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Joystick Controlled Wheelchair Bed

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Abstract: *This paper presents a biometric face recognition system designed specifically for identifying missing persons and generating instantaneous reports containing their detailed information. The system employs advanced facial recognition algorithms to compare scanned facial data against a database of registered individuals. Upon successful identification, the system automatically alerts registered family members through messaging services and provides the current location of the identified individual. The dual-interface application segregates functionality between administrative and user dashboards, ensuring data security while enabling efficient information management. Experimental results demonstrate the system's effectiveness in real-world scenarios with varied lighting conditions and partial facial obstructions, achieving an identification accuracy of over 90% in controlled environments.*

Keywords: Wheelchair with bed conversion, Electric wheelchair bed, Assistive mobility device, Futuristic Assistive Device

I. INTRODUCTION

A wheelchair is a mobility device designed for individuals who have difficulty walking due to illness, injury, or disability. It can be operated manually or through automated systems.

Wheelchairs come in various types, often customized to meet individual needs, with adjustable features such as seat size, height, footrests, and controls.

This paper explores the growing trend of electric-powered wheelchairs (EPWs), initially developed by George Klein for injured World War II veterans. EPWs are available in rear-wheel, front-wheel, center-wheel, or four-wheel drive models, each with unique handling characteristics. They also vary in seat design, resembling either manual chairs or captain's chairs. Designed for indoor, outdoor, or dual use, EPWs assist individuals who struggle to operate manual wheelchairs due to physical limitations. Many models include powered functions like tilt, recline, and seat elevation.

They are typically powered by deep-cycle rechargeable batteries, with modern versions favoring dry cell batteries and built-in chargers.

Disability is a term that has evolved over time. Historically used in sports and competitions, it became associated with physical and mental impairments by 1915. Today, disability is understood as a broad concept encompassing impairments, activity limitations, and participation restrictions, shaped by both individual conditions and societal factors.

II. LITERATURE REVIEW

Mohan Kumar R. and et al. (2012)

Found Design of Multipurpose Wheel Chair for Physically Challenged and Elder People. The design of wheel chair started by means of literature review to know its evaluation from earlier to the present generation. Market study was carried out to know the present competitors available in the market with cost analysis of the existing product.

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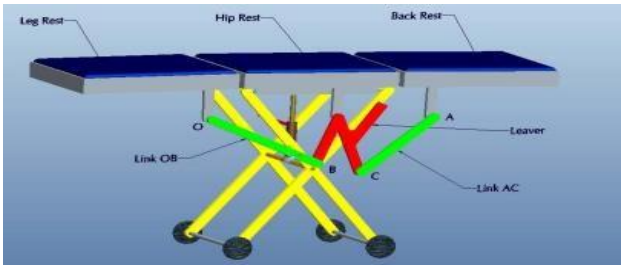
Ehsanullah Khan and et al. (2011)

He says synthesis of trolley cum wheelchair for patient handling. Handling of patient from hospital bed to CT-Scan, MR Scan, X-Ray, Sonography centre etc is a cumbersome and tedious job. Generally from bed, the patient is moved to trolley manually. Three to four persons lift the patient and keep him on the stretcher. The trolley is moved to lift if necessary.

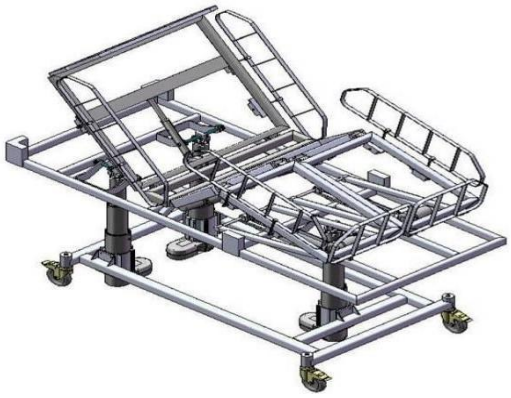


Jingtao.Chen and et al. (2013)

Found design of the wheelchair bed. People's request, in this paper by considering the wheelchair on the research of the front foot and back structure, finally decided to use in forefoot plate rack mechanism, backplane using slider-crank mechanism, so as to achieve transformation between the wheelchair and the bed. And using computer application software for 3d drawings of drawing and carry on simulation test.

Nenad Pavlović and et al. (2010)

Found development of multifunctional hospital bed. The need for multifunctional hospital beds is especially present in care of immovable patients (patients with persistent vegetative state, paraplegia, stroke and spinal cord injuries), where the care requires a lot of time and manpower.



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III. PROBLEM STATEMENT

People with mobility impairments tend to experience difficulties in transferring between a bed and a wheelchair and need help with repositioning and moving. A joystick-operated wheelchair bed is designed to offer a combined solution that unites the functions of both, enabling users to change their position easily with minimal effort.

The primary challenge is to create a system that smoothly shifts between wheelchair and bed modes while maintaining stability, safety, and control ease. The joystick has to provide smooth movement in several directions with addition features such as height adjustment, reclining, and automatic posture support. The system should also include safety features like obstacle detection, emergency stop facilities, and battery efficiency to improve user confidence and dependability.

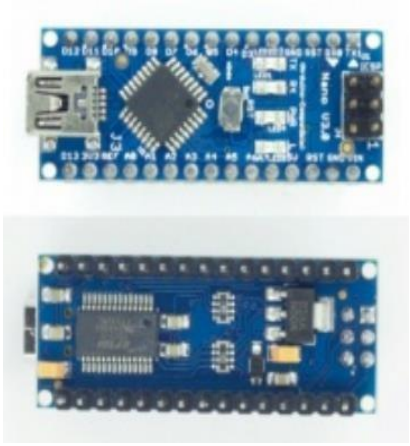
This project aims to develop a smart, easy-to-use joystick-controlled wheelchair bed that fosters independence, comfort, and enhanced quality of life for people with restricted mobility.

IV. METHODOLOGY

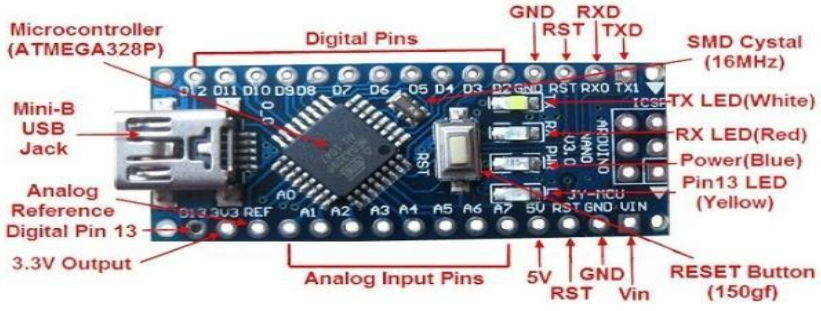
COMPONENTS USED

ARDUINO

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x) or ATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package.



It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Arduino Nano can be powered via the Mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the highest voltage source.



ARDUINO NANO EXPANSION SHIELD

Arduino Nano IO Expansion Shield is specifically designed to facilitate an easy connection between Arduino Nano and many other devices. In essence, it expands the Arduino Nano controller to link those devices in a simple and trouble free manner.

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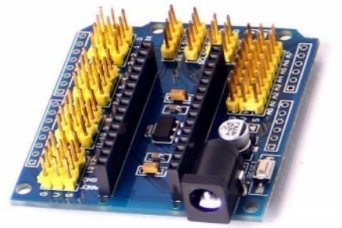


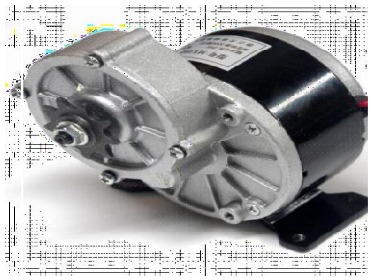
JOYSTICK

This is JoyStick Module PS2 Breakout Sensor very similar to the 'analog' joysticks on PS2 (PlayStation 2) controllers. Directional movements are simply two potentiometers – one for each axis. Pots are ~10k each. This joystick also has a select button that is actuated when the joystick is press down.

With the help of this Joystick Module, you can measure position coordinates on the X and Y axis by moving the "hat". It also contains a switch that is press-able by pushing the "hat".It also contains a switch that is press-able by pushing the "hat" down. Similar to the XBOX controller.

The X and Y axes are two 10k potentiometers which control 2D movement by generating analog signals. When the module is in working mode, it will output two analog values, representing two directions. This module uses the 5V power supply, and value, when reading through analog input, would be about 2.5V, a value will increase with joystick movement and will go up till maximum 5V; the value will decrease when the joystick is moved in other direction till 0V.

DC MOTOR



Ebike MY1016Z2 250W 360rpm Geared DC motor is a popular reduction dc motor & it's simply the most commonly used motor for scooters, bikes, and quads available in the market! Also due to its robustness, it is also in many DIY projects like Segway, e-cars, etc and in many robots like ATV robots, combat robots, etc. It is normally found in the better-quality quads and scooters on the market and is classed as a mid- range combination.

Specifications:

Output Power: 250 Watt.
Rated Voltage: 24V
Rated Speed: 360 RPM
Full load Current: ≤13.4A
No load Current: ≤2.2A
Torque Constant: 0.8 N.m (8.15 kg-cm).

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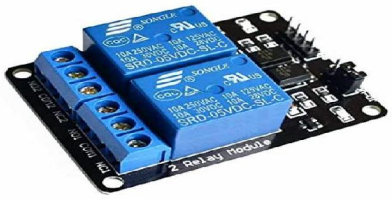
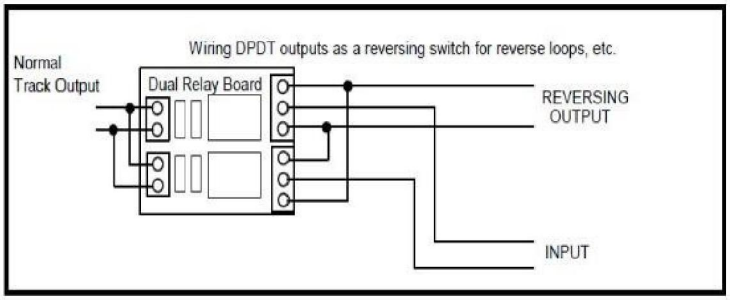
RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.



A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".



BATTERY:

Seal lead acid battery

The lead–acid battery was developed in 1859 by French physicist Gaston Planté and is the most established kind of rechargeable battery. In spite of having a low vitality to weight proportion and a low vitality to-volume proportion, its capacity to supply high surge streams implies that the cells have a moderately extensive energy to-weight proportion. This element, alongside their minimal effort, makes it appealing for use in engine vehicles to give the high current required via car starter engines. As they are cheap contrasted with more up to date advancements, lead– acid batteries are generally utilized notwithstanding when surge current is not vital and different plans could give higher vitality densities. Extensive arrangement lead–acid plans are generally utilized for capacity as a part of reinforcement force supplies in mobile phone towers, high accessibility settings like healing facilities, and stand-alone power frameworks. For these parts, altered variants of the standard cell might be utilized to enhance stockpiling times and lessen support prerequisites. Gel-cells and consumed glass-mat batteries are basic in these parts, all in all known as VRLA (valve-directed lead– acid) batteries. Charging:- Charging Sealed Lead Acid (SLA) batteries does not appear an especially troublesome procedure, but rather the critical step in charging a SLA battery is boosting the battery life. Basic consistent current/steady voltage chargers will carry out the occupation for some time, yet the battery future cited by the producer will be enormously decreased by utilizing non-clever chargers like this. Amplifying the life of your SLA battery by utilizing an insightful charger is not just practical, it is likewise better for the earth. Before taking a gander at the distinctive charging strategies it is vital to comprehend the battery science and what happens amid typical charge and release cycles. Normally the positive plates in a SLA battery are produced using lead dioxide, and the negative plates from a wipe lead. The electrolyte is generally sulphuric corrosive blended with a gelling operator and is to a great extent

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consumed and held by protecting separators between the plates, see Figure When an SLA battery is being discharged; the lead (Pb) onthe negative plate and the lead dioxide (PbO2) on the positive plate are converted to lead sulphate (PbSO4). At thesame time the sulphuric acid (H2SO4) is converted to water(H2O). In a normal charge, the chemical reaction isreversed. The lead sulphate and water are electro-chemically converted to lead, lead dioxide and sulphuric acid. During afull charge cycle any gasses produced need to be recombined in a so called 'oxygen cycle'. Oxygen isgenerated at the positive plates during the latter stages of thecharge cycle, this reacts with and partially discharges in thesponge lead of the negative plates. As charging continues, the oxygen produced also re-combines with the hydrogenbeing produced on the negative plate forming water. Withcorrect and accurate cell voltage control all gasses producedduring the charge cycle will be re- combined completely intothe negative plates and returned to water in the electrolyte

WHEELCHAIR

DURABLE FRAME: KosmoCare wheelchair is made of heavy-duty steel for rigorous use. Steel frame adds extra durability and stability to the chair while the MS powder coating ensures extra strength, longevity, and resistance from corrosion. The steel frame provides a high load-bearing capability up to 100 kgs.

COMFORTABLE REXINE UPHOLSTERY SEAT: Wheel chair seats are made using rexine upholstery with heavy-duty inner liners to keep the seat and back from stretching. 18" seating area provides relief and includes an adjustable safety belt for added security.

HIGH QUALITY WHEEL CHAIR: The wheelchair comprises superior quality rust-free mag wheels which increases the life span of this chair. The 24 inch rear wheels are for self manoeuvring while the solid PVC front casters swivel at 360° to improve the wheel chairs movements.

PROPELLING OPTIONS: This wheelchair can be used interchangeably as self-propelled wheelchair or attendant wheelchair. While users of this type of chair will generally push themselves, the handles mean it is possible for a caregiver or attendant to push the chair if required. This provides greater flexibility to users.

ERGONOMICALLY FOLDING DESIGN: The foldable wheelchair can folds flat for convenient storage and travel. Our folding wheelchair for old people make independent mobility easy via specialized features like soft padded armrests, storage pocket, rexine upholstery etc.

Net Weight of wheelchair: 18 kgs(approx)

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DESIGN

General Requirements of Machine Design

1. High productivity.
2. Ability to produce and provide required accuracy of shape and size and also necessary surface finish.
3. Simplicity of design.
4. Safety and convenience of control
5. Low Cost.
6. Good Appearance.

Design Procedure

Before we proceed to the process of manufacturing, it's necessary to have some knowledge about the project design essential to design the project before starting the manufacturing. Maximum cost of producing a part of product is established originally by the designer.

The product consists of:

1. **FUNCTIONAL DESIGN.**
2. **PRODUCT DESIGN.**
3. **ENGINEERING DESIGN.**

Design procedure for a product:

When a new product or their elements are to be designed, a designer may proceed as follows:

1. Make a detailed statement of the problems completely; it should be as clear as possible & also of the purpose for which the machine is to be designed
2. Make selection of the possible mechanism which will give the desire motion.
3. Determine the forces acting on it and energy transmitted by each element of the Machine
4. Select the material best suited for each element of the machine.
5. Determine the allowable or design stress considering all the factors that affect the Strength of the machine part.
6. Identify the importance and necessary and application of the machine.
7. Problems with existing requirement of the machine productivity and demand
8. Determine the size of each element with a view to prevent undue distortion or breakage under the applied load.
9. Modify the machine element or parts to agree with the past experience and judgment and to facilitate manufacture.
10. Make assembly and detail drawings of machine with complete specification for the materials and manufacturing methods i.e. accuracy, Surface finish etc

V. CONCLUSION

A motorized wheel chair for disabled persons was designed. This is used for handicapped person for living like the normal persons do. Two way switches is used to control the flow wheel chair in forward or reverse direction. The Battery used to drive the D.C motor. The wheel chair is particularly used for the physical disabled persons. It can be used for taking books from the self, taking dress from the self's and this also can be used for cooking

VI. ADVANTAGES, LIMITATIONS & APPLICATIONS

Advantages

1. Increase in comfort level of the patient
2. Prevents further damage to patients and the helper while transferring him/her from chair to bed or vice versa.
3. Patients with serious injuries need not be moved to aggravate their injuries even more.
4. No special training required to operate them.
5. Is more efficient than other chairs

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Limitations

1. Increases weight of the chair
2. Increases the cost of the chair

Applications

The applications are as follows:

1. Most useful in hospitals. Most useful in old age homes

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