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Design and Development of Speed Breaker Detection and Automatic Speed Control System in 4-Wheeler

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Abstract: *This paper is related to design and development of speed breaker detection and automatic speed control system in Wheeler. India has a large network of road throughout the country. India faces the highest number of accidents and accidental fatalities in the world. To prevent the accidents caused due to over speeding of vehicles, speed breakers are used. But, the accidents are caused due to both presence and absence of speed breakers. The traffic related accidents can have dire consequences. Traffic safety solutions of today forces heavy vehicles to slow down more than necessary. Smart Speed Breaker is a traffic safety system where speeding vehicles activate the speed breaker and raises the speed bumps above the road surface and giving the physical remainder to driver to slow down the vehicle. If the speed of the on-going vehicles is within the permissible limit then the speed bumps stay flat on road surface and vehicles passes over it comfortably. It's modern way to keep control on speeding vehicles only and un-affect the legal speed vehicles. Further modification can be also done for emergency vehicles accessibility.*

Keywords: Speed Breaker Detection, Automatic Speed Control, Accident, Traffic

I. INTRODUCTION

The speed breaker detection and automatic speed control system in 4-wheelers is a crucial development in enhancing road safety and vehicle performance. This innovative system aims to detect the presence of speed breakers on the road using advanced sensors and then automatically adjust the vehicle's speed to ensure a smooth and safe passage over the obstacle.[1] The system comprises various components such as sensors, microcontrollers, actuators, and a control unit. The sensors are responsible for detecting the speed breakers on the road, while the microcontrollers process this information and send signals to the actuators to adjust the vehicle's speed. The control unit acts as the central processing unit to coordinate the entire system's operation.[2]

Detection Mechanism

The speed breaker detection mechanism relies on the use of advanced proximity sensors that can accurately identify the presence of speed breakers in real time. These sensors are strategically placed on the vehicle's chassis to ensure comprehensive coverage of the road ahead.[3]

Automatic Speed Control

Upon detection of a speed breaker, the system automatically regulates the vehicle's speed by communicating with the engine control unit. This control mechanism ensures a smooth transition over the speed breaker, minimizing discomfort for the passengers and reducing wear and tear on the vehicle.[4]

Benefits

The integration of this system in 4-wheelers offers numerous benefits, including enhanced safety by preventing accidents caused by abrupt speed breaker encounters. It also contributes to improved vehicle efficiency and reduced maintenance costs by mitigating the effects of sudden shocks on the vehicle.

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II. METHODOLOGY

The development of the speed breaker detection and automatic speed control system in 4-wheelers involves a comprehensive methodology that encompasses the design, implementation, and testing phases.

1. Design Phase:

In the design phase, extensive research and analysis are conducted to determine the most effective sensor placement on the vehicle's chassis for optimal speed breaker detection. The selection of appropriate microcontrollers and actuators is also a crucial aspect of the design phase to ensure seamless integration and efficient operation of the system.

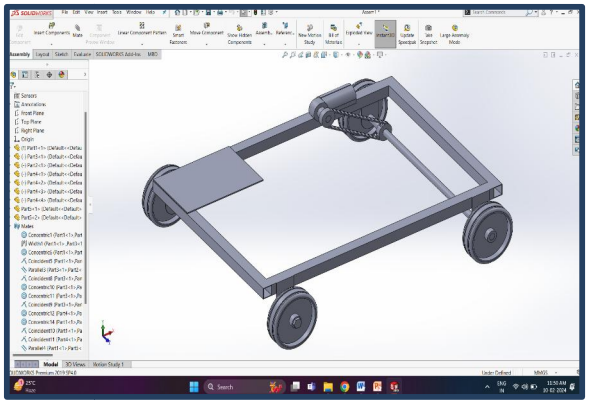

Figure 1. Chassis Design of Vehicle.

2. Implementation Phase:

During the implementation phase, the selected components are integrated into the vehicle's existing framework while adhering to strict safety and performance standards. The communication protocols between the sensors, microcontrollers, actuators, and the control unit are established to enable seamless data transfer and real-time speed adjustments.

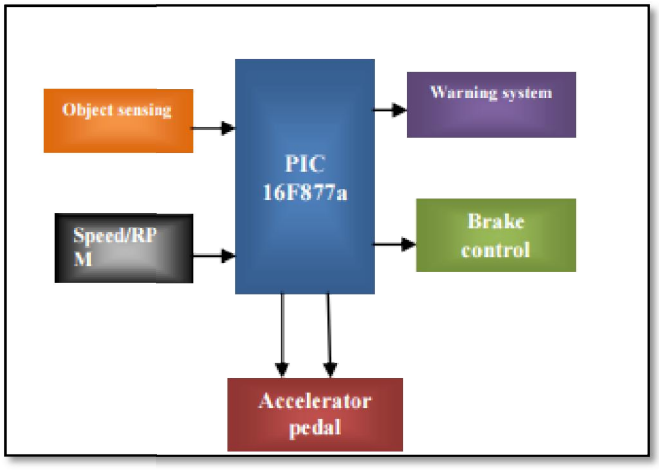

Figure 2. Control System of Vehicle.

3. Testing Phase:

Once the system is integrated, rigorous testing is conducted under various road conditions to validate its effectiveness and reliability. Real-world scenarios, including different speed breaker profiles and varying vehicle speeds, are simulated to assess the system's responsiveness and accuracy in speed control.The development of this innovative

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system involves interdisciplinary collaboration between mechanical, electrical, and software engineering professionals to ensure a holistic and robust solution for enhancing road safety and vehicle performance.

III. AIM AND OBJECTIVE OF PROJECT

3.1 Aim:

The goal of creating and developing a speed breaker detection and automatic speed control system for four-wheeler vehicles is to improve road safety and reduce speed-related accidents. And detect the object and stop the vehicle.

3.2 Objectives:

Design and Development of Speed Breaker Detection& Automatic Speed Control System in 4 Wheeler.
Manufacturing of prototype model that explain exact idea of Speed Breaker Detection& Automatic Speed Control System.

IV. RESULTS AND DISCUSSION

The results of the development and testing of the speed breaker detection and automatic speed control system have shown promising outcomes. The comprehensive methodology employed in the design, implementation, and testing phases has led to the successful integration of the system into the 4-wheeler.

4.1 System Integration and Performance

Through meticulous design and implementation, the system components have been seamlessly integrated into the vehicle's framework, ensuring compatibility with existing systems while meeting safety and performance standards. The precise placement of proximity sensors on the chassis has facilitated accurate detection of speed breakers, enabling the automatic speed control mechanism to function effectively.

4.2 Real-world Testing

Rigorous testing under various road conditions has demonstrated the system's responsiveness and reliability in real-world scenarios. Different speed breaker profiles and varying vehicle speeds have been simulated, validating the system's ability to adjust the vehicle's speed in real time, ensuring a smooth and safe passage over obstacles.

4.3 Interdisciplinary Collaboration

The successful development of this innovative system has been made possible through close collaboration between mechanical, electrical, and software engineering professionals. This interdisciplinary approach has ensured a holistic and robust solution that addresses the complexities of road safety and vehicle performance.
The next phase of this project will involve further refinement of the system based on the testing outcomes and feedback from experts in the field. Additionally, the integration of advanced machine learning algorithms for predictive speed control based on road conditions and terrain will be explored to enhance the system's capabilities even further.

V. CONCLUSION

The development of speed breaker detection and an automatic speed control system signifies a significant leap forward in vehicle safety and comfort. Its potential to reduce accidents and enhance the overall road travel experience makes it a pivotal innovation in the automotive industry.

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