



HYBRID BICYCLE WITH PEDAL ASSISTED SENSOR

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ABSTRACT :

A Hybrid cycle, called a bike or cycle, is a human-powered, electric motor-operated, pedal-driven, single-track vehicle, having 2 wheels attached to a frame. An electric bicycle uses an electric motor to move. On this bicycle, people do not have to use their muscular force to move. It uses electrical energy for motion. They are also known as e-bikes. There are many varieties of electric bicycles. Some of these bikes have a rechargeable battery. They make use of stored electrical energy in some other form. Due to this form of energy, the bikes have more power and speed. These bikes are more convenient than regular ones. An electric bicycle, or e-bike, operates by integrating an electric motor into its design. This motor is powered by a rechargeable battery, typically mounted on the frame. Riders can activate the motor to assist their pedalling effort, providing an extra boost of speed and making cycling easier, especially uphill or over longer distances

INTRODUCTION

A hybrid cycle is also called as 2-wheeler bicycle and sometimes referred as “pedal bike”, “pedal cycle”, or is human powered electric powered, pedal driven, motor driven vehicle having a 2-wheel attached to frame.

Touring hybrid cycles are constructed specifically for the personal ownership market and are built to be lighter and faster than normal bicycle. They can have given them remarkable hill climbing capabilities. They are used for short distance travel as well as local use some are used for cycle commuting to work. Compared to touring on bicycles, touring hybrid cycles are more comfortable to ride, can navigate steeper hills more easily, deal with crosswinds better, and can carry a much heavier load than a bicycle.

An hybrid bicycle is an electric and pedal assisted bicycle, which is one of the fastest-growing technologies in the bicycle industry. This bicycle uses an electric motor to help you along. So you can ride it like a normal bicycle, but with less effort.

Pedal assist is a mode on your electric bike that provides power from the motor to help you pedal easier and move faster. When you turn on pedal assist and choose your level of assist, the motor will provide a certain level of power output as you pedal.

METHODS AND MATERIAL

Methods:

1. Hybrid cycles is a combine two forms of power: human-generated, in the form of pedaling, and a second, non-human energy-generator using electric motor.
2. Torque pedal-assist sensors measure how hard you pedal to determine how much electric power to supply. In effect, the harder you pedal, the more power the motor delivers. If you pedal softer, the motor provides less power.
3. When power supply is given to electric motor, the PAS sensor senses the load applied on the pedal and according to load applied on pedal the power supply is given to the motor.
4. All these functions are done with the help of controller
5. In case of less power supply, we can use pedal for riding the bike

Materials:

1. Electric motor
2. Controller
3. battery
4. Sprocket wheel
5. Chain & chain wheel
6. Suspension system
7. Braking system
8. Pedal assist sensor.

BASIC COMPONENTS**• Main components****1. Bicycle Frame**

- **Purpose:** Acts as the base structure to support all components.
- **Material:** Typically made from lightweight yet strong materials like aluminium, carbon fiber, or steel.

2. Pedal-Assisted Sensor

- **Types:**
 - **Torque Sensor:** Measures the force applied to the pedals.
 - **Cadence Sensor:** Monitors the pedalling speed (rotations per minute).
 - **Combined Sensors:** Incorporates both torque and cadence measurements for more precise control.
- **Function:** Detects pedalling effort and sends signals to the controller to adjust motor assistance accordingly.

3. Electric Motor

- **Purpose:** Provides propulsion assistance.
- **Types:**
 - **Hub Motor:** Installed on the front or rear wheel hub.
 - **Mid-Drive Motor:** Located near the pedal crank for better weight distribution and efficiency.
- **Power Rating:** Commonly between 250W and 750W, depending on the bicycle's purpose and regulations.

4. Controller

- **Purpose:** Acts as the brain of the system.
- **Function:**
 - Processes signals from the pedal-assist sensor.
 - Controls the power supplied to the motor based on pedalling effort and speed.
 - Ensures smooth transitions between pedalling and motor assistance.

5. Drivetrain

- **Purpose:** Transfers pedalling power to the wheels.
- **Components:**
 - Chain drive.
 - Gears: Multi-speed options to adjust to terrain and rider effort.

ADVANTAGES

Here are some of the key benefits of a research report on:

Assisted Pedalling: E-bikes provide pedal assistance, making it easier for riders to pedal and travel longer distances without as much effort. This feature particularly benefits individuals with limited physical fitness or those looking for a more relaxed ride.

Increased Range: The electric motor on e-bikes extends the range of travel compared to traditional bicycles. Riders can cover greater distances and tackle hills and challenging terrain more easily, which is especially useful for commuting or recreational purposes.

Eco-Friendly: E-bikes are considered environmentally friendly since they emit fewer pollutants than traditional vehicles. They can contribute to reducing air pollution and greenhouse gas emissions, particularly when used as an alternative to cars for short-distance commuting.

Health Benefits: While e-bikes provide electric assistance, riders still engage in physical activity by pedalling. This can contribute to improved cardiovascular health, increased physical fitness, and overall well-being. It also encourages individuals who might otherwise be deterred by the physical demands of cycling to take up the activity.

FUTURE SCOPE

1. Growing Demand for Eco-friendly Transport: With increasing awareness about environmental sustainability, hybrid bicycles, especially those with pedal assist sensors, provide a green alternative to conventional vehicles. The use of e-bikes is expected to rise, particularly in urban areas for commuting.

2. Smart Connectivity: Hybrid bicycles are increasingly integrating IoT technologies. This opens opportunities for real-time data sharing, enhanced safety features, and ride optimization. The pedal assist sensor can be integrated with mobile apps to track fitness goals, energy savings, and performance analytics.

3. Urban Mobility Solutions: As cities push for more bicycle-friendly infrastructure, hybrid bicycles with PAS can become a critical element of urban transportation, offering a viable solution for reducing traffic congestion.

4. Health and Fitness: Pedal assist systems enable more people, including seniors or those with physical limitations, to engage in cycling as a fitness activity. This could lead to expanded use cases, including cycling for rehabilitation.

APPLICATIONS

1) 1. Urban Transportation

- **Purpose:** Serves as an alternative to motor vehicles for daily commuting in cities.
- **Benefits:**
 - Reduces traffic congestion.
 - Provides an economical and eco-friendly mode of transport.
 - Assists riders in tackling hilly terrains or long distances with less physical exertion.

2. Delivery Services

- **Purpose:** Used for delivering goods, particularly in urban areas.
- **Benefits:**
 - Reduces delivery costs compared to fuel-powered vehicles.
 - Enhances delivery efficiency in congested or narrow streets.
 - Supports sustainability goals for eco-conscious businesses.

3. Environmental Sustainability Initiatives

- **Purpose:** Promotes green energy solutions and reduces carbon emissions.
- **Benefits:**
 - Encourages adoption of sustainable transportation in urban planning.
 - Helps individuals and organizations meet environmental targets.

4. Educational and Awareness Programs

- **Purpose:** Used in schools, colleges, and community programs to promote green mobility.
- **Benefits:**
 - Educates communities on sustainable practices.
 - Provides hands-on learning for students interested in renewable energy and smart transportation technologies.

RESULTS

1. The hybrid bicycle with a pedal-assist sensor (PAS) system demonstrated significant improvements in rider efficiency, comfort, and overall performance. This project successfully achieved its objective of creating a sustainable and user-friendly transport option, combining manual pedalling with electric motor assistance.

2. The pedal-assist system allowed riders to maintain consistent speeds with reduced effort, particularly on uphill terrain or during long-distance commutes. By detecting the pedalling motion and cadence, the PAS system effectively controlled the motor to provide proportional assistance based on the rider's input. In trials, riders experienced less fatigue, enabling longer rides without excessive strain.

3. The electric motor, powered by a rechargeable battery, provided seamless transitions between manual pedaling and motor assistance. Depending on the assist level selected, riders could conserve battery life during flat terrain while increasing motor power on inclines or when extra speed was needed. The system was designed to automatically shut off motor assistance when the rider stopped pedaling or reached the maximum assist speed, ensuring safety and efficiency.

CONCLUSION

The primary goal of our project is to decrease pollution. The Hybrid bicycle continues to play an important role in the lives of Indian. Today in the Indian automobile sector is spread over the wide ranges. So use of the hybrid bicycle will reduce the use of vehicles up to some extent.

The secondary goal of our project is to make modern HYBRID bicycle having more speed than the regular bicycle, it they will play greater role on daily lives in future.

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