RESEARCH ARTICLE OPEN ACCESS

DESIGN AND FABRICATION OF SCOOTER WITH OSPREY DOCKING GEAR TECHNOLOGY FOR PHYSICALLY CHALLENGED PEOPLE.

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Abstract:

Nowadays we can see many physically challenged people riding bikes and scooters. Especially for the people who don't have legs or as from birth they struggle a lot to balance their vehicles. For them we already have supporting wheels which are attached to the vehicles with the rear wheels. We often see them in traffic and in the parking area they may struggle and feel uncomfortable with the wheels attached to the vehicle which covers extra space. Here we have our "WINGS SUPPORT" with this we can help them to use the vehicles as user-friendly and they don't ever feel that they are physically challenged. This system helps them to balance at the time of parking speed and low speed for the speed breakers. We require balance and support for the vehicles only in the range of 15- 25 kmps and above this speed we often don't require any support or balancing. We use a small electric circuit for actuating the pump, for this pump we don't require any high supply we use only ordinary vehicle's 12v battery only. This works under the vehicle's speed only so there is no problem of unbalancing and miss support. We have installed shock absorbers for more comfort and safety. They are very safe with this system because our system works within 1 sec, so that in any emergency case, support will be engaged quickly. We also attached cut off switch manually operated so that others like their relatives also can utilize the vehicle. So that they can also don't feel that they are riding a physically challenger's vehicle. This system is cost efficient and can be sold in an affordable price so that all can use this feature.

Keywords — **SCOOTER, OSPREY DOCKING GEAR TECHNOLOGY, FOR PHYSICALLY CHALLENGED PEOPLE**

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INTRODUCTION

The Docking System aims to revolutionize mobility for physically challenged individuals by providing a compact, efficient, and automatic balancing system for scooters. The project focuses on designing, fabricating, and implementing this technology to ensure ease of use, safety, and affordability.

Development of a mechanized support system that deploys at low speeds (15-25 km/hr). Integration of an electric circuit powered by a 12V battery for automation. Use of shock absorbers to enhance ride comfort and stability.

System design to prevent imbalance or sudden failures. Manual cut-off switches for normal vehicle operation when required. Use of lightweight and durable materials to enhance reliability.

The need for studying and developing the Docking System arises from the challenges faced by physically challenged individuals while using two wheelers. This project aims to address mobility issues, enhance safety, and improve the overall riding experience for such users.

Challenges Faced by Physically Challenged Riders • Difficulty in balancing conventional two wheelers.

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- Existing support wheel attachments are large and cumbersome.
- Struggles in traffic and parking due to extra width.
- Lack of affordable and efficient solutions in the market.

Importance of a Compact & Efficient Support System

- Reduces space requirements in parking areas.
- Enhances manoeuvrability in traffic.
- Keeps the vehicle lightweight for better mileage

Safety and Stability Considerations

- Ensures stability at low speeds (15-25 km/h) and during stops.
- Provides emergency support within 1 second to prevent falls.
- Shock absorbers improve ride comfort and safety.

User-Friendly and Cost-Effective Solution

- Operates using the existing 12V battery of the scooter.
- Easy to install and use, requiring minimal maintenance.
- Includes a manual cut-off switch, allowing normal use by other riders

II. PROPOSED SYSTEM

The aim of this project **Osprey Docking System** is a mobility enhancement mechanism specifically designed for **physically challenged individuals**, allowing safer and more stable operation of scooters or bikes. Inspired by the osprey bird's strong landing mechanism, this system integrates automated balancing supports (referred to as "wings") that deploy at low speeds, offering improved safety, comfort, and independence.

III. SYSTEM DESCRIPTION

The **Osprey Docking System** is an innovative balance-assist mechanism integrated into scooters, specifically designed to aid **physically challenged individuals** who face difficulty in maintaining balance at low speeds. The system draws inspiration from the osprey bird's precise and stable landing mechanics and incorporates both mechanical and electronic components to enhance rider safety and confidence.

IV. **Technical Specifications:**

Hardware:

Component Specifications

Support Rods Ms steel rod

Shock Absorbers Mini shock absorbers	
Microcontroller ARDUINO UNO R3	
Power Supply 12v dc power supply	
LCD Display 16 X 2 Display	
Wheels and Bearing 5 inch trier	
Hall Effect Sensors	MOC7811 Speed Sensor

Software:

Software Component Specifications

Integration Overview

Sensor to Microcontroller: Detects wheel rotation by sensing the interruption of an IR beam through a slotted disk.
Provides digital pulses corresponding to wheel rotation speed.

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WORKING PRINCIPLE

When the vehicle drops below a certain speed threshold (e.g., 20 km/h), the sensors send a signal to the Arduino. The Arduino activates the motor driver circuit, which extends the support rods ("wings") for stabilization. Shock absorbers cushion the deployment and ensure a smooth engagement. The system retracts the supports when speed increases beyond the threshold.

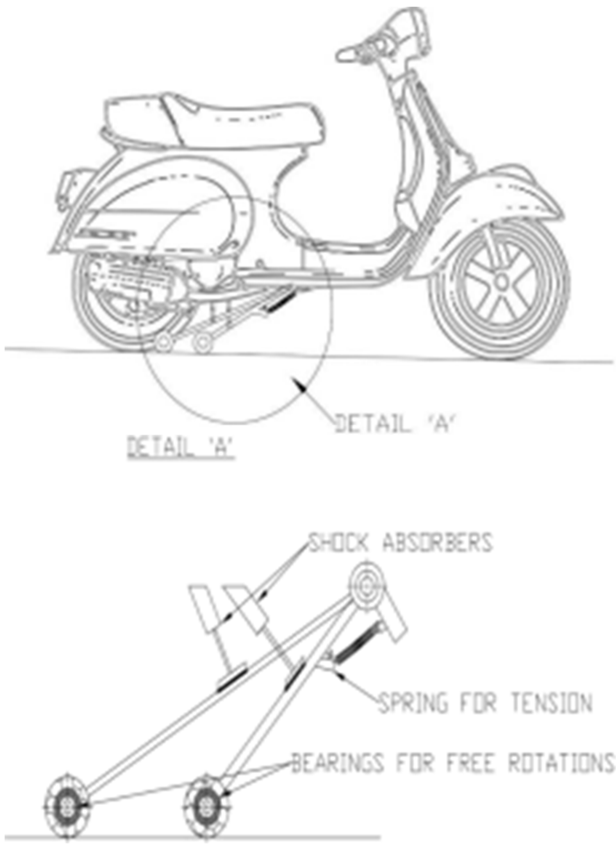
A manual override switch allows other users to ride the vehicle without interference from the system.
At vehicle speeds below 25 km/h, the speed sensor sends a signal to the Arduino. The microcontroller processes this input and activates the motor driver, which powers the DC motor. The motor deploys the support rods, stabilizing the scooter. As the speed increases beyond the threshold, the support rods retract automatically. In emergency scenarios, deployment happens in under 1 second, reducing the risk of tipping or falling**.** A working electric circuit requires a closed loop of electricity flow, including a power source, conductors (like wires), and a load (like a light bulb). Electrons move through the circuit, starting from the power source, traveling through the conductors, and then to the load where they do work, finally returning to the power source.

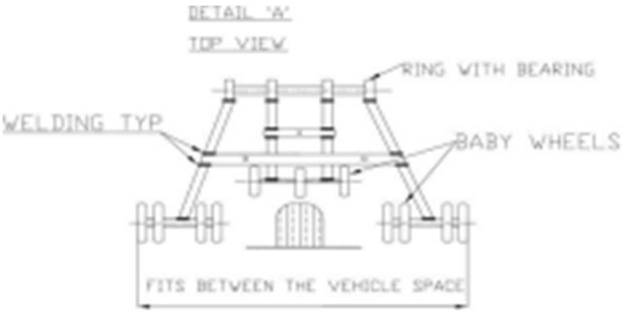
· It serves as a visual tool for the design, construction, and maintenance of electrical and electronic equipment. By utilising either images of distinct
components or standard symbols, a circuit diagram presents a simplified depiction of the circuit's elements and their interconnections. Tuning Suspension
Components: Adjusting spring rates, shock absorber damping, and other suspension parameters can help find the right balance between comfort and handling.

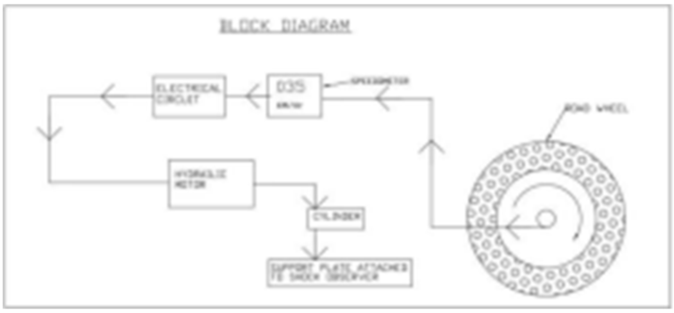
· Wheel Alignment: Correct wheel alignment (camber, toe, and caster) ensures that the wheels are properly aligned, and that the suspension is working optimally.

· Tire Pressure and Size: Proper tire pressure and size can also impact suspension
performance.

DESDIAGRAM







Mechanical Components

- Support Rods – Provides balance at low speeds.
- Hydraulic and Spring Shock Absorbers – Ensures stability on uneven roads.
- Frame Structure – Lightweight and durable, supports the docking system.

Electrical & Electronic Components

- 12V DC Motor – Controls the movement of the support mechanism.
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PROGRAMMEE IN ARDUINO IDE

```
#include <LiquidCrystal_I2C.h> // Include the LCD library

// Motor control pins
const int motorPin3 = 5; // Motor control pin 1 (direction)
const int motorPin4 = 6; // Motor control pin 2 (direction)
const int motorPWM = 7; // PWM pin to control motor
speed

// Speed sensor pin
const int sensorPin = 2; // Speed sensor input pin

// LCD setup (address 0x27, 16 columns and 2
rows) LiquidCrystal_I2C lcd(0x27, 16, 2);

// Variables for speed measurement
volatile int pulseCount = 0; // To count pulses from the
speed  sensor
unsigned long lastTime = 0; // To calculate the
speed float wheelSpeed = 0.0; // Wheel speed in
RPM

void setup() {
  // Initialize motor control pins as output
  pinMode(motorPin3, OUTPUT);
  pinMode(motorPin4, OUTPUT);
  pinMode(motorPWM, OUTPUT);

  // Initialize the speed sensor pin as input
  pinMode(sensorPin, INPUT);

  // Attach interrupt to the sensor pin to count pulses
attachInterrupt(digitalPinToInterrupt(sensorPin),
countPulses,  RISING);

  // Initialize LCD
  lcd.begin(16, 2);
  lcd.print("Speed Measurement");

  // Start serial monitor for debugging
  Serial.begin(9600);
}

void loop() {
  // Update speed every second
  if (millis() - lastTime >= 1000) {
    // Calculate wheel speed in RPM (revolutions per minute)
wheelSpeed = (pulseCount / 2.0) * 60.0; // Assuming 2
pulses  per full revolution
    pulseCount = 0; // Reset pulse count for next
    interval lastTime = millis();

    // Display speed on the LCD
    lcd.clear();
    lcd.setCursor(0, 0);

   lcd.print("Wheel Speed: ");
   lcd.setCursor(0, 1);
   lcd.print(wheelSpeed);
   lcd.print(" RPM");

   // Control motor speed based on measured
   speed if (wheelSpeed <= 0.0) {
    // If wheel speed is too low, speed up the motor
    analogWrite(motorPWM, 255); // Full speed
```

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```
  digitalWrite(motorPin3, LOW); // Forward
 direction digitalWrite(motorPin4, LOW); // Forward
 direction }
 else if (wheelSpeed < 150.0) {
  // If wheel speed is too high, slow down the
  motor analogWrite(motorPWM, 255); // Half
  speed
  digitalWrite(motorPin3, HIGH); // Reverse
  direction digitalWrite(motorPin4, LOW); //
  Reverse direction

 }
 else if (wheelSpeed > 200.0) {
  // If wheel speed is too high, slow down the
  motor analogWrite(motorPWM, 255); // Half
  speed
  digitalWrite(motorPin3, LOW); // Reverse
 direction digitalWrite(motorPin4, HIGH); //
 Reverse direction }
 else {
  // Maintain medium speed
  analogWrite(motorPWM, 200); // Medium speed
 digitalWrite(motorPin3, HIGH); // Forward
 direction digitalWrite(motorPin4, LOW); //
 Forward direction }
 }
}

// Interrupt function to count pulses from the speed
sensor void countPulses() {
 pulseCount++; // Increment pulse count whenever the
sensor detects a pulse
}
```

CONCLUSION

The system proves to be a practical and innovative mobility solution that enhances independence and safety for physically challenged individuals.

- Automation improvements using advanced sensors for real-time balancing.
- Wireless control options for easier handling.
- Expansion of the system to different types of vehicles, including electric scooters and bicycles.

In conclusion, the project not only demonstrates effective problem-solving but also showcases how engineering can be harnessed for inclusive innovation. The system stands as a testament to how thoughtful design and technology can contribute meaningfully to social welfare

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