

- Hassan Sahaf-EE
- Mustafa Obaidan-EE
- Ahmed Almousa-ME
- Ali Tuwailib-ME
- Ali Ibrahim-ICS
- Abdurahman Bahareth-ICS

Road Power Generation

Smart Speed Bump System with Integrated Energy Harvesting and Data Analytics



We extend our heartfelt thanks to Dr. Usman for their dedicated guidance and support, and to Team Design for fostering a nurturing academic environment that allowed us to thrive and explore our interests.

01. Introduction

This project explores the innovative approach of road power generation to convert the kinetic energy of moving vehicles into electrical power. By integrating mechanisms like the speed bump into road infrastructure, the generated electricity will illuminate streets and homes, with surplus stored for future use. Automated operations are managed by a microcontroller system and can be monitored online.

02. Problem Statement

Municipalities, renewable energy companies are increasingly challenged by the need for sustainable and environmentally friendly energy solutions. Road power generation provides an innovative solution by harnessing the kinetic energy from vehicles on roads. This method can potentially convert 10-15% of vehicular kinetic energy into electricity, offering a continuous and dependable power source that significantly reduces reliance on fossil fuels and enhances sustainability.

03. Specifications and Constraints



- 1-EFFICIENCY:** 100 w per hour
- 2-LOAD CAPACITY:** 20 kg of weight.
- 3-Cost:** 6000 SAR.
- 4-LEDS CONTROL:** minimum 2 LEDES
- 5-SIZE OF THE ROAD:** 1m × 80 cm

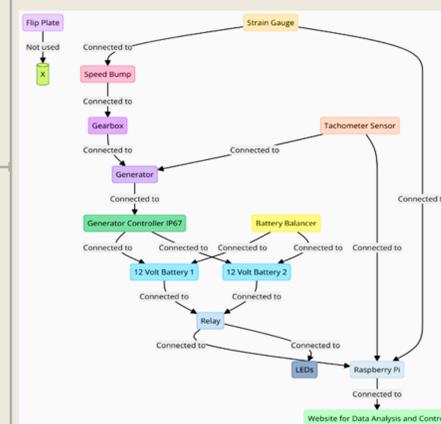


- 1-MAINTENANCE**
- 2-TRAFFIC INTERRUPTIONS**
- 3-SPACE LIMITATIONS**
- 4-WEATHER CONDITIONS**
- 5-TECHNOLOGICAL CONSTRAINTS**

04. Project Impact

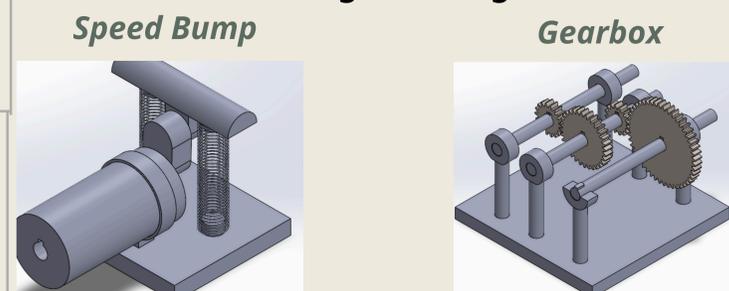
- 1-Addressing Commercial Opportunities:** generates electricity from road traffic, tapping into the demand for renewable energy with strong commercial potential.
- 2-Health and Safety:** The energy-harvesting speed bumps are safe for all types of transport and promote public health by reducing greenhouse gas emissions.

05. System Diagram



The project system includes a speed bump and gearbox that convert linear motion into rotational motion. It features a distribution circuit to channel electricity from the speed bump, and a Raspberry Pi-controlled website for system management, complemented by sensors for data analysis.

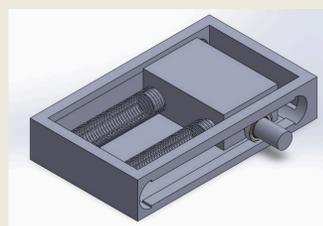
06. Mechanical Engineering



Innovative design calms traffic while capturing kinetic energy. Depresses under vehicle weight, harnessing motion for power generation.

Essential for energy generation system, increases rotational speed from speed bump. 1:14 gear ratio optimizes power output.

Flip Plate(Future Work)



This mechanism will be implemented inside the road. By using the fractional force between the tiers of the cars and the moving plate a liner motion will be generated. There are springs to control the motion.

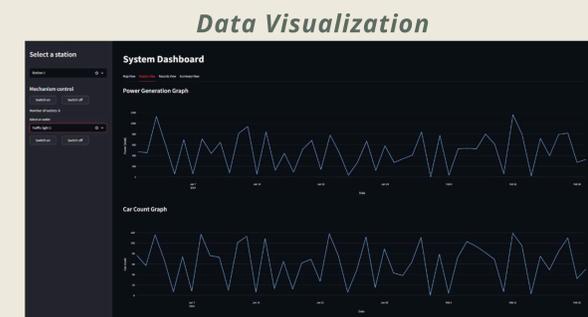
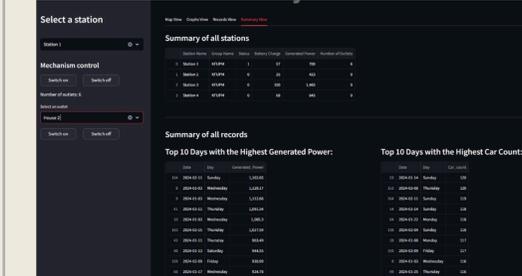
07. Electrical Engineering

Distribution Circuit

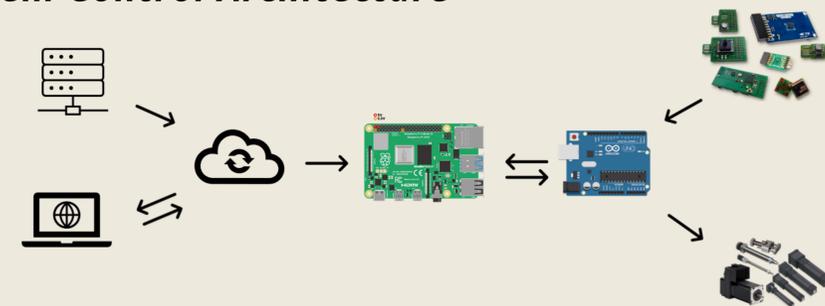


Electricity generated by a speed bump and gearbox setup is initially produced in three phases. This is then converted to a single phase using a charge controller and evenly distributed via a battery balancer. Additionally, the load is placed on one battery, prompting the battery balancer to transfer electricity from the storage battery to the consumption battery.

08. Computer Science



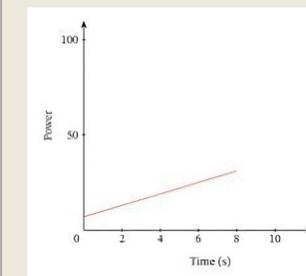
09. System Control Architecture



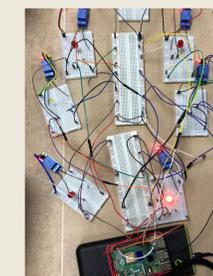
10. Conclusion

Road power generation offers a promising way to harness renewable energy, transforming infrastructure into a sustainable energy source. This innovative approach not only generates clean electricity but also enhances infrastructure efficiency, driving us towards a greener, more resilient future.

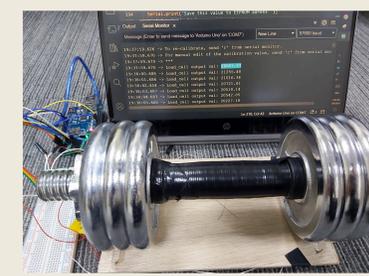
11. Validation and Test



EFFICIENCY



LEDS CONTROL



LOAD CAPACITY