International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

DESIGN AND FABRICATION OF SOLAR POWERED AUTOMATIC BRAKING SYSTEM AND BUMPER ACTUATION WITH BLUETOOTH CONTROL

Prof. Amol Ghude[1], Vishal Yadav[2], Varun Nikalje[3], Vaibhav Sonawane [4], Atharva Chavan[5]

[1] Asst.Professor Department of Mechanical Engineering, Datta Meghe College of Engineering, Airoli

[2,3,4,5]B.E. Students Department of Mechanical Engineering, Datta Meghe College of Engineering, Airoli

---

Abstract - The declining human life spans of today can be attributed to the increasing use of automobiles, resulting in a dramatic rise in death rates due to accidents. Brake failure is a common cause of accidents, making automatic brake control crucial in reducing accident impact. Additionally, currently used rigid bumpers in vehicles have limited capacity, often leading to failure and transferring force to the driver and passengers during high-impact collisions. To address this issue, our project incorporates an infrared sensor that detects obstructions. When an obstruction is detected, the sensor emits infrared waves which are reflected back to the receiver. The received signal is then sent to an Arduino controller, which activates the brakes and bumper. This intelligent mechatronic system uses a microcontroller to control the vehicle's speed based on the detection pulse, allowing for prompt and effective braking to ensure safety.

***Key Words*:** Accidents , Infrared sensor , Brake.

1.INTRODUCTION

Driving has become a common activity for most people, and with the increasing number of vehicles on the roads, technology has evolved to enable faster speeds for covering longer distances in less time. However, this increased speed has also led to a rise in road accidents. Traditional braking systems may not be sufficient to prevent accidents when the driver is not able to react in time. Therefore, there is a need for an automatic braking system that can function independently. The infrared braking system is designed to automatically apply brakes when the sensors detect an obstacle in front of the vehicle. It consists of an infrared wave emitter and receiver, placed in front of the vehicle, which emit and receive infrared waves to measure the distance to the obstacle. The information from the detection pulse is used by the PIC microcontroller to control the servo motor, which in turn controls the vehicle's braking mechanism. This system aims to prevent accidents by allowing the vehicle to stop automatically when the driver may not be able to react in time. Additionally, efforts are being made to reduce emissions by modifying engine functions. While mechanical braking systems have limitations, the automatic braking system can complement and enhance existing braking mechanisms, making it a promising solution for improving road safety in the present generation of vehicles with advanced technologies.

An automatic braking system is a crucial component of modern vehicle safety technology. It utilizes various sensors, such as radar, video, infrared, or infrared , to scan for objects in front of the vehicle and uses brake control to prevent or reduce the severity of a collision if an object is detected. These systems are often integrated with other safety features like pre-collision systems and adaptive cruise control to enhance overall safety on the road.

Different car manufacturers may use different types of sensors, but the basic principle is similar. The system continuously monitors the area in front of the vehicle and analyzes sensor data to assess the possibility of a collision. If an object is detected and the system determines that the vehicle's speed is greater than the speed of the object, it can automatically activate the brakes to try to prevent the collision from occurring or reduce the impact of the collision.

Automatic braking systems have proven to be effective in reducing the occurrence of collisions and minimizing their severity. They are an important advancement in vehicle safety technology, providing an additional layer of protection for drivers, passengers, pedestrians, and other road users. It's important for drivers to understand the capabilities and limitations of the automatic braking system in their vehicles and use it as a tool to enhance their driving safety.

2.LITERATURE REVIEW

2.1 [1] G.MUTHU BRINDHA,KK KARISHMA"Accident prevention by Auto Braking System and Multisensors" :

Our project's key objectives are to employ sensors to automatically control speed and avoid accidents. This article is centred on the use of sensors to monitor the surroundings and the driver.The driver's tiredness is also picked up by the eye blink sensor, which is present. If the driver is driving when fatigued, the buzzer will alert them. Since the prototype for the design was successfully implemented, it can be said that such a system can help keep the driver attentive while driving and, as a result, make it simpler to prevent any traffic problems involving driver alertness.

2.1 [2] Eung Soo Kim,2009, "Fabrication of Auto-Braking System for Pre-Crash Safety Using Sensor" :

In this research study, an infrared sensor and a radar sensor will take the role of the auto-braking system that is installed on a real car.The auto-braking system was designed and implemented by VHDL to keep a gap. It provides a pre-crash safety system for intelligent cars. This module may detect the distance between the front vehicle and your vehicle to maintain a constant distance and to forcibly engage the brake system if the driver does not reduce the speed of the car. The technology displays the speed of your car as well as the distance between it and the other car. The system performed well.

3.PROBLEM STATEMENT

One of the main issues is when a car or object unexpectedly moves in front of the driver when they are not paying attention to the road. This can result in serious collisions and costly losses. This kind of technology can help us prevent such situations.The second main factor in accidents is the unexpected emergence of barriers while driving. In such a panicked circumstance, everyone's reaction time and stopping distance fluctuate, and some drivers are able to avoid accidents while others manage to do so with significant damage.The project will support us in every way as we attempt to solve this issue.

4.OBJECTIVE

The two main issues with the traditional braking system now in use are wear and tear and unnecessarily high temperatures. Brake pads typically regain efficiency after cooling down again. Therefore, this initiative intends to give the driver and passenger safety measures removing the aforementioned

- Drunk driving
- Driving while daydreaming
- The vehicle experiencing mechanical issues
- The drivers' negligence

5.WORKING PRINCIPLE

In front of the car is a fixed infrared sensor. The circuit as a whole is powered by a solar plate. The battery is charged since the solar panel is attached to it. As If the driver does not take the necessary action or use the brakes, the circuit is broken and the DC gear motor stops working, which causes the vehicle to come to a complete stop as soon as the Infrared sensor senses the impediment or moving item in front of it.

6. DESIGN OF THE PROTOTYPE

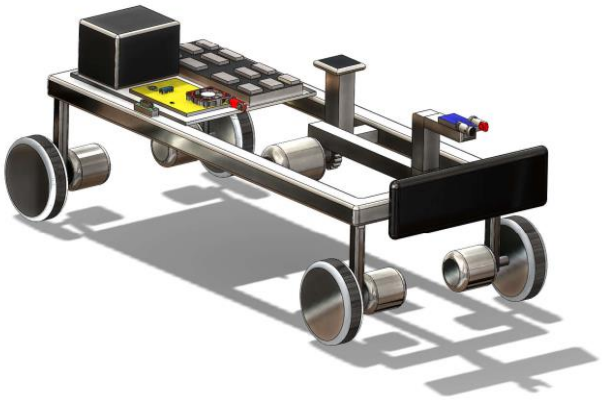

Figure 1. design of the prototype software solidworks 2017

7.THE AUTOMATED BRAKING SYSTEM'S MAIN COMPONENT

7.1 Solar Panel

A solar cell panel, solar electric panel, photo-voltaic (PV) module, or simply solar panel is a cluster of photovoltaic cells arranged in a framework for installation. sun panels use sun energy to generate direct current power. A group of PV modules is referred to as a PV panel, while a system of PV panels is referred to as an array. Photovoltaic arrays use solar energy to power electrical equipment.

Figure 2. Solar Panel

7.2 Linear Actuator

In contrast to the circular motion of a traditional electric motor, a linear actuator is an actuator that generates motion in a straight line. Machine tools and industrial machinery, computer peripherals like disc drives and printers, valves and dampers, and numerous more applications requiring linear motion all use linear actuators. Cylinders, whether hydraulic or pneumatic, naturally provide linear motion. A spinning motor can provide linear motion through a variety of additional processes.

Figure 3. Linear Actuator

7.3 Battery

Rechargeable sealed lead sulphate batteries with a 12V 4.5AH rating are the type of battery utilised in this project. This kind of battery is ideal for use with rechargeable devices.A collection of one or more electrochemical cells makes form a storage battery or rechargeable battery. Because their electrochemical reactions are electrically reversible, they are referred to as secondary cells. From a button cell to megawatt systems connected to stabilise an electrical distribution network, rechargeable batteries are available in a wide variety of sizes and configurations.

Figure 4. Battery

7.4 Arduino

How well an electrical circuit performs is determined by the layout and design of the printed circuit board (P.C.B.).Modern electronic systems would be practically impossible to package without the use of circuits. A printed circuit board is made up of a substrate, a resin insulating layer that is manufactured on it and roughened at its surface, and a conductor that is formed on it. This printed circuit board has remarkable conductance resistance and peel strength. The conductor contains at least a portion of a eutectic metal layer.A substrate and an insulating layer made of resin with a roughened surface are both parts of a printed circuit board.

Figure 5. Arduino

7.5 Bluetooth HC-05

It is utilised in numerous consumer applications, including wireless keyboards, wireless mice, wireless headsets, and game controllers. Depending on the transmitter and receiver, atmosphere, geography, and urban settings, the range can go up to about 100m. A Bluetooth module called HC-05 is created for wireless communication. This module can be set up as either a master or a slave.

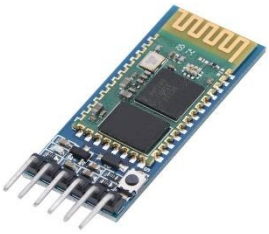

Figure 6. Bluetooth HC-05

7.6 Infrared Sensor

The infrared waves reflected from the road surface are picked up by an infrared receiver, which then produces a reception signal. An infrared transducer can convert sound waves back into electrical energy. An amplifier amplifies this signal. To find components in the amplified signal caused by obstructions on the road surface, the amplified signal is compared to a reference signal. To keep a consistent ratio between the average of the reference signal and the average of the amplified signal, the magnitude of the reference signal or the amplifier's amplification factor is regulated.

Figure 7. Infrared Sensor

8. CIRCUIT DIAGRAM

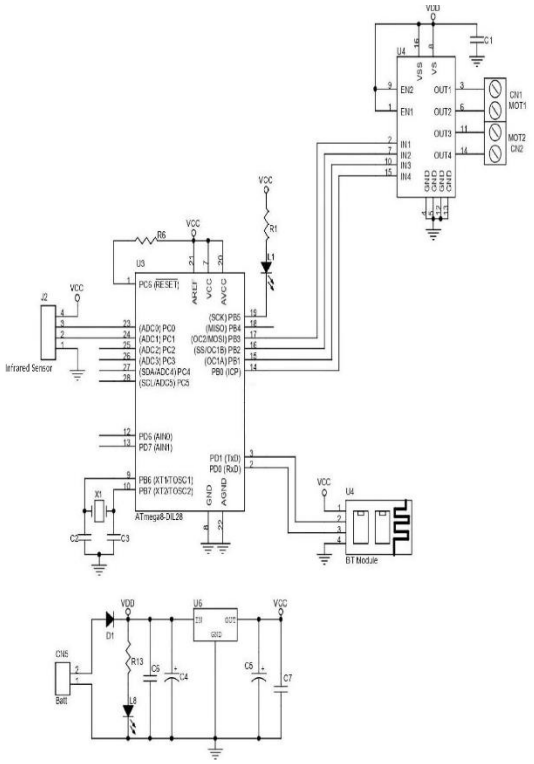

Figure 8. Circuit Diagram

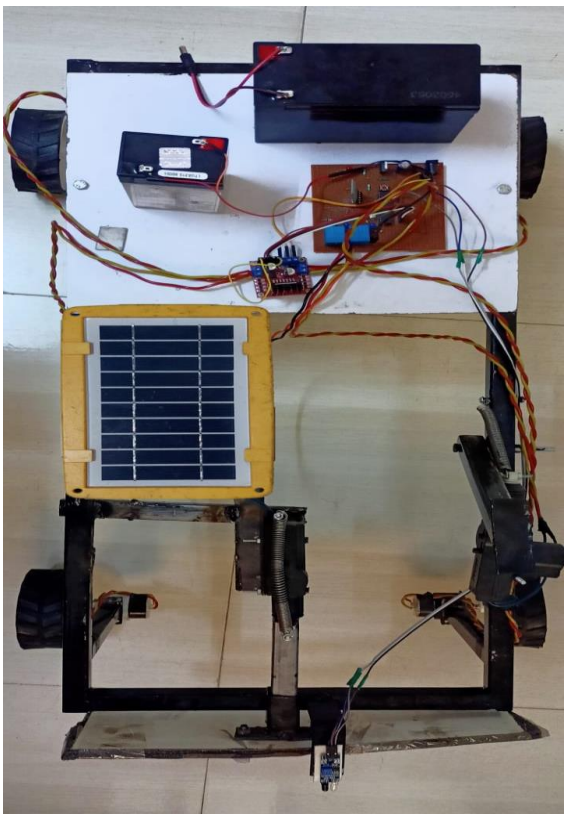

Figure 9. Prototype

9. FUTURE SCOPE

Future development will concentrate on developing a control system that is modelled after the "Automatic Braking System" seen in cars. The automated braking system with an infrared sensor will inform the driver before applying the brakes when the space between the vehicle and the obstruction is within the sensing range zone. This prototype design has a novel function that might be used in all autos. This approach will increase safety and provide a more solid guarantee for the car's security while preventing losses. As a result, auto safety systems will be enhanced, and perhaps market demand will rise.

10.CONCLUSION

A bumper-activated, Bluetooth-controlled automated braking system has been successfully created.In this research, an infrared automatic braking system with a bumper actuator system mechanism is implemented to prevent forward collisions. The system is intended for use in cars whose brakes cannot be applied manually but whose speed can be automatically decreased as a result of the recognition of obstructions. Less gear is required for the system, and the infrared sensors are less expensive. Using consecutive samples of the expected distance, the relative speed of the vehicle in relation to the obstruction is calculated. It is used by the control system to calculate the braking action and adjust the speed in order to maintain a safe distance and avoid accidents.

11. REFERENCES

[1]M. Mamat, N. M. Ghani, “Fuzzy Logic Controller on Automated Car Braking System”

[2].MEDIA.FORD.COM “Ford Makes Parallel Parking A Breeze With New Active Park Assist”.

[3]David Zipser, Richard A. Andersen, “A back propagation programmed network that simulates. response properties of a subset of posterior parietal neurons, Nature vol. 331, February 1988.

[4]Volvo Car Group. "Collision Warning with Auto Brake helps prevent rear-end collisions." Jan. 11, 2008. (Jan. 31, 2013)

[5]C.H.mohammed Koya,”A Case Study of Road Accidents in Kerala during 2010 to 2016” ISSN-2347-6710 Volume 6, Issue 4,March 2017. [9]Francis,A., Antoo, A., John, J., Sagar,A., Sreejith.(2018). Intelligent Braking System for Automobiles. International Research Journal of Engineering and Technology.5(3).

[6]Rohit Khadatkar 1 ,Pritish Giripunje 2 , Devesh Yerne 3, Swapnil Khaparde 4 , Rushabh Dhanwant 5 “Design Of Solar Powered Intelligent Braking System With Pneumatic Bumper” ISSN: 2395-0056 Volume: 08 Issue: 06.June 2021.