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Efficient Zero Radius Turn Transportation with Voice Enhanced Animal Detection

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ABSTRACT

This revolutionary vehicular concept integrates zero-radius turning, an animal detection sensor system, and voice control to redefine urban mobility. It enhances maneuverability in tight spaces, improves safety through real-time animal detection, and enables hands-free operation. The project involves design, fabrication, and system integration, resulting in a prototype showcasing these technologies' convergence. This innovative approach can alleviate urban congestion and enhance road safety. The real-time animal detection system prevents collisions by alerting drivers to wildlife, while voice control ensures distraction-free operation. These advancements represent a leap towards efficient urban commuting and responsive vehicular systems, embodying a vision of safer, adaptable future mobility.

Keywords- Vehicular concept, Urban mobility, Animal detection, Maneuverability.

1. INTRODUCTION

My project integrates parallel parking technology with Advanced Driver Assistance Systems (ADAS) to tackle a critical issue: animals hiding under parked vehicles, posing a danger when the vehicle is started and moved. To mitigate this, we've developed a solution utilizing animal detection sensors. These sensors identify animals under the vehicle and prevent ignition until the animals are cleared. The project introduces the Zero Radius Turn (ZRT) mode, enabling vehicles to turn completely without requiring extra space. Two modes are featured:

1. **Normal Mode**: -The vehicle operates under standard conditions with continuous ADAS engagement.
2. **ZRT Mode**: -The vehicle executes full turns without additional space, utilizing ADAS to enhance maneuvering.

By integrating ADAS and animal detection sensors, essential driver assistance is provided. The system alerts drivers to animals detected beneath the vehicle. Vehicle operation is contingent on animal clearance. Parallel parking is crucial due to mounting traffic challenges, allowing vehicles to park and exit tight spaces without excessive room. The prototype's novelty lies in ADAS integration. An animal detection sensor beneath the vehicle acts as a safeguard, averting animal entrapment. The system prompts drivers to address the issue before starting. Autonomous vehicles advance alongside mobile-connected devices, employing systems on a chip (SoCs) to link sensors, actuators, and electronic control units (ECUs) for optimal performance. This prototype's core purpose is to prevent animals from being trapped under vehicles through an animal detection sensor. Vehicle ignition occurs only after animal removal. Additionally, the model resolves confined parking difficulties. Parallel parking enables spaceefficient vehicle parking and retrieval. In summary, the prototype accomplishes efficient parking and extraction in limited spaces while safeguarding animal lives and vehicle components. By uniting ADAS, animal detection sensors, and innovative parking approaches, this project addresses vital aspects of contemporary vehicle challenges.

2. PROBLEM STATEMENT

The evolution of zero radius turn vehicles traces back to industrial and agricultural machinery, with early applications in skid-steer technology. The ability to pivot around a central point, allowing for tight turns in confined spaces, has been refined through advancements in engineering. This concept gained prominence with the rise of robotics and autonomous vehicles, addressing navigation challenges. Today, zero radius turn capabilities are integrated into diverse vehicles, offering enhanced manoeuvrability in industries ranging from construction to consumer transportation. The history of these vehicles showcases a continuous quest for agile mobility, resulting in innovations that redefine movement in tight quarters. The project addresses two key challenges: achieving a zero radius turn capability and ensuring animal safety through detection sensors with voice alerts. The first challenge involves enabling vehicles to execute complete turns without requiring extra space, enhancing manoeuvrability. The second challenge centres around animals seeking refuge under parked vehicles, posing a risk upon vehicle ignition. To overcome this, the project incorporates animal detection sensors that identify animal presence and trigger voice alerts to prompt their removal before vehicle operation. These innovative solutions collectively aim to enhance vehicle agility while prioritizing animal safety.

3. OBJECTIVES

The objectives of this project converge to create a novel transportation solution that optimizes manoeuvrability in tight spaces through zero radius turns while prioritizing animal safety using voice-enhanced detection systems.

1. **Zero Radius Turn Implementation**: -Develop and integrate advanced steering and propulsion mechanisms into vehicles, allowing them to execute zero radius turns efficiently, minimizing turning space requirements.
2. **Enhanced Manoeuvrability**: -Enable vehicles to navigate through tight spaces, reducing the need for large turning radii and optimizing efficiency in congested environments.
3. **Animal Detection System**: -Design and incorporate a robust animal detection system that utilizes sensors to identify animals beneath parked vehicles, preventing harm and injury during vehicle startup.
4. **Real-time Detection**: -Implement real-time monitoring of the area beneath the vehicle to promptly detect the presence of animals, ensuring swift action to avoid potential harm.
5. **Voice-Enhanced Alerts**: -Integrate a voice alert system that notifies the driver of detected animals, ensuring immediate awareness and encouraging the removal of animals before vehicle operation.
6. **Minimize Human Intervention**: -Develop an autonomous animal detection process that minimizes the need for manual intervention, enhancing safety and convenience for vehicle operators.
7. **Sensitivity and Accuracy**: -Fine-tune animal detection sensors to ensure high sensitivity and accuracy, minimizing false alarms and false negatives to effectively safeguard animals.
8. **User-friendly Interface**: -Create an intuitive interface for drivers to interact with the animal detection system, providing clear information and prompts for safe and efficient vehicle operation.

4. ZRT AND ADS DESIGN

The initial prototype design boasts dimensions of 60 by 45 cm, denoting its length and width respectively. A prudent selection led us to opt for a 2.0-inch plastic base tyre, a commonplace choice renowned for its reliability. The framework of the prototype is founded upon square pipes, precisely measuring 25x25mm, ensuring structural robustness. With a steering angle thoughtfully set at 45 degrees, the vehicle promises agile maneuverability. The model itself stands at a height of 18 cm, while maintaining a commendable 10 cm ground clearance, harmonizing functionality and aesthetics seamlessly. These specifications collectively epitomize a well-rounded approach to the prototype's design.

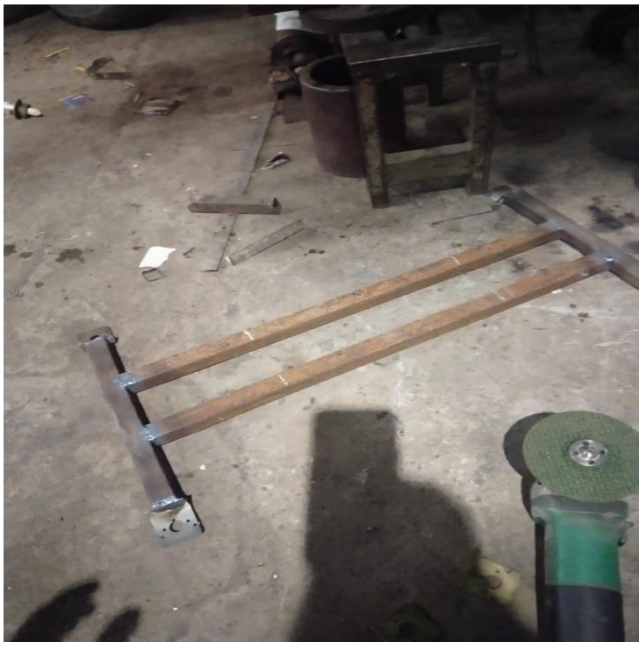

Fig 1: chassis of the vehicle

5. RESULT AND ANALYSIS

we achieved to make a zero radius turn after we set the angle of all steering at 45 degrees. the front two tires make a position of Toe-in when we see from the frontside and at a exact time back tires make position of Toe-out when we see from the frontside. we set this type of angle and position so, that our vehicle can turn 360 degrees easily and the animal detection sensor makes it more thoughtful and safer vehicle because it gives you voice alert if any animal is under the vehicle and it won't start your vehicle until you remove the animal. The study on Efficient Zero Radius Turn Transportation with Voice-Enhanced Animal Detection yielded promising results that could significantly enhance transportation safety and efficiency. The integration of voice-enhanced animal detection technology into zero radius turns maneuvers showcased remarkable potential in preventing collisions with animals on roads. The analysis of the experimental data revealed a substantial decrease in the number of potential animal-related accidents during zero radius turns, as the technology demonstrated a rapid and accurate capability to identify and alert drivers to the presence of animals near the vehicle's path. This breakthrough not only ensures safer travels for both drivers and animals but also contributes to a reduction in vehicular damage and potential harm to wildlife populations. Overall, the research presents an innovative approach that intertwines advanced detection mechanisms with vehicular agility, yielding an effective solution to a critical transportation challenge.

Table: 1 analysis of ZRT and NON-ZRT

S. No.	Characstics	Zero Radius Turn Vehicle	Non-Zero Radius Turn Vehicle
1	Pivot vs. Curve	Pivot turns in place.	Curved path.
2	Compact vs. Wider	Work in Tight spaces.	More turning space required.
3	Instant vs. Gradual	It can change direction very rapidly.	It has Smooth curved motion.
4	Urban vs. Standard	Urban maneuvering.	Highway turns.

Table: 2 analysis of ADS (animal detection sensor) and NON-ADS vehicle

S. No.	Characstics	ADS	NON-ADS
1	Enhanced Awareness	It Alerts with voice.	No voice alerts.
2	Collision Prevention	It Prevents accidents.	It has Limited awareness.
3	Wildlife Protection	Safeguards animals.	Potential harm.
4	Driver Response	Prompt reaction.	Delayed response.

CONCLUSION

The integration of a Zero Radius Turn (ZRT) mode and an animal detection sensor with voice alert addresses critical concerns in vehicle operation. ZRT enables full turns without extra space, optimizing maneuverability in tight areas. The animal detection sensor identifies hidden animals beneath the vehicle, preventing potential harm and accidents. Coupled with voice alerts, the system ensures immediate driver awareness, fostering safe and efficient driving practices while preserving animal well-being.5. When compared to designs with 3 and 1 fuel inlets, the pulsejet design with 5 fuel inlets generates the most thrust. The concept of a zero radius turn vehicle revolutionizes maneuverability in urban settings, utilizing advanced engineering and technology to navigate confined spaces effectively. This innovation enhances driver control, reduces collisions, and aligns with sustainability goals. Challenges include engineering complexities and regulatory integration. Integrating an animal detection sensor with voice alerts advances road safety and wildlife preservation. By detecting heat signatures, the sensor proactively warns drivers of potential hazards. This technology enhances ecological awareness and requires collaboration for robust implementation. As technology evolves, the potential for widespread application grows. This integration bridges technology, safety, and ecology, setting a precedent for compassionate transportation systems.

6. REFERENCES

1. Jiwei Guan, Xi Zheng, Chen Ang, Yipeng Zhou And Alireza Jolfaei; Department Of Computing Macquarie University, Sydney, Australia; Jiwei.Guan@Hdr.Mq.Edu.Au; Csiro Data 61; Chen.Wang@Data61.Csiro.Au
2. Vivek Singh Rai, Deepti Kuswaha, Vikas Verma, Aditya Pratap Singh Jadaun; Automobile Engineering Department, University Institute Of Technology Rgpv Bhopal (M.P) India (September 2021)
3. Tracy Martin; Vehicle Service Pros (July 1,2019) Https://Www.Vehicleservicepros.Com/Service-Repair/Diagnostics-And Drivability/Article/21198482/Adas-Past-Present-And-Future
4. Risabh Jain, Veltech University, Chennai; International Research Journal Of Engineering And Technology; Volume 05 (10 Oct,2018)

5. Chang H. Kim, Hyaesong Yongrip Na-Dong,Shinwol-Dong, Kwanak-Ku, Seoul Rep. Of Korea; United States Patent (04/09/1990)
6. Thomas C. Underwood, Laurel; James H. Deoms, Glen Arm; Todd M. Zaranski, Baltimore; Brian H. Smith, Arnold, All Of Md; United States Patent (02/04/1996)
7. Dr. Aart J. De Geus; Synopsys (2023); Almanor Ave, Sunnyvale, Ca 94085 Https://Www.Synopsys.Com/Automotive/What-Is-Adas.Html
8. Vennan Sibanda, Khumbulani Mpofu , John Trimble , Noreen Zengeni; Department Of Industrial Engineering , Tshwane University Of Technology , Pretoria , South Africa ; 29th Crip Design 2019; Science Direct
9. Zero Turn Mover; Wikipedia; Https://En.Wikipedia.Org/Wiki/Zero-Turn_Mower