MULTIFUNCTIONAL ROBOT FOR SPECIALLY ABLED PEOPLE

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Introduction:

This project presents a multifunctional robotic device tailored for specially abled individuals. It transitions smoothly between chair and bed modes and can also lift the user. This solution offers flexibility in medical, residential, and elderly care settings. The device is designed with comfort, safety, and cost-efficiency in mind, incorporating secure locking, adjustable speeds, and user-friendly controls. It enhances mobility, reduces caregiver strain, and improves patient independence.

Objectives:

- Economically suitable for all hospitals.
- Safe design prioritizing patient protection.
- Dual-function: usable as both bed and chair.
- Height adjustability.
- Wide range of applicability: hospitals, old-age homes, patients with paralysis or mobility impairments.
- Operable via an Android app for ease of use.

Methodology:

1. Methods Used:

- Project Discussion
- Project Proposal & Documentation
- Material Selection
- Conceptual Design (3D models/blueprints)
- Analytical Simulations
- Component Fabrication
- System Assembly
- Testing & Validation
- Performance Review
- Final Report Submission

2. Techniques Used:

- CAD Modelling (AutoCAD, SolidWorks, Fusion 360)
- FEA (Finite Element Analysis)
- CFD (Computational Fluid Dynamics)
- Prototyping (3D printing, CNC machining)
- Machining & Welding
- Electronics Integration (Arduino, Raspberry Pi, sensors)
- Adhesive Bonding
- Quality & Load Testing
- Electrical & Thermal Testing

3. Materials Used:

- Metals: Aluminium, Steel, Copper
- Plastics: ABS, PLA
- Composites: Carbon Fiber
- Electronics: Microcontrollers, PCBs, Sensors
- Fasteners & Adhesives: Screws, Epoxy

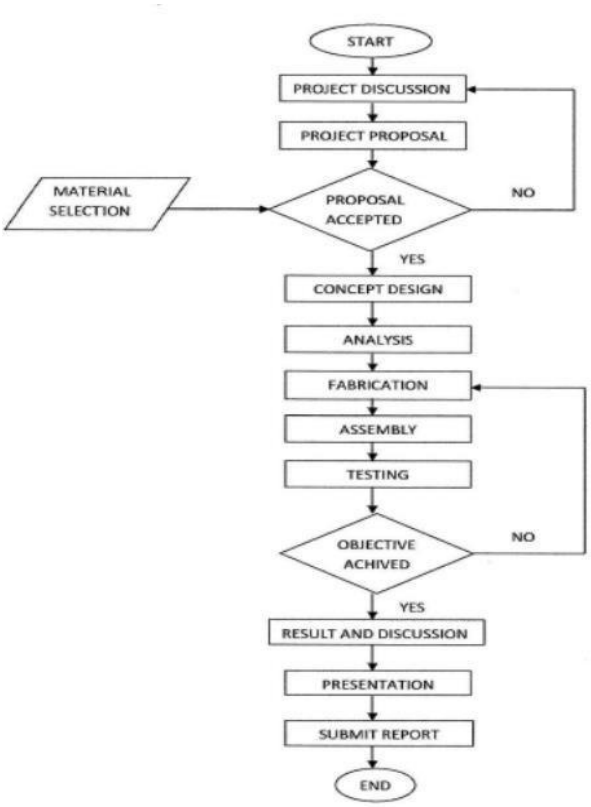

Figure 1: Methodology of the project

Result and Conclusion:

The working prototype was successfully tested. It meets the design expectations for mobility, transformation, and lifting. The project strengthened team skills in robotics and mechanical design. With further development, it can be optimized for mass production and include features like IoT integration for smart control. Overall, the device demonstrated potential to revolutionize mobility solutions in assistive tech.

Figure 2: Working Model of the Project

Project Outcome and Industry Relevance:

- Enhanced Automation: Future integration with AI for adaptive behaviour.
- Predictive Assistance: Anticipates user needs using smart sensors.
- Smart Integration: Connect with smart homes for seamless control.
- Customization: Modular upgrades and personal aesthetics.
- Sustainability: Energy-efficient designs and long-term savings.
- Industry Fit: Ideal for hospitals, care homes, and rehabilitation centres.
- Scalability: Can be adapted for larger loads and broader use cases.

Working Model vs. Simulation:

A physical working model was successfully developed and tested.

Project Outcomes and Learnings:

Key Outcomes:

- Fully functional chair-to-bed robotic device.
- Supports user independence and reduces caregiver workload.
- Incorporates safety mechanisms and customizable settings.
- Proven feasible through real-world testing.

Key Learnings:

- Iterative design and prototype refinement are critical.
- User feedback guided ergonomic and functional design.
- Integration of safety and smart features is essential.
- Balancing mechanical complexity with user simplicity.
- Real-world trials help identify and improve flaws.
- Maintenance and long-term use must be planned early.

Future Scope:

With enhancements, this device can be commercialized to serve hospitals and healthcare sectors globally. AI integration, improved load-``bearing, and cost-effective production are the next steps. There is immense potential for impact in both developing and developed healthcare infrastructures. Scalability and adaptability make it suitable for diverse user groups.