

Design and Development of Smart Speed Breaker

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ABSTRACT

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 rises the speed bumps above the road surface and giving the physical remainder to driver to slow down the vehicle. If the speed of the ongoing 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.

Keyword: Speed breaker, Scissor jack, Arduino, sensors

1. INTRODUCTION

India is developing country with the second largest road network in the world. Out of total stretch of 5.4 million km of road network, almost 97,991 km is covered by national highways. It's already a huge challenge for a the Indian government to provide world-class road, due to sheer magnitude. On an average, a person spends anywhere between 30 minutes to two hours of their day driving. Which means, in a year, it almost 360 hours. Imagine the kind of stress and unnecessary burden the person is putting on their body. In-spite of all that the biggest mode of transport in India is-Roads. Almost 90% of the passenger and industrial transport is carried out through roads.

The rapidly increasing population increases the traffic and good control on traffic is very necessary for safety and also reduces travelling time. Traffic solution which are available now a day and popularly using is good solution but not the best one. It slows down all the vehicles without considering their speed of vehicles. In short it's collective punishment to all vehicles and bad accessibility or dangerous traffic situation and an unsafe road. After slowdown of heavy vehicles and small vehicles also more time are require to regain their previous speed by vehicles in tern it increases traffic. The vehicles with slow speed also get shocks and vibration which the does not deserve.

1.1 Problem Statement

Design The traffic safety solution of today force all the vehicles to slow down without considering the speed of on-going vehicle it increase the traffic problem .In order to avoid that, system needs to be prepared which will operate according to the vehicle speed.

1.2 Objectives

The smart speed breaker aims towards safe and easy accessibility of on-going vehicle by only affecting the vehicles whose exceeding a speed limit. It creates even traffic flow with less missions. In future modification can be also done to allows full access for emergency vehicles like police van, ambulance etc. It also increases life of automobile components by avoiding unnecessary shocks and vibrations.

1.3 Scope

The smart speed breaker originally constructed for town and city environments but has also proven to be very effective at toll booths. It would be suitable for installation in harbours, at airports and industries any where there are pedestrians and cyclist sharing space with vehicles moving at high speed. They can installed at entrance of society, collages gate, mall entrance big hotel entrance and so much for effective speed control. It's very useful in parking stations at big apartments and theatres.

2. METHODOLOGY

Various methods can be employed for motion of smart speed breaker bumps.

2.1 Upward Motion Smart Speed Breaker

In this assembly the bump are rises few centimeter above the road surface and give physical remainder to driver. The upward motion to the bumps is provides by various mechanism like Rack and Pinion mechanism, Scissor Jack mechanism



Fig -1: Upward Motion Smart Speed Breaker

2.2 Downward Motion Smart Speed Breaker

In this assembly the bumps of smart speed breaker lower into the road surface production natch in road surface thus giving physical remainder to driver. The downward motion of bump is provided by roller mechanism.



Fig -2: Downward Motion Smart Speed Breaker

3. SCISSOR JACK MECHANISM

In the Scissor Jack mechanism, the bumps are rises by upward motion of scissor jack which is provided just below the bump. Various parts used in Scissor Jack mechanism are listed below

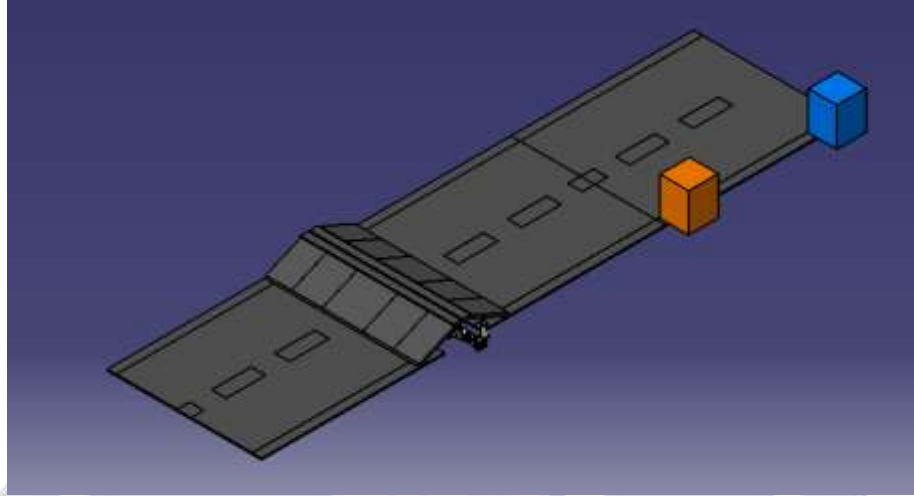


Fig -3: Actual mechanism of scissor jack

3.1 Scissor Jack

Screw jack along with electric motor can be used to load lifting easier. Screw jack is linked mechanically and also electronically and with advance in motion control.

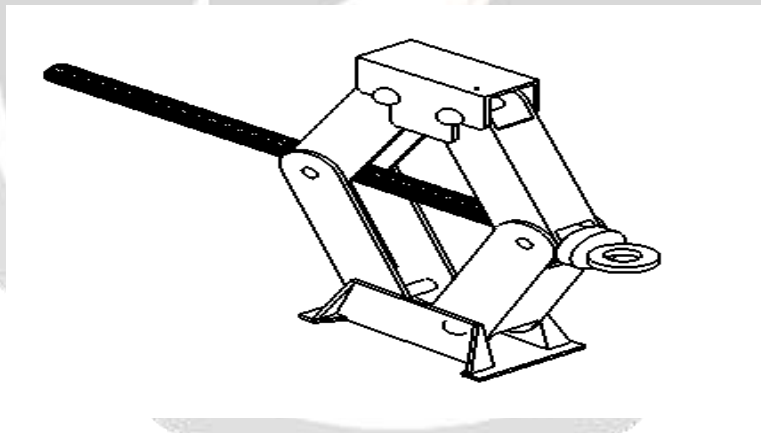


Fig -4: Scissor Jack

3.2 Arduino Microcontroller

The Arduino Uno is a micro-controller board based on the ATmega328(data-sheet). It has 14 digital input/output pins(of which 6 can be used as PWM output), 6 analog input, a 16 MHz ceramic resonator, a USB connection, an ICSP header and a reset button. It contain everything needed to support the micro-controller; simply connects it to computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differ from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2(Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

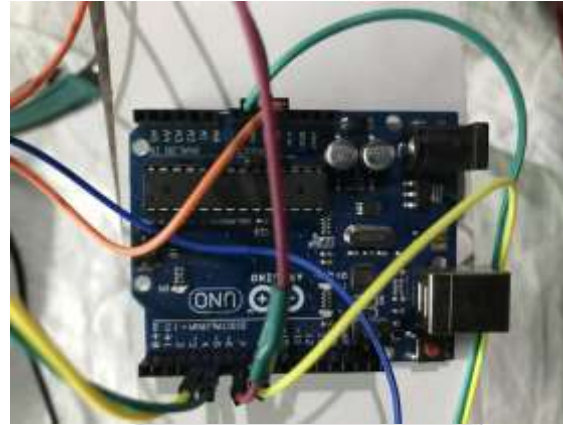


Fig -5: Arduino Microcontroller

3.3 Infrared sensors

Infrared sensors uses special sensors to modulate IR signals emitted from to IR transmitter and detect the modulated IR signal reflected back from near by objects this sensor has built in IR LED driver to modulate the IR signal at 38KV to match built in detector. The modulated IR signal immunes the sensors from the interferences cause by the normal light of the sun light. The module will output a high if no object is detected and low if an object is detected.

Table -1: Rating of IR sensors

Parameter	Min	Max	Unit
Operating Voltage	4	6	V
Sensing Range	2	8	Cm



Fig -6: Infrared Sensor

3.4 Wiper Motor

Wiper motors are devices in the wiper system that functions on a power supply in order to move the upper platform of speed breaker in a smooth motion. Like other motors, the wiper motor rotates continuously in one direction which is converted into a back and forth motion. Its composition entails a lot of mechanical linkages each playing a role in initiating the movement. The gearhead motor is the type of wiper motor known for its abundance in torque.

3.5 Frame

It is component of project which support all the parts of speed breaker .Mild Steel material is used to manufacturing due to its high strength and corrosion resistance.

4. WORKING

The IR sensors are installed before the Smart Speed Breaker at appropriate distance. As vehicle passes, it detected by first IR sensor and then by second. The distance between two IR sensors are known and from that we can calculate the speed of vehicle. A predetermine speed limit set into programme of Arduino microcontroller. If vehicle speed is exceeding the predetermine speed then Arduino microcontroller give input to Relay Circuit. Relay Circuit operate the wiper motor and rises the Smart Speed Breaker, thus giving physical remainder to driver for slow down. If speed of on-going vehicle is within the permissible limit then, the Smart Speed Breaker stays flat on road.

5. CONCLUSION

Smart Speed Breaker would prove to be a pivotal innovation in pedestrian safety, especially in school zones and roads with heavy pedestrian or vehicular traffic. The implicit speed enforcement and the savings in public spending thereby shall offset part of the costs associated with the installation of a new Smart Speed Breaker. The Smart Speed Breaker acts as a deterrent to speeding vehicles, which serves the purpose of its design. Perhaps more important, its effectiveness as a traffic calming device is independent of driver obedience. The selective deterrence ensures that law abiding drivers are not punished and thus keep from antagonizing them. The systems installation would thus be met with no or lesser public resistance compared to conventional bumps. The pre-emption system eliminates concerns related to bumps affecting emergency response times. The bump would cause fewer vehicles to brake and accelerate thereby reducing the pollution any other traffic calming device may create.

6. REFERENCES

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