

LOAD BASED SPEED CONTROL AND OVERLOAD CONTROL SYSTEM FOR HEAVY VEHICLES

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ABSTRACT- The concept of reducing the maximum speed of the vehicle with respect to increase in load of the vehicle using mechatronics. The maximum speed of the vehicle reduces with the increase in the load. Thereby offering variable maximum speed for the variable load. The load of the vehicle can be diagnosed by using the stress strain relationship in the springs using load cell. The measured weight is used to determine the permissible speed of the vehicle for that particular load. It is use to indicate the overload of the vehicle beyond the safety limit. The misalignment of load in the four springs can be identified by load cell and it notify the driver during loading and driving mode thereby avoiding the felling of truck on one side.

Keywords: Overload, load cell, servo motor, throttle valve, Bluetooth module, maximum speed.

I. INTRODUCTION

Electronic speed governor is a device which maintains the speed of vehicle within the permissible speed approved for the specific vehicle. The speed governor controls the speed of the vehicle by controlling amount of fuel supplied to the engine. It constantly monitors the speed of the vehicle and if the vehicles exceeds the permissible speed, it reduces the amount of fuel supplied to the engine and maintains the speed. In an electronic speed governor, the speed of the vehicle is measured by a control system

The governor is the device and it is used to measure and control the speed of the machine. Speed Governor which is the speed limiting device whose function is to control the speed of the engine in order to control the vehicle speed to the designed value in the governing system [7]. The governor system is like a control system in the vehicle. It regulate the speed of the outdoor power products.

The speed controller are introduced to improve safety and by controlling the speed of vehicles and thus reducing accidents in the dangerous society. The primary function of the system is to control the speed of the vehicle by using the simple concept of enclosing the throttle valve of the engine which just like closing the tap to the container [6]. And the main disadvantage of this speed governor is that once the speed is installed the vehicle moves with the specified speed irrespective of their load on the vehicle.

And our idea is to overcome this disadvantages of speed governor is that speed will be maintained according to the load weighing on the vehicle, that is if the vehicle is loaded with the fewer amount of load the vehicle will move in the speed of the specified speed which is programmed on the system and the main advantages of this system is that if the vehicle is overloaded that is the vehicle is loaded beyond the specified load which is programmed as the overload system the vehicle will stopped immediately the display provide in the system shows the overload parameter, and it ensures the driver to alert that the vehicle is subjected to overload.

The throttle valve will closed with the help of the servo motor which act as the stop valve it will close the fuel way to the engine and within the fraction of second the vehicle will stopped. The important thing is that the control system does not depend on the loyal of the driver it will work according to the system specified value which is programmed in the control system.

II.OBJECTIVE

According to the National Highway Traffic department there were nearly 4000 fatalities and 10,000 individuals were injured as a result of heavy loaded vehicle every year. One of the reason for dangerous injury because of truck collisions of overloaded truck .The misalignment of load on one side truck is also a cause. The government cannot control the overloading of the vehicles which is impossible to do so. The solution fthis problem is installing the device which avoid accident though the vehicle is overloaded.

III.HARDWARE COMPONENTS

Load Cell: A load cell is a type of transducer, specifically a force transducer. It converts a force such as tension, compression, pressure, or torque into an electrical signal that can be measured and standardised. As the force applied to the load cell increases, the electrical signal changes pro- portionally. The most common types of load cells used are hydraulic, pneumatic, and strain gauge.



Fig 1: LOADCELL

HX711 ADC : HX711 is a 24 high precision A/D converter (Analog to digital converter). HX711 has two analog input channels and we can get gain up to128 by programming these channels. So HX711 module amplifies the low elec- tric output of Load cells and then this amplified & digitally converted signal is fed into the Arduino to derive the weight.

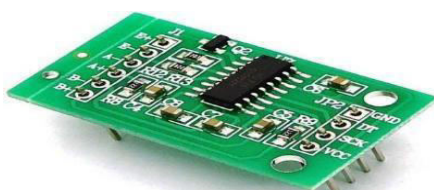


Fig 2:
HX711 ADC

Arduino Uno : The Arduino Uno is an open-source micro- controller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced with various expansion boards (shields) and other circuits. The board has 14 digi- tal I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Inte- grated Development Environment), via a type B USB cable It can be powered by the USB cable or by an external 9- volt battery, though it accepts voltages between 7 and 20 volts

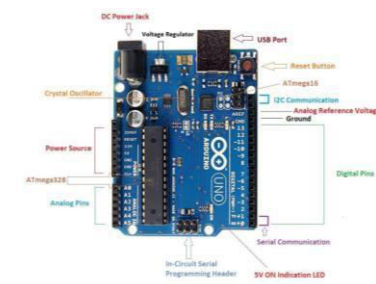


FIG3.Arduino UNO

DC MOTOR: A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. A DC motor's speed can be con- trolled over a wide range, using either a variable supply voltage or by changing the strength of the current in its field windings.



Fig 4: DC
Motor

Liquid Crystal Display : A liquid-crystal display (LCD) is a flat-panel display or another electronically modulated optical device that uses the light-modulating properties of liquid crystals. It consists of 16 input ,output pins.



Fig 5:LCD DISPLAY

BLUETOOTH MODULE: A Bluetooth Module is usually a hardware component that provides a wireless product to work with the computer; or in some cases, the Bluetooth may be an accessory or peripheral, or a wireless headphone. The Bluetooth technology manages the communication channel of the wireless part. The Bluetooth modules can transmit and receive the data wirelessly by using two devices. The Bluetooth module can receive and transmit the data from a host system with the help of the host controller interface.

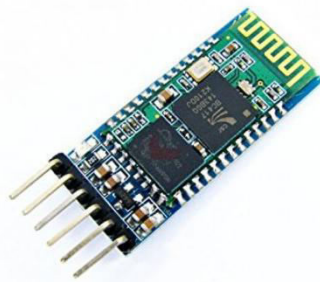


Fig 6: BLUETOOTH MODULE

SERVO MOTOR: A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motor to rotate with great precision. Servomotors are generally used as a high-performance alternative to the Stepper Motor. Stepper motors have some inherent ability to control position, as they have built-in output steps. This often allows them to be used as an open-loop position control, without any feedback encoder, as their drive signal specifies the number of steps of movement to rotate, but for this the controller needs to 'know' the position of the stepper motor on power up. Therefore, on first power up, the controller will have to activate the stepper motor and turn it to a known position, e.g. until it activates an end limit switch. This can be observed when switching on an ink jet printer. The controller will move the ink jet carrier to the extreme left and right to establish the end positions. A servomotor will immediately turn to whatever angle the controller instructs it to, regardless of the initial position.



Fig 7: SERVO MOTOR.

IV. WORKING

The load sensor is placed over the suspension spring of the vehicle. As the load cell is to be fixed at one end and load is to be over the free end two load cells are needed for the one suspension spring. The total load of the vehicle is calculated by the sum of load on each strain gauge. The Load cells which have a strain gauge and it expands when the external mechanical force is applied on it. And the strain gauge generates the electrical signal due to change in the resistance on expansion of the strain gauge. But the generated voltage is in few millivolts and it must be amplified in the digital form. For that the HX711 module is used to amplify the generated electrical signal by the load cell and finally it should pass to Arduino for further manipulation.

The response of the Arduino board feeds the control signal to the servo motor. The signal identifies the position of the shaft. Depending on the load of the vehicle, the servo motor adjusts the throttle valve and decides the maximum speed of the vehicle.

If the vehicle is overloaded, the servo motor closes the throttle valve fully and the vehicle could not be started. It not only finds the overloading of the vehicle but also it

determines misalignment of loading of goods by comparing the loads

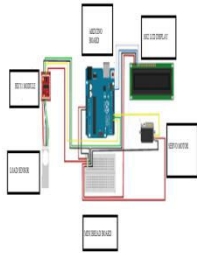


FIG 8:Architecture Diagram

on the opposite wheels. Thereby it avoids the accidents due to feeling of truck on one side. And we also used Bluetooth module for displaying vehicle speed and overload condition for better user friendly through mobile application

V. HARDWARE RESULTS



Fig 9 Result of Zero Load Condition

Consider the load capacity of the vehicle is 3 tons. The Tabulation 1 represents the hardware results are given below. Results under different Load Conditions. The maximum speed of the vehicle reduces with the increase in the load. Thereby offering variable maximum speed for

the variable load. If the vehicle is overloaded, the servo motor closes the throttle valve fully and the vehicle could not be started[15]. It also avoid the accidents due to misalignments of the load.

VI Conclusion:

Hence maximum speed of the vehicle reduces with the increase in the load. Thereby offering variable maximum speed for the variable load. If the vehicle is overloaded, the servo motor closes the throttle valve fully and the vehicle could not be started[15]. It also avoid the accidents due to misalignments of the load.

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