The creation of a brake failure warning and backup braking system

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Abstract:

According to the research presented in the review article, the number of vehicles on Ghanaian roads has increased dramatically in recent years. Since there are now more people and vehicles on the road, there has been a rise in traffic accidents. It is the responsibility of law enforcement to guarantee that drivers maintain their cars, particularly the brakes, by conducting frequent campaigns to inspect brake maintenance around the nation. Driving safety may be increased with upgraded brakes. Damage to the braking component is caused by friction between the disc pad and the rotor. Brake performance depends on it; thus, it must be serviced regularly. Rapid braking causes brake wear, the produced heat will be discharged into the atmosphere, but the dissipation capacities will be diminished. Since a modification to the material is possible and will enhance braking performance, this is an essential step. Ventilated discs, which may be used instead, aid to reduce heat by an extra 10%. Even with the implementation of the new system, Locomotives installed on trains may immediately bring the train to a halt if an emergency occurs. The major benefit of this sort of system is that the vehicle may be entirely stopped to rest without any movement when it is on the slope of a mountain or bridge, and movement only commences when the valve has been released by the driver. To slow the car, regenerative brakes transform the vehicle's kinetic energy into another kind of usable energy that is saved until it is needed. The energy that would have been wasted due to friction between the shoes and the wheel is captured and channelled towards lighting the rear car side light, freeing up the car's battery for other applications. Normally, using the brakes in a car causes the lighting system to illuminate, but with this advancement, we may specify the lighting system's brightness according to the force or pressure used to stop the vehicle.

INTRODUCTION

As is evident all around us now in this age of high-tech automobiles and engineering, this too will pass. About a decade ago, when automobile-based sensors were still in their infancy, technology was still in the early stages of development. While we only utilise roughly 60–100 sensors at the moment, that number is expected to rise every year because to technological progress. Sensors utilised primarily in the interest of human security and comfort. However, despite this, there is still a significant risk of accidents resulting in human injury or death. These incidents are often the result of careless driving or faulty vehicle components. Other issues include a lack of forethought, distraction, breaking of traffic laws, improper use of lanes, unclear signage, and a road surface riddled with potholes. Today's accidents can be traced back to a wide range of causes, but one of the most common is faulty equipment that hasn't been properly maintained. This new system addresses this problem by employing a circuit model that monitors the state of an automobile's brake wire and sends an audible or visual warning to the driver. In contrast to the significant research on thermal stresses, the topic of mechanical stresses in brake discs has received

relatively less attention. Currently, grey cast iron and steel are utilised to make brake discs. Lowered temperatures, thermal stresses, and overall mass have all resulted from the employment of novel materials and designs. Strain gauges attached to a solid brake disc allow for the experimental measurement of mechanical loading on brake pads, which may be broken down into compressive stresses owing to clamping force and shear stresses due to applied braking torque. The outcomes of the clamping load test were. In this region, compressive stresses are concentrated yet weak elsewhere. Despite being uniformly distributed over the disk's periphery, the shear stresses are highest at the disk's interaction with the surrounding space.

By repurposing the energy that would otherwise be wasted between the brake shoes and the wheel, innovative braking systems not only reduce the strain on the car's battery but also allow passengers in the back to gauge how hard the brakes are being applied. There are essentially two categories of safety measures: Actively ensuring one's safety (Pre-Impact) Secondly, passive protection (Post-Impact) Active system helps to lessen the effect or make it null so that it does not occur, some of them are Traction and control-preserving anti-lock braking system, Electronic stability and control aids the automobile from sliding and losing control in curves, The automobile's autonomous emergency system will automatically apply the brakes if it detects that the car in front of it is experiencing any of a number of potentially dangerous conditions. When the car starts to drift out of its lane, the lane-keeping assist will sound an alarm.

If the motorist is becoming weary of driving, drowsiness and attention detection might alert them to slow down. Sensors, radars, cameras, global positioning sensors, and lasers are all a part of this safety armamentarium. Passive safety features, such as seatbelts (which are also primary restraint systems) and airbags (which deploy an inflated air-filled cushion bag to protect the head and upper body during collision) and crumple zones (which are located in the front of the vehicle and are used to withstand an impact during collision by controlled deformation), lessen the severity of injuries both during and after an accident. Unfortunately, despite all of these measures, the number of accidents on today's roads continues to rise unchecked. This is due to a number of factors, including drivers' inability to anticipate hazards, distractions, violations of traffic laws, inadequate lane markings, unclear traffic signs, and subpar road conditions. The importance of adopting this cutting-edge method.

The Urgent Requirement to Adopt the New System

Data from the United States indicates that roughly 5.6 million accidents annually may be attributed to faulty brakes. And if so, many accidents have happened in the United States, a highly developed nation, because of this, imagine the toll it has taken in other places. Despite the fact that numerous preventative measures are being taken, the likelihood of a car accident remains high. We don't expect this new method to eliminate accidents altogether, but we do anticipate a significant reduction in their likelihood as a result of its implementation. Assuming the driver uses good judgement and maintains composure.

THE CAR MUST COME TO A COMPLETE STOP

There are times when it's necessary to come to a full stop with your car. Even if the vehicle loses its brakes on a steep incline, a typical route with less slope, while carrying a heavy load, EBS will assist bring the vehicle to a safe halt. However, if we use the same principles found in standard braking systems, we may get the desired effect. The risk of injury or death, as well as damage to neighbouring property or other vehicles, increases while travelling downhill with damaged brakes and little time to prepare. The train's chain-pulling mechanism served as inspiration for this method since, when the chain is pulled, the whole train comes to a halt and won't move again until the assistant loco pilot arrives and relieves the pressure and the brakes manually.

EMERGENCY BRAKING AND BRAKE FAILURE DETECTION SYSTEM

Figure 1 depicts the proposed circuit model, which provides the audio and visual outputs to the red light and buzzer sound, which in turn activates the emergency braking system by having the motor rotate the wheel by ninety degrees, causing the hydraulic system to lower the emergency wheels, synchronising it with the wheel velocity. In order to prevent the vehicle's engine from supplying power while the clutch is depressed, an EBS may be activated; this system, which consists of a basic PCB bread board in which a copper wire serves as a brake wire cut timer, can be constructed by anybody.

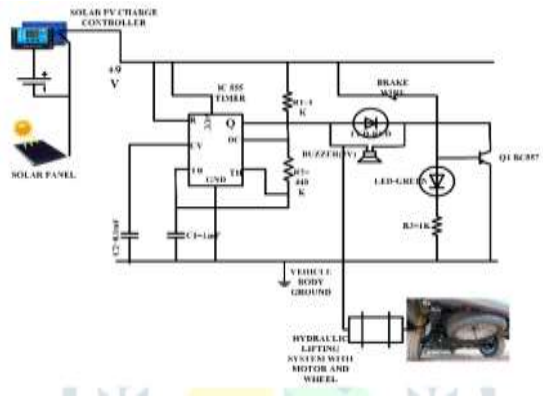
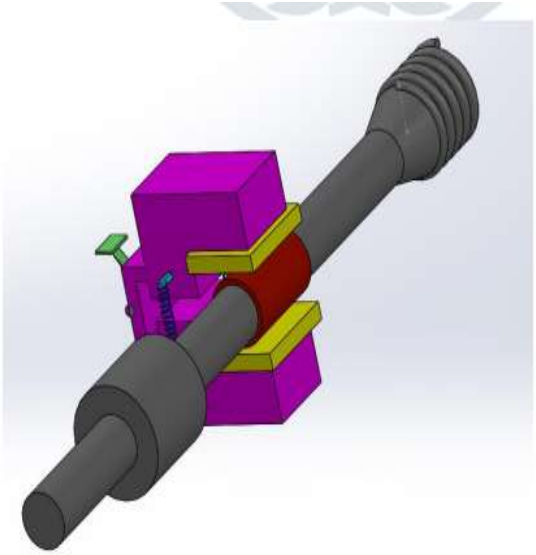
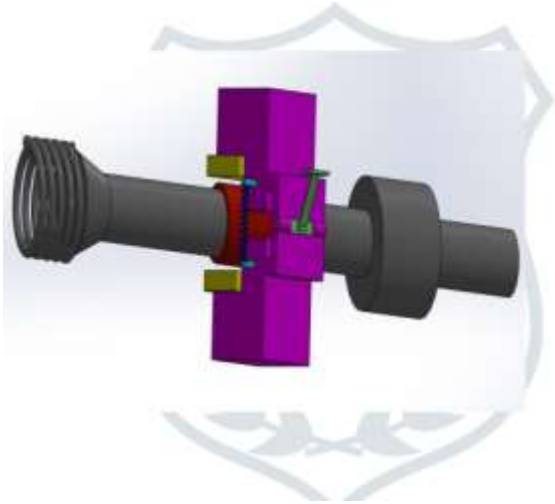


Figure 1 Circuit diagram of the proposed model

555 Setting the timer to a steady state makes it easier to switch the lads on and off. Prerequisites for Use To avoid any interference with Good Green's lead, EBS will be turned off during its on-air time. Light green with a hint of red indicates minimal damage; EBS is disabled in this condition. In the event of a wire cut or disconnect, the EBS will go into an "on" mode, indicated by a red light and a buzzer.

PROPOSED MODEL





The following system shown will be installed between the constant velocity joints and between the power transmitting differential rod in manual or automatic vehicles, with the activation of the system contingent on the vehicle being in neutral. The constant velocity joints on the far left of the above figure are used to transport rotational power from the vehicle's engine to the drive shaft, and the drive shaft boots on the far right are a depiction of the real components of the drive shaft. Here, the central red area serves as the braking medium, represented by what is often a disc ring formed of cast iron but also possible in composites such reinforced carbon or ceramic matrix composites. Here, yellow represents the brake pads, which may be either ceramic or organic (including asbestos). When in operation, the anti-lock braking system (ABS) and chain-pulling system (CS) may be put into effect thanks to the pink thing, which is the holder it fits into and is controlled by the springs and piston cylinder arrangement. When a car hits a speed hump, the green section will prevent any harm to the vehicle by allowing the circulating rod, which will be connected to the car body but will move vertically in a free flow manner, to move out of the way.

CONCLUSIONS

- As you can see, the aforementioned study analysed the existing literature and the most recent studies in this area in great detail. The following are the findings:
- There is a heavy monetary cost associated with the tragic outcomes of automobile accidents, which may even claim the lives of unborn children. According to the findings, stricter rules should be implemented to ensure regular vehicle maintenance, notably of the brakes.
- The precise display of the operational status of the brake helps avoid accidents caused by brake failure. The system keeps track of the state of the brake wire at all times and gives the rider an audible warning before the wire is severed.
- A good braking system ensures the user's safety and comfort, but a rise in temperature has a significant impact on brake performance. This may be mitigated by including an external cooling system, such as cooling fluid or holes and fins, into the design.
- The system, which consists of hardware add-ons and an Android app, ensures a safe and effective emergency stop process. Gaining command at time of crisis. Areas with the greatest frequency of chain-pulling incidents should be prioritised for implementation.
- The method of loading the solid brake disc has been completed utilising a bespoke rig. Compressive stresses owing to clamping load and shear stresses due to applied braking torque were used to define the mechanical stresses created in the brake disc.

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