study on Advanced Patient Support System with Smart Wheelchair and Automated Bed

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***Abstract:*** ***An Advanced Patient Support System is developed to improve patient safety and care using smart technologies. This project integrates a joystick-controlled smart wheelchair and a safety-based automated bed system. The wheelchair allows easy movement of patients with limited mobility, while the bed is designed to detect patient movement and prevent accidental falls by providing alerts. The system helps caregivers monitor patients effectively and reduces manual effort. It offers a simple, reliable, and efficient solution for hospitals and home care environments.***

***Key idea of the Abstract: The abstract describes a healthcare support system that combines a joystick-based wheelchair for easy patient mobility and a smart bed with an ultrasonic sensor for continuous monitoring. It focuses on detecting patient movement and providing immediate alerts through buzzer and LED to prevent accidents. The system highlights safety, ease of use, and cost-effectiveness, making it suitable for hospitals and home care environments.***

***Common features highlighted:***

- ***Joystick-based control system for smooth and easy movement of the wheelchair.***
- ***Ultrasonic sensor-based monitoring system to detect patient movement on the bed.***
- ***Immediate alert mechanism using buzzer and LED for safety and accident prevention.***
- ***Simple, cost-effective, and user-friendly design suitable for healthcare applications.***

## I. INTRODUCTION

With the advancement in healthcare technology, there is a growing need for systems that can support patient mobility and ensure safety. Patients who are physically weak or bedridden require continuous monitoring and assistance.

The proposed Advanced Patient Support System integrates a joystick-based wheelchair for controlled movement and a smart bed with an ultrasonic sensor to detect patient movement. The system provides alert signals in case of unsafe conditions, helping in improving patient care and reducing the burden on caregivers.

### *A. Core Definition*

An Advanced Patient Support System refers to an integrated healthcare model that uses electronic devices and sensors to assist patients and enhance their safety. It combines mobility support through a joystick-operated wheelchair with a monitoring system that tracks patient movement on the bed. The system is designed to detect abnormal conditions and generate alerts, ensuring timely assistance and reducing the risk of accidents.

## II. NEED AND SCOPE OF STUDY

With the increasing number of elderly and physically challenged patients, there is a strong need for efficient healthcare support systems that can ensure both mobility and safety. Patients who depend on wheelchairs and are confined to beds are at a higher risk of accidents such as falls and injuries. Continuous monitoring and assistance from caregivers can be difficult and time-consuming. Therefore, a system that can provide easy movement and real-time safety alerts is highly required.

### *A. Need*

The system is needed to assist patients in moving independently and to reduce the risk of accidents while resting on the bed. It helps in providing immediate alerts in case of unsafe movement, ensuring timely response. It also reduces the physical workload of caregivers and improves overall patient care and safety.

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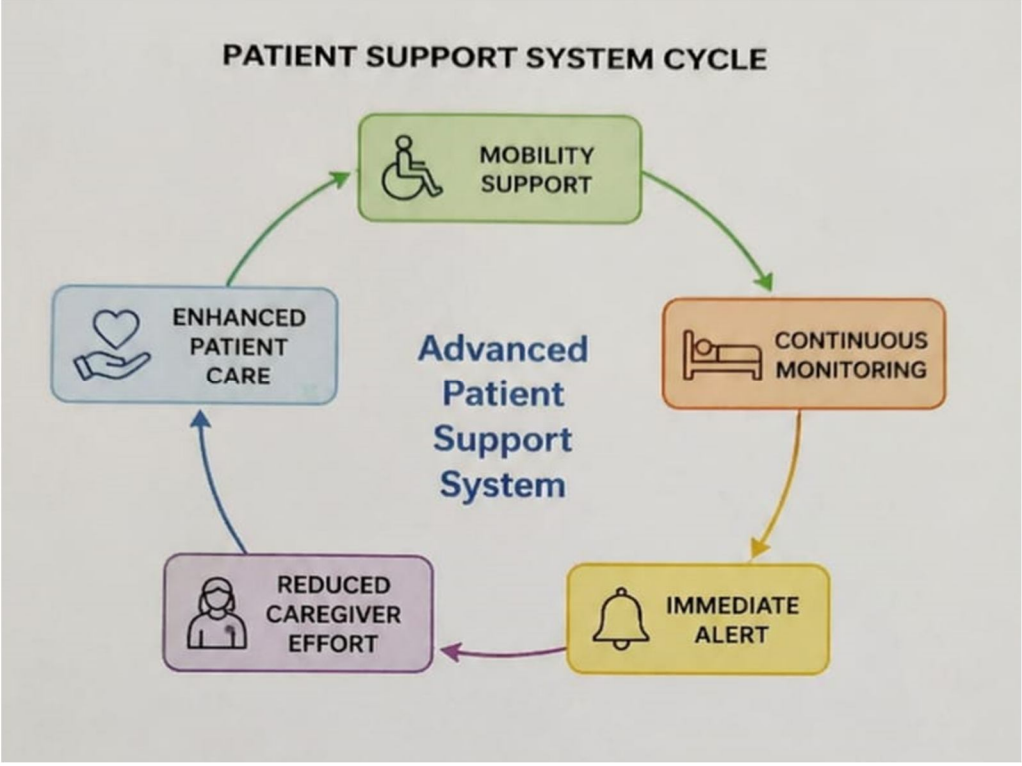
*B. Scope Of Study*

The scope of this project includes the design and development of a joystick-based wheelchair for controlled mobility and a smart bed system using an ultrasonic sensor for monitoring patient movement. The study covers the working of sensors, microcontrollers, and control systems. It also focuses on improving patient safety, system reliability, and usability in hospitals and home care environments. Future scope includes integration of advanced sensors, remote monitoring, and automation for better performance.




*1)* Improving Mobility: Joystick-based wheelchair allows patients to move easily and independently, reducing dependency on caregivers.
*2)* Ensuring Patient Safety: Smart bed with ultrasonic sensor continuously monitors patient movement and helps prevent accidental falls.
*3)* Immediate Alert System: Buzzer and LED provide instant alerts when unsafe movement is detected, ensuring quick response.
*4)* Reducing Caregiver Effort: The system minimizes manual monitoring and physical workload of caregivers.
*5)* Enhancing Patient Care: It improves overall healthcare support by combining mobility assistance and safety monitoring in one system.

## III. METHODOLOGY

The methodology of this project focuses on the design and development of an Advanced Patient Support System that includes a joystick-based wheelchair and a smart bed with an ultrasonic sensor. The system is developed to improve patient mobility and ensure safety through continuous monitoring and alert mechanisms.

*1)* Project Planning: At the initial stage, the objective was defined to create a system that can assist patients in movement and provide safety while resting. The project was divided into two main parts: joystick-controlled wheelchair and smart bed monitoring system.
*2)* Data Collection and Study: Relevant information was collected from textbooks, online resources, and component datasheets. The working of Arduino Uno, joystick module, motor driver, and ultrasonic sensor was studied to understand their role in the system.
*3)* Circuit Diagram: A proper circuit was designed to connect all components efficiently. The joystick module was connected to the microcontroller to control the wheelchair movement, while the ultrasonic sensor was connected to monitor patient position. Output devices like buzzer and LED were also integrated for alert purposes.

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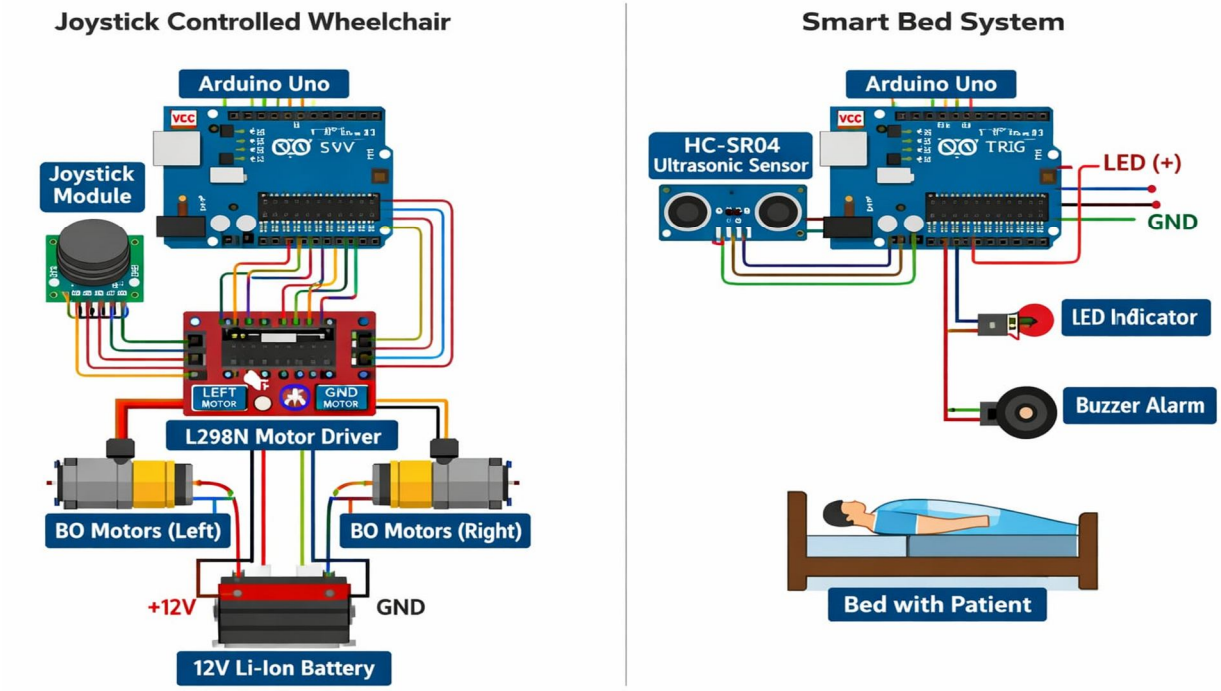
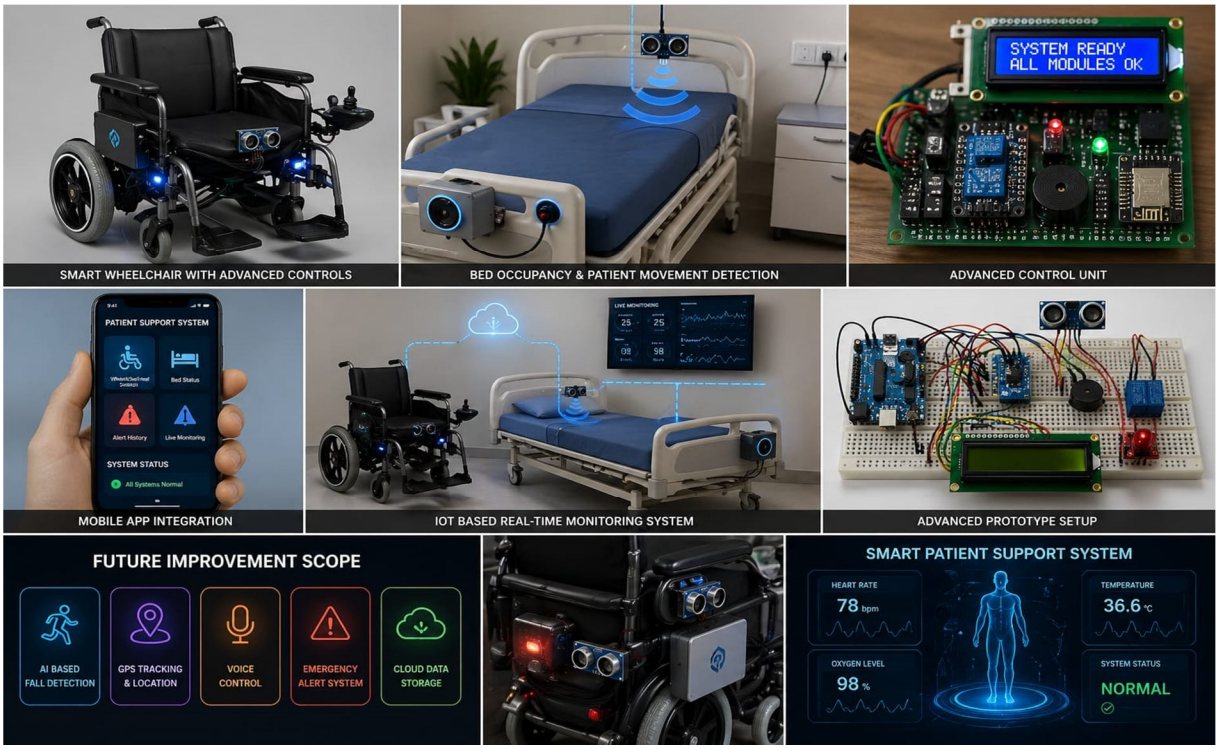



*4)* Working principle: The system works on the principle of input, processing, and output. The joystick provides input to control the movement of the wheelchair in different directions. The ultrasonic sensor continuously measures the distance between the patient and the bed. If the distance exceeds the safe limit, the microcontroller activates the buzzer and LED to generate an alert.

*5)* Future Improvement Scope: The system can be further improved by adding advanced sensors, increasing accuracy, and integrating remote monitoring features for better performance and efficiency.

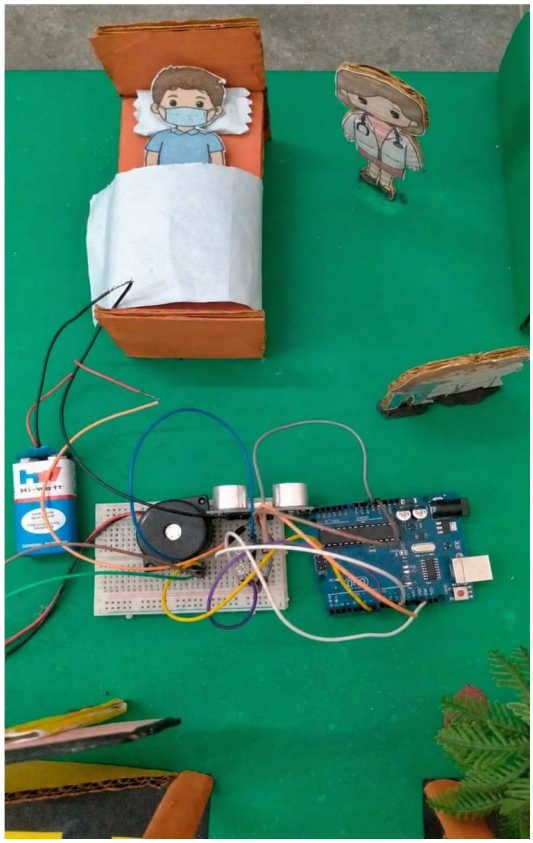


## IV. CONCLUSION

This project presents the successful design and implementation of an Advanced Patient Support System that combines a joystick-based wheelchair and a smart bed with an ultrasonic sensor. The system effectively improves patient mobility and ensures safety by providing continuous monitoring and timely alerts in case of unsafe movement.

The integration of simple electronic components such as Arduino, sensors, and control modules demonstrates how technology can be used to solve real-life healthcare problems. The system is cost-effective, user-friendly, and suitable for both hospitals and home care environments.

In conclusion, this project highlights the importance of smart healthcare solutions in reducing caregiver effort and enhancing patient care. It also provides a strong foundation for future improvements and advanced automation in patient support systems.



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## REFERENCES

[1] Kumar, A., Singh, R., & Verma, P. “Design and Development of Smart Wheelchair for Physically Disabled People.” International Journal of Engineering Research & Technology (IJERT), 9, no. 5 (2020): 1234–1238.

[2] Sharma, S., & Gupta, N. “Patient Monitoring System Using Ultrasonic Sensor and Arduino.” International Journal of Innovative Research in Science, Engineering and Technology, 8, no. 6 (2019): 4567–4572.

[3] Patel, D., & Mehta, K. “IoT Based Smart Healthcare System for Patient Safety and Monitoring.” IEEE Access, 7 (2021): 102345–102356.

[4] Khan, M. A., & Ali, S. “Assistive Technologies for Elderly and Disabled People: A Review.” Journal of Healthcare Engineering, 2022: 1–10.

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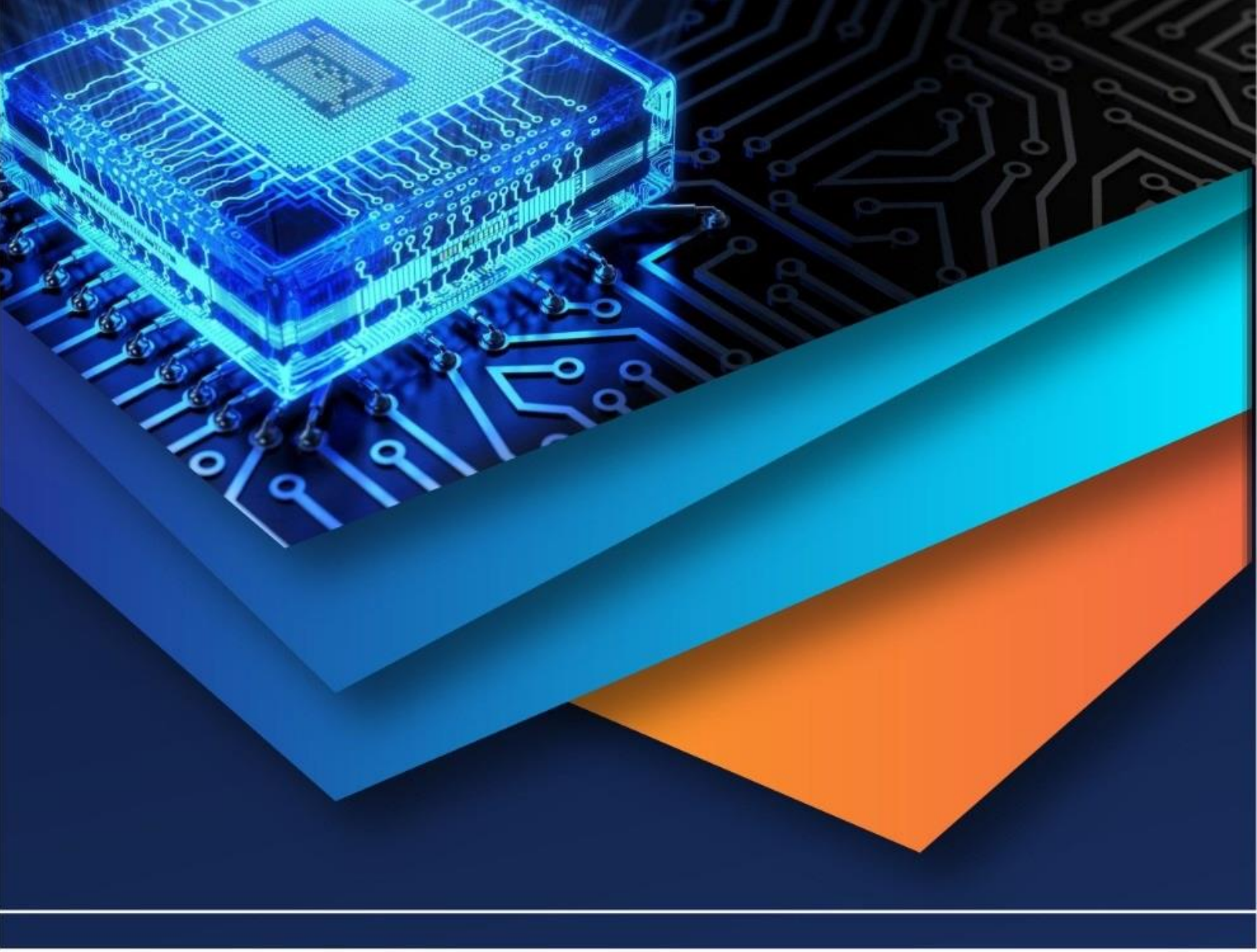

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