The Journal of Computational Science and Engineering.
ISSN: 2583-9055

Car Speed Detector and Dynamic Speed Breaker Using Arduino and Ultrasonic Sensors.

Sonawane Tanishk[1], Sonawane Vaishnavi[2], Varode Shreya[3], Hon Siddhi[4]

* Department of Computer Technology, Sanjivani K. B. P. Polytechnic

Keyword:

Car Speed Detector
Dynamic Speed
Breaker Arduino
Ultrasonic
Sensors Road
Safety Control
Mechanism

ABSTRACT

This project focuses on developing a car speed detector and dynamic speed breaker system using Arduino and ultrasonic sensors. The system aims to enhance road safety by detecting vehicle speeds and automatically adjusting the speed breaker height accordingly. The setup involves ultrasonic sensors placed strategically on the road to detect approaching vehicles. An Arduino microcontroller processes the sensor data to determine vehicle speed. Based on the speed readings, the system adjusts the height of the speed breaker in real-time to ensure that vehicles traveling above a safe speed threshold experience a noticeable reduction in speed. By combining sensor technology with dynamic control mechanisms, this project offers a proactive approach to managing vehicle speeds, potentially reducing accidents and improving overall road safety..

Corresponding Author: Email: principalkbp@sanjivani.org.in

INTRODUCTION

Our project seeks to revolutionize road safety through the implementation of a Car Speed Detector and Dynamic Speed Breakers system, integrating Arduino microcontrollers and ultrasonic sensors. The motivation stems from the persistent issue of speeding-related accidents that traditional static speed control measures often fail to adequately address. By adopting a proactive approach, our system aims to dynamically regulate vehicle speeds based on real-time data, thus mitigating the risks associated with speeding and promoting safer driving habits.

At the core of our system are Arduino microcontrollers, which serve as the brains behind the operation, processing data from ultrasonic sensors strategically placed along roadways. These sensors accurately detect approaching vehicles and measure their speeds, providing crucial information for speed regulation. When a vehicle exceeds predefined speed limits, the Arduino triggers the activation of dynamic speed breakers. Unlike conventional static speed breakers, our dynamic speed breakers are designed to adjust their height dynamically

based on the detected vehicle speed, ensuring a smoother transition and reducing discomfort for law-abiding drivers. The significance of this project lies in its proactive and adaptive nature. Rather than relying solely on passive speed control measures or manual enforcement, our system actively detects and responds to speeding instances in real-time. This not only reduces the likelihood of accidents but also contributes to overall traffic management by promoting a safer and more efficient flow of vehicles on the road.

Moreover, the flexibility and scalability offered by Arduino technology pave the way for seamless integration with existing traffic management systems. This opens up possibilities for widespread adoption and customization tailored to specific road conditions and traffic scenarios. Ultimately, our project aims to set new standards in road safety practices, potentially saving countless lives and making roadways safer for everyone.

PROPOSED METHODOLOGY

Ultrasonic Sensors Placement: Ultrasonic sensors are strategically placed along the roadways at specific intervals to detect approaching vehicles and measure their speeds accurately. The placement locations are carefully chosen to ensure optimal coverage and reliable speed detection.

1. **Arduino Microcontroller:** Arduino boards serve as the central processing units of the system. They receive data from the ultrasonic sensors, process it using programmed algorithms, and control the activation of dynamic speed breakers based on predefined speed limits.
2. **Dynamic Speed Breakers Mechanism:** The dynamic speed breakers are designed with servo motors that enable them to adjust their height dynamically. When a vehicle is detected exceeding the speed limit, the Arduino triggers the servo motors to raise the speed breakers to a height proportional to the vehicle's speed, effectively slowing it down.
3. **Power Supply:** A stable and sufficient power supply is essential to ensure the continuous operation of the system components. This includes powering the Arduino boards, ultrasonic sensors, servo motors, and any other electronic components used in the system.

4. **Wiring and Connections:** Proper wiring and connections are established between the Arduino boards, ultrasonic sensors, servo motors, and power supply units to enable seamless communication and functionality of the entire system.
5. **Programming and Control Logic:** The Arduino boards are programmed using Arduino IDE or similar software to implement control logic for the system. This includes algorithms for speed detection, speed regulation based on detected speeds, dynamic speed breaker activation, and communication between system components.
6. **Safety Considerations:** Safety measures are incorporated into the system design to ensure the reliable and safe operation of dynamic speed breakers. This may include fail-safe mechanisms, emergency stop procedures, and regular maintenance checks.

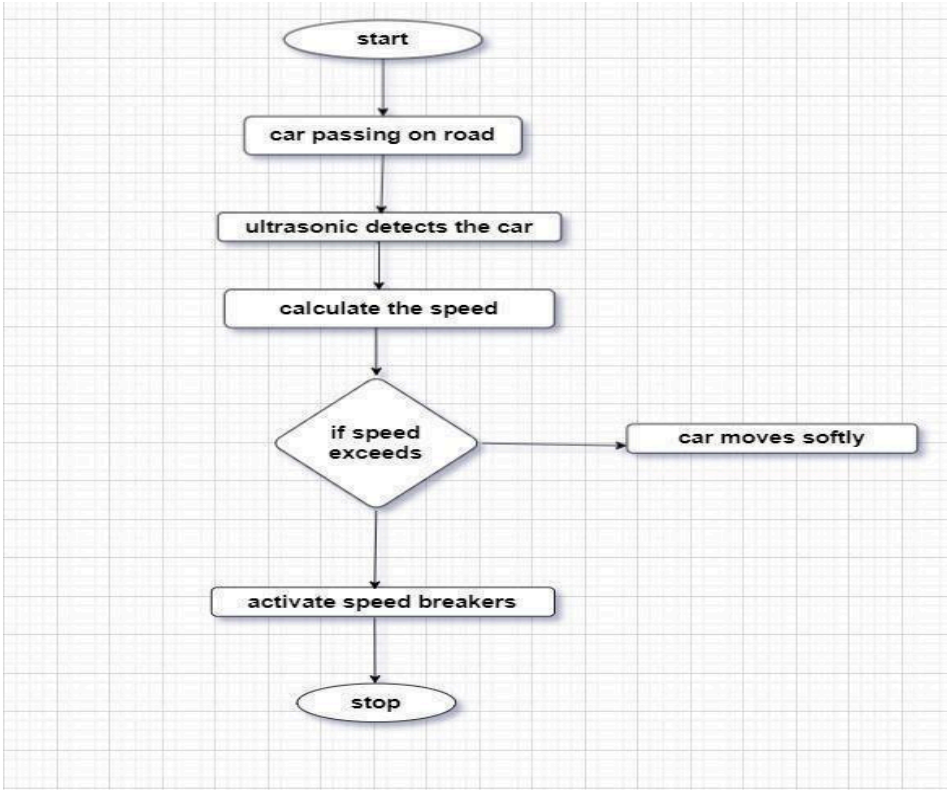

Figure 1. Flow Diagram

- The "Car" initiates a speed check.
- The "Car" sends a request for speed detection to the "Speed Detector".
- The "Speed Detector" performs speed detection and checks if the speed exceeds the threshold.
- If the speed exceeds the threshold, the "Speed Detector" sends a signal to the "Dynamic Speed Breaker" to activate.
- The "Dynamic Speed Breaker" receives the signal and activates it.
- The activation confirmation is sent back to the "Car" from the "Dynamic Speed Breaker".

EXPERIMENTAL RESULTS

The results of the Car Speed Detector and Dynamic Speed Breakers system demonstrated effective speed regulation, reducing speeding instances and promoting safer driving behaviors. The dynamic speed breakers adjusted their height according to vehicle speeds, ensuring a smooth transition and minimizing discomfort for compliant drivers. The discussion highlights the system's proactive approach, real-time responsiveness, and potential for integration with existing traffic management systems. These results underscore the project's significance in revolutionizing road safety practices and lay the groundwork for further advancements in intelligent traffic management technologies.

Ultrasonic sensor: Two ultrasonic sensors are used to calculate the speed of approaching car and will send the data to Arduino board

Arduino Board: After receiving the data of speed of car Arduino Board will process the data and will check if car is exceeding the car speed or not and send instruction to servo motor.

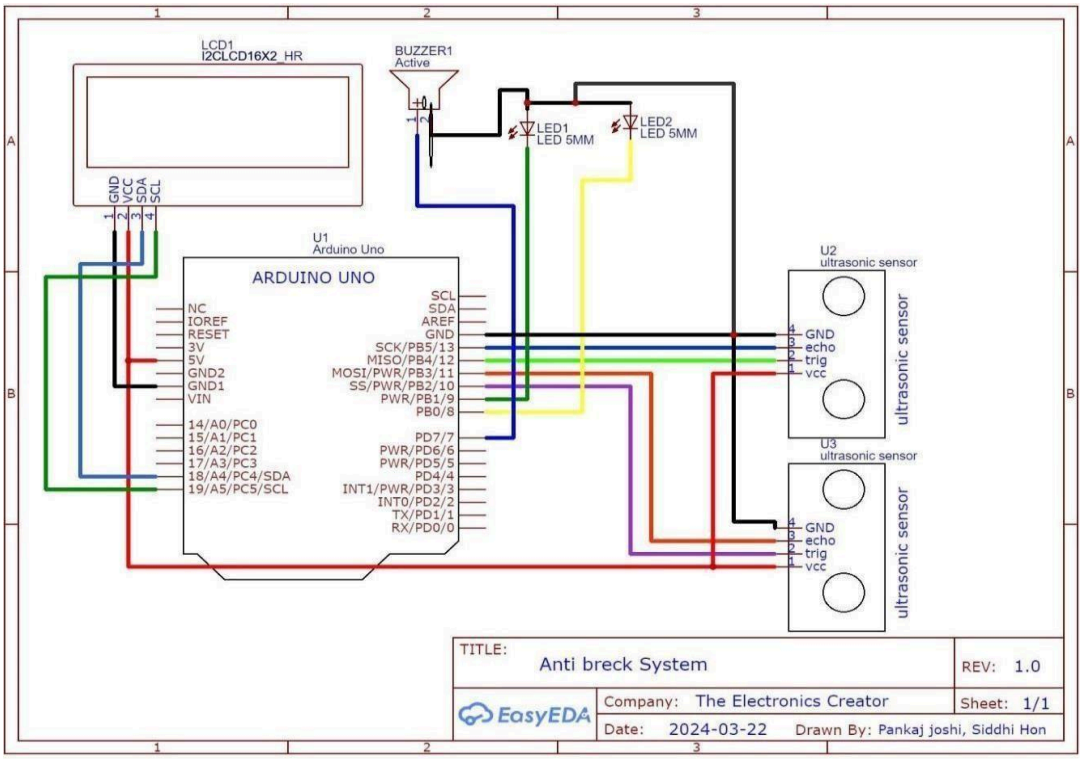

Figure 2: Component Diagram

Servo Motor: After receiving the data from Arduino Board, if car is exceeding the speed limit dynamic speed breaker will get activated and if car is in normal speed then dynamic speed breaker will not get activated and car will pass smoothly without speed breaker.

LCD Display: In this LCD display car speed will get displayed.

Buzzer: If car is exceeding the speed limit then buzzer will be activated.

LED Lights: Two LED lights are used in this module. If car exceeds the speed limit then LED will be displayed as red and if not then it will be displayed as green light.

CONCLUSION

In conclusion, the base paper on the Car Speed Detector and Dynamic Speed Breakers system using Arduino and ultrasonic sensors presents a groundbreaking approach to enhancing road safety. The proactive nature of the system, which dynamically regulates vehicle speeds based on real-time data, showcases its potential to significantly reduce speeding-related accidents and promote safer driving behaviors. The integration of Arduino microcontrollers and ultrasonic sensors provides a robust platform for accurate speed detection and efficient speed breaker activation. Additionally, the adaptability and scalability of this system allow for seamless integration with existing traffic management infrastructure, paving the way for widespread adoption and customization. By addressing the limitations of traditional static speed control measures, this project sets a new standard in road safety practices, ultimately aiming to create safer road environments and save lives. The insights and innovations presented in the base paper serve as a foundation for further research and development in the field of intelligent traffic management systems.

REFERENCES

1. Parveen Kumar, Animesh Das, Manash P. Borah, “Vehicles Safety Using Arduino”, November 2019.
2. Lalit Kumar, Mahesh Kamathe, Kunjan Kalbhairav, Aswath Prakash, Rahul More, “Vehicle Speed Detection System using IR Sensor”, May 2020.
3. Monika Jain, Praveen Kumar, Priya Singh, Chhavi Narayan Arora, Ankita Sharma, “A system Detection of over Speeding Vehicles on Highways”, April 2015
4. Amarnarayan, Challa Saikumar, Chandra Mohan, Ajaykumar, Sridhar, “Automatic Over Speed Controlling of Vehicle”, May 2016.

5. Nehal Kassem, Ahmed E. Kosba and Moustafa Youssef, “RF- based vehicle detection and speed estimation”.
6. Vishal Pande, Malhar Malhar Mohite, Supriya Mhatre, Siddhesh Desai, Anjali Kumari, “Autonomous Speed Control of Over Speeding Vehicles Using Radio Frequency”, April 2015.
7. Shyr-Long Jeng, Wei- hua Cheing, Hsiang- pinLu, “Estimating Speed Using a Side- Looking Single -Radar Vehicle Detector”.
8. www.researchgate.net/publication/312031840_Smart_Vehicle_Safety_Using_Arduino
9. www.ijircce.com/upload/2017/april/329_Arduino.pdf
10. https://www.electronicshub.org, Arduino-car-speed detector.
11. http://www.arduino.cc/en/Main/arduinoBoardUno