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Shock Absorber Test Rig Integrated with Mechatronics System

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ABSTRACT: Shock absorber is an example of under damped vibration system is the key element in the suspension of any automobile vehicle which aim to absorb the maximum amount of kinetic energy and sometimes potential energy. For the measurement of transmissibility of the shock absorber a test rig is design and developed an experiment on the test rig is carried out at different speeds and loads and tested with the help of data acquisition system and graph are plotted.

These graphs are used to find Transmissibility at different load and speed combinations. The results obtained are used to find out behaviour of Transmissibility at different speed and load.

I. INTRODUCTION

The design and development of an ESP8266-based tachometer, incorporating an IR sensor and load cell integration for a shock absorber test rig, represents a significant advancement in the field of suspension system evaluation. This innovative project aims to enhance the precision and depth of data acquisition during shock absorber testing.

The integration of an IR sensor enables accurate measurement of rotational speed, offering insights into the dynamic performance of the shock absorber. Additionally, the incorporation of load cell technology allows for the quantification of the forces experienced during shock absorption, providing a comprehensive understanding of the load-bearing capacity. The utilization of the ESP8266 ensures real-time data acquisition and wireless transmission capabilities, allowing engineers and researchers to monitor and analyse critical parameters efficiently.

This project not only addresses the limitations of traditional testing methodologies but also paves the way for more sophisticated and insightful approaches to optimize shock absorber design and vehicle dynamics.

As we delve into the intricacies of this development, subsequent sections will explore the hardware components, software implementation, and the overarching goal of advancing the capabilities of shock absorber testing through state-of-the-art technology integration.

II. LITERATURE REVIEW

➤ Paper 1: -

Shock absorber device is generally used in all automobiles. It is an example of under damped vibration system which absorbs maximum amount of kinetic energy and sometimes potential energy. Main purpose of our research is to measure transmissibility of shock absorber and to analyse it for different loads and speeds. Effectiveness of the vibration absorber can be measured by transmissibility. And for measurement of transmissibility shock absorber test rig is designed and developed. an experiment on test rig is carried out at various loads and speeds which results to output in the form of sinusoidal waveform on paper by using stylus. The waveform is used to find out the transmissibility at various load-speed combinations. It gives the behaviour of shock absorber at various speeds and loads.

➤ Paper 2: -

The automotive suspension plays a crucial role in vehicle safety and driving comfort. One of the most important components in vehicle suspensions is the damper (or shock absorber). Because there is no precise method to perform shock absorber test within the vehicle, an embedded autonomous system, powered by the energy harvested from the shock absorber itself, capable of monitoring shock absorber parameters and transmitting these values throughout a wireless interface to the vehicle central diagnostic unit, is presented. Such a device will permit the shock absorber condition assessment under vehicle operation, which to our best knowledge is considered a breakthrough in vehicle safety.

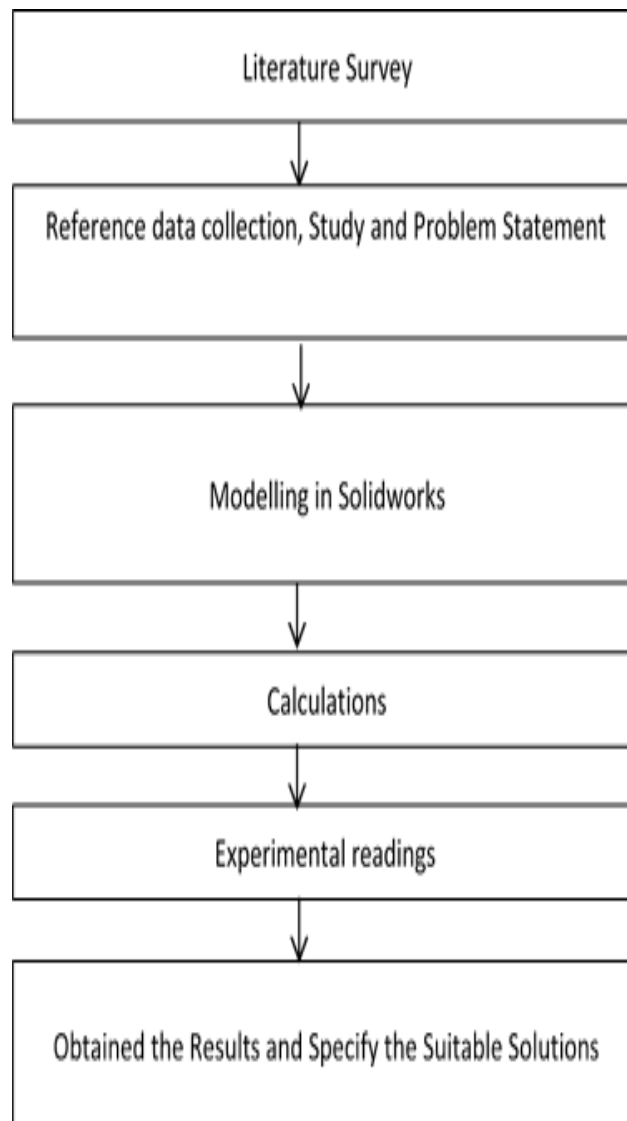
➤ Paper 3: -

To achieve an effective monitoring of shock absorbers (or dampers), a concept study of an embedded sensing device, capable of measuring, under vehicle operation, the condition of the automotive dampers is presented. The results show that a monitoring device embedded in a damper body is capable of continuously determining shock absorber status, enabling real time diagnosis thus increasing overall safety.

➤ Paper 4: -

Shock absorber is very important term in automobile industries. They are used for the driving comfort and driving safety. This paper presents performance characteristics of the shock absorbers under real conditions. Dynamic behaviors of the absorber are studied by computer simulation and experimental testing and are validated with MATLAB results. The road disturbance is generated in the model by giving speed brakes fixed on drum which is rotated by using motor. In this paper study and analysis of single DOF spring-mass-damper system (Hero Splendor Rear Shock Absorber) and plotted its dynamic characteristics curve for different values of spring stiffness for different oils

III. METHODOLOGY



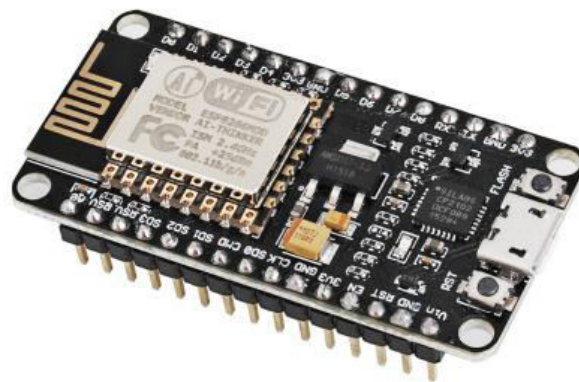
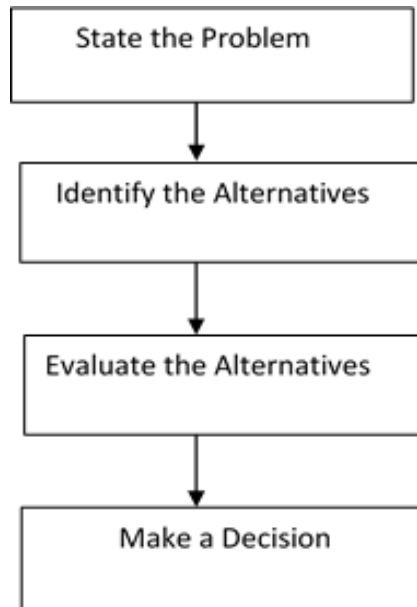


Fig 1: - ESP8266 IOT Module

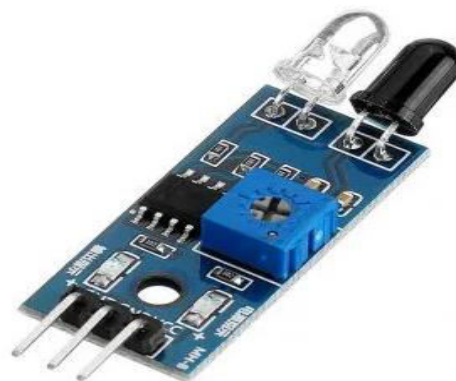


Fig 2: - IR Sensor for RPM OR Hall sensor

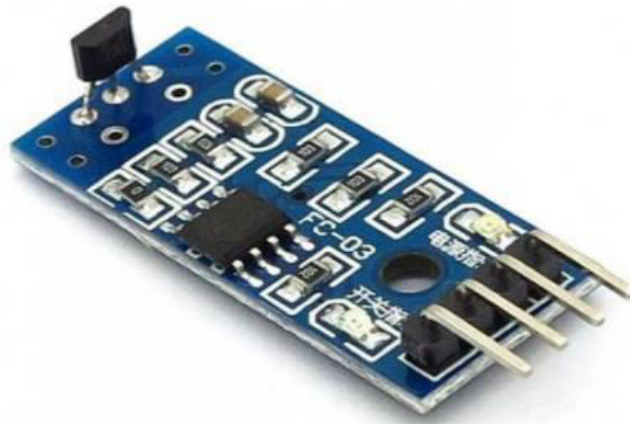


Fig 3: - Hall Sensor

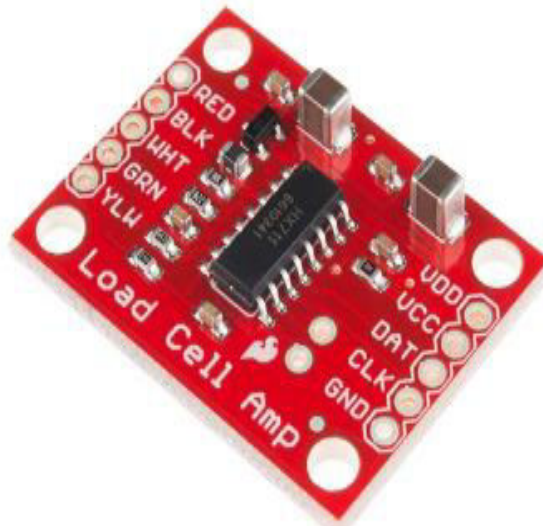


Fig 4: - Load cell
Load Cell Amplifier – HX711

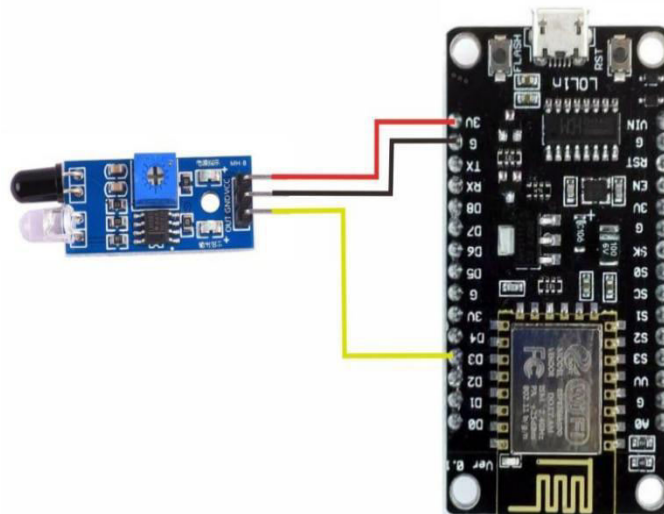


Fig 5: - Integration of IR sensor and ESP 8266

IV. MODEL

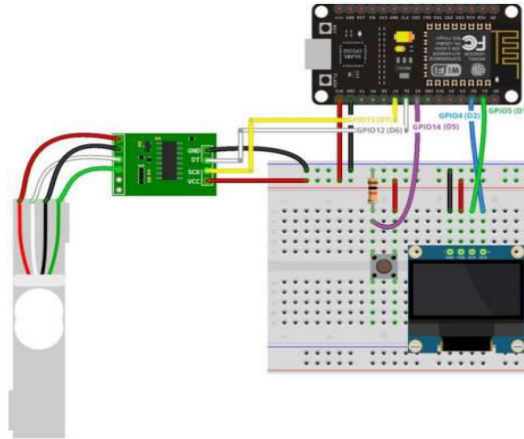


Fig 6: - Pin Connection for ESP to Amplifier

V. RESULT



Fig 7: - Experimental results

VI. CONCLUSION

1. It can be concluded that when speed increases at constant load, the transmissibility of the system goes on increasing. Practically it shows the increase in distinct manner while theoretically it shows very small increase.
2. it is clear that as load increases at constant speed, the transmissibility of the system goes on decreasing practically, there is increase in transmissibility calculated by theory but it is nearly negligible.

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