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Automotive Speed Breaker & Energy System

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Abstract —

This study introduces the design and development of a multi-functional energy-harvesting system combined with an automotive rotating speed breaker. The system includes a solar tracking panel and roadside vertical axis wind turbines to optimize renewable energy harvesting. As cars drive over the spinning speed breaker, mechanical energy is transformed into electrical energy. This hybrid solution is intended for powering streetlights on nearby streets, traffic signals, or charging storage systems. The solution mirrors sustainable engineering practice for urban energy demand and traffic management

.***Keywords*** — Energy harvesting, spinning speed breaker, solar tracker, wind turbine, sustainable traffic systems, smart roads, renewable energy integration..

A. Introduction:

As the need for sustainable infrastructure and renewable energy increases, novel technologies that harness mechanical power and convert it into electrical energy are becoming increasingly sought after. One such idea is the Automotive Rotating Speed Breaker with Energy Harvesting System, which employs solar tracking panels and wind turbines to derive power from day-to-day vehicular movement.

This system is to be installed on roads in the form of a rotating speed breaker that absorbs the kinetic energy of moving vehicles. When the vehicles move over, the rotation mechanism converts this mechanical energy into electrical energy. In parallel, solar panels

with tracking systems are always aligned with the sun to collect maximum solar energy during the day, and wind turbines use the wind produced by moving vehicles or natural wind flow.

B. Literature Review:

Recent studies support the feasibility of energy harvesting from road infrastructure using mechanical and renewable systems. Research has shown success in generating electricity from rotational speed breakers, solar tracking systems, and wind turbines placed strategically on roadsides. Integration of these methods is rarely explored together, making this project a novel hybrid approach.

C. System Architecture/Methodology:

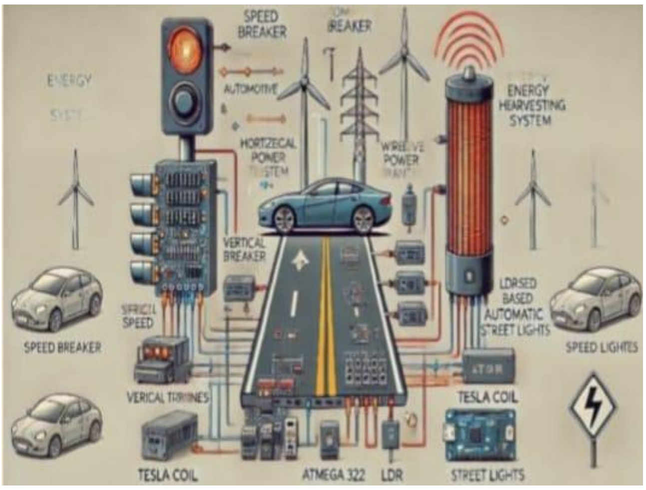
Rotating Speed Breaker: Transforms vehicle-caused rotation into electricity through a gear and dynamo system.

Solar Tracking Panel: Dual-axis solar panel that follows sun using LDR sensors and servo motors.

Roadside Turbines: Vertical axis turbines turn due to wind caused by passing cars, powering mini-generators.

Power Management Unit: Powers all sources and stored in a battery or capacitor array.

- Automotive Speed Breaker
- Solar Tracker
- Road Side Turbines
- Tesla Coil



Credits: Automotive Speed Breaker & Energy System

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D. Implementation:

The spinning drum inside the speed breaker is connected to a DC generator.

Solar tracker positions the panel based on instant light feedback.

Wind turbines supported on poles adjacent to traffic lanes capture airflow.

Energy output is rectified, controlled, and stored or used for powering surrounding systems (streetlights, cameras, etc.).

The "Automotive Rotating Speed Breaker with Energy Harvesting System using Solar Tracker and Wind Turbine" project is executed step by step by combining mechanical and renewable energy technologies. Mechanical design, energy conversion, and power management systems are involved in the process to generate and use electricity efficiently in rural and government settings.

E.Features:

1. Rotating Speed Breaker Mechanism:
Transfers the kinetic energy of oncoming vehicles into mechanical rotation.

Provides electricity as vehicles move over without interrupting traffic flow.

2. Energy Harvesting using Wind Turbine:

Miniature wind turbines harness the wind caused by oncoming vehicles or natural wind current.

Provides an extra level of power generation, particularly in highways and windy regions.

3. Solar Tracker System:

Automatic tracking solar panels optimize sunlight collection during the day.

Increases energy output over fixed solar panels.

F.Components:

1. Brushless Motor - 3 qty (Wind turbine)

2. LED for street light

3.Servo Motors

The SG90 is a lightweight, low-cost servo motor widely used in robotics and DIY electronics for precise angular movements. It is ideal for small-scale projects due to its compact size and reliable performance. In this robotic dog project, the SG90 is used to control the head movement, allowing it to tilt up and down within a specified angle range.

4. Arduino Atmega 328 Microcontrooler

ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno, Arduino Pro Mini and Arduino Nano models.

5.Speed breaker motor 12V DC

12V DC motors have a versatile role, powering a variety of applications from household appliances to renewable energy systems

6.IR Sensor

7.LDR sensor

LDR is an acronym for Light Dependent Resistor. LDRs are tiny light-sensing devices also known as photoresistors. An LDR is a resistor whose resistance changes as the amount of light falling on it changes. The resistance of the LDR decreases with an increase in light intensity, and vice-versa.

8. Solar

Nominal Capacity: 150Ah at a 10-hour rate to EOD of 1.8V per cell at 25°C. Maximum Discharge Current: 1500A (5 sec) Recommended Max Charging Current: 45A. End of discharge voltage: Varies from 10.5V to 10.8V

9.Tesla Coil

Tesla coil is a transformer (resonant transformer) that operates on the principle of resonance.

G. Conclusion and Future Scope:

This system proves a viable means of renewable energy harvesting in cities. It presents a low-maintenance, environmentally friendly power source utilizing existing vehicular traffic. Future research can incorporate IoT-based monitoring, real-time analysis, and grid integration for smart city use.

- Improved Mobility – All-terrain movements using motors, sensors, and adaptive navigation for rough terrains.
- AI & Autonomous Navigation – Machine learning for threat detection and intelligent decision-making.
- Secure & Long-Range Communication

H.Acknowledgement

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