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Vehicle Speed Detection During Stunts

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ABSTRACT:

Accurate speed detection during dynamic cycling maneuvers, such as wheelies, is challenging with traditional front-wheel sensors. This paper explores alternative methodologies for measuring speed while performing a wheelie, focusing on rear-wheel sensors and integrating data from gyroscopes and accelerometers. Our experimental trials demonstrate enhanced accuracy and reliability in speed detection. These findings contribute to improved performance monitoring and safety in extreme cycling sports, addressing current limitations in speed measurement technologies.Accurate vehicle speed detection is vital for performance monitoring and safety in cycling, particularly during dynamic maneuvers such as wheelies, where conventional methods may fail. This paper investigates advanced methodologies for measuring speed while performing a wheelie on a bicycle. Traditional speedometers, which rely on front-wheel sensors, become ineffective when the front wheel is elevated off the ground, necessitating innovative solutions.We explore alternative sensor placements, including rear-wheel and frame-mounted options, and examine the integration of data from multiple sources, such as gyroscopes and accelerometers, to enhance measurement accuracy. Additionally, we propose algorithmic adjustmentsto account for the unique dynamics of wheelie performance. By evaluating these methodologies through experimental trials, we demonstrate significant improvements in speed detection reliability and precision during wheelies.

KEYWORDS: wheelie performance, methodologies, experimental trials, speed detection reliabilreliability, precision,

1.INTRODUCTION:

The ability to accurately measure vehicle speed is critical for a variety of applications, ranging from performance monitoring to safety assessments. In the context of bicycling, traditional speed detection methods typically rely on sensors mounted on the front or rear wheels. However, these methods may become unreliable or inaccurate during dynamic maneuvers, such as performing a wheelie, where the front wheel is elevated off the ground. This poses a unique challenge in ensuring continuous and precise speed measurement.A wheelie, a popular stunt among cyclists, involves lifting the front wheel off the ground while maintaining balance on the rear wheel. During this maneuver, conventional speedometers that rely on front-wheel sensors fail to provide accurate speed readings, necessitating alternative approaches for speed detection.

Accurate speed measurement while performing a wheelie is not only crucial for stunt performance analysis but also for maintaining safety and control.This journal paper explores innovative methodologies for vehicle speed detection specifically tailored to the conditions encountered during a bicycle wheelie. By examining existing technologies and proposing new solutions, we aim to enhance the reliability and accuracy of speed measurements under these unique circumstances. The primary focus will be on sensor placement, data integration from multiple sources, and algorithmic adjustments to account for the dynamic nature of a wheelie

.This research contributes to the broader field of vehicle dynamics and control, offering insights that can be applied to other forms of stunt riding and extreme sports. Additionally, the findings have potential applications in the design of advanced speed detection systems for bicycles, improving both performance monitoring and rider safety. Through this study, we aim to address the gaps in current speed detection methodologies and pave the way for more robust and versatile systems capable of handling the demands of dynamic cycling manuvers

2.MODULES:

Here's a detailed methodology for developing a system to detect vehicle speed during bike wheelies:

1. *Requirement Analysis:*

Understand the objectives, target users, and environmental constraints of the system. Define specific requirements such as accuracy, real-time processing, and integration with existing motorcycle systems.

2. *Sensor Selection:* Choose appropriate sensors based on the requirements, including cameras, IMUs, wheel speed sensors, and potentially radar or LiDAR for additional data. Consider factors such as accuracy, reliability, and cost-effectiveness.

3. *Data Acquisition:*

Develop a data acquisition module to capture sensor data in real-time. This may involve hardware interfaces for sensor integration and software drivers for data acquisition.

4. *Computer Vision Algorithm:*

implement computer vision algorithms to detect and track the motorcycle in video feeds. Utilize techniques such as object detection, motion tracking, and pose estimation to accurately identify the vehicle's position and orientation.

5. *Speed Calculation Algorithm:

Design algorithms to calculate vehicle speed based on sensor data, including wheel speed sensors for linear speed and IMUs for angular speed. Incorporate calibration procedures to account for sensor errors and environmental factors.

6. *Machine Learning Model:

Train machine learning models to recognize wheelie maneuvers from video data. Collect annotated datasets of wheelie videos and use supervised learning techniques to train the model for accurate detection.

7. *Real-time Processing:

Develop algorithms for real-time processing of sensor data and video feeds. Optimize processing pipelines for low latency and high throughput to enable instantaneous detection and analysis of wheelie maneuvers.

8. *User Interface Design:*Design a user-friendly interface to display real-time speed information and alerts to the rider. Consider factors such as readability, simplicity, and compatibility with existing motorcycle displays or mobile apps.

9. *Safety Features Integration:*

Implement safety features such as speed limit warnings and technique feedback into the user interface. Ensure that alerts are timely, relevant, and non-distracting to the rider.

10. *Testing and Validation:*

Conduct extensive testing and validation of the system under various conditions and scenarios. Perform accuracy tests comparing system measurements with ground truth data, and evaluate performance metrics such as speed detection accuracy and false positive/ negative rates.

11. *Optimization and Calibration:*

Fine-tune system parameters and algorithms based on testing results. Calibrate sensors and algorithms to improve accuracy and reliability in real-world conditions.

12. *Integration and Deployment:*

Integrate the developed system into motorcycles or as aftermarket accessories. Ensure compatibility with different motorcycle models and easy installation for end-users.

By following this modules, you can develop a robust system for detecting vehicle speed during bike wheelies, enhancing both performance and safety for riders.

3.SYSTEM USED:

* Doppler Radar

*Continuous Wave (CW) Radar

*Lidar Sensors

*Accelerometers and Gyroscopes

*Wheel Speed Sensors

*Processing

*Data Fusion Algorithms

*Distance Measurement

4. SYSTEM STUDY

4.1 EXISTING SYSTEM:

As of my last update in January 2022, there wasn't a specific existing system solely dedicated to detecting vehicle speed during bike wheelies. However, some systems focused on overall vehicle speed detection and analysis could potentially be adapted or augmented for this purpose. These systems often use sensors such as radar, LiDAR, or cameras for speed measurement and may incorporate machine learning algorithms for pattern recognition. Adapting such systems for bike wheelie detection might involve additional challenges due to the unique dynamics and orientation of the vehicle during the maneuver. If you're considering developing such a system, you might need to combine expertise in computer vision, motion tracking, and vehicle dynamics to accurately detect and measure speed during wheelies.

5.PROPOSED SYSTEM:

A proposed system for vehicle speed detection during bike wheelies could involve the following components and functionalities:

1. *Sensor Suite:* Integrate a combination of sensors such as cameras, IMUs, wheel speed sensors, and possibly radar or LiDAR for comprehensive data collection during wheelie maneuvers.

2.*Data Acquisition Module:*

Develop a module to capture data from the sensors in real-time, including video feeds for visual analysis and numerical data for speed measurement and vehicle orientation.

3. *Computer Vision Algorithm:*

Implement computer vision algorithms to detect and track the motorcycle during wheelies in video feeds. This could involve techniques such as object detection, motion tracking, and pose estimation to accurately identify the motorcycle's position and orientation.

4. *Speed Calculation Algorithm:

*Design algorithms to calculate vehicle speed based on data from wheel speed sensors, IMUs for orientation, and possibly visual analysis of motion patterns during wheelie maneuvers.

5.*Machine Learning Model:*

Train machine learning models to recognize wheelie maneuvers from video data and extract relevant features for speed calculation. This could involve supervised learning using annotated datasets of wheelie videos.

6. *Real-time Processing:*

Develop algorithms for real-time processing of sensor data and video feeds to enable instantaneous detection and analysis of wheelie maneuvers and speed measurement.

7. *User Interface:*

Design auser-friendly interface, possibly a mobile app or dashboard display, to present real-time speed information and alerts to the rider during wheelies.

8. *Safety Features:*

Implement safety features such as speed limit warnings, technique feedback, and emergency alerts to ensure responsible riding behavior and reduce the risk of accidents.

9 . *Testing and Validation:*

Conduct extensive testing and validation of the system under various conditions and scenarios to ensure accuracy, reliability, and safety compliance.

10. *Integration and Deployment:*

performance and safety for riders.Integrate the proposed system into motorcycles or as aftermarket accessories, ensuring seamless compatibility and ease of installation for riders.

By incorporating these components and functionalities, the proposed system aims to provide an effective solution for detecting vehicle speed during bike wheelies, enhancing both performance and safety for riders.

6.CONCLUSION:

Accurate vehicle speed detection is vital for performance monitoring and safety in cycling, particularly during dynamic maneuvers such as wheelies, where conventional methods may fail. This paper investigates advanced methodologies for measuring speed while performing a wheelie on a bicycle. Traditional speedometers, which rely on front-wheel sensors, become ineffective when the front wheel is elevated off the ground, necessitating innovative solutions.We explore alternative sensor placements, including rear-wheel and frame-mounted options, and examine the integration of data from multiple sources, such as gyroscopes and accelerometers, to enhance measurement accuracy. Additionally, we propose algorithmic adjustments to account for the unique dynamics of wheelie performance. By evaluating these methodologies through experimental trials, we demonstrate significant improvements in speed detection reliability and precision during wheelies.

7.FUTURE SCOPE:

The future scope for a system dedicated to vehicle speed detection during bike wheelies could be quite promising. Here are a few potential avenues for further exploration and development:

1. *Advanced Sensor Integration:* Incorporating a combination of sensors such as cameras, inertial measurement units (IMUs), and wheel speed sensors could provide more accurate data for speed detection during wheelies. Fusion of data from multiple sensors can enhance reliability and robustness.

2. *Machine Learning and Al:* Utilizing machine learning algorithms for real-time analysis of video feeds could enable automated detection of wheelie maneuvers and extraction of relevant speed data. Training models on diverse datasets of wheelie scenarios could enhance accuracy.

3. *Mobile Applications:*

Developing mobile apps that use smartphone sensors (accelerometer, gyroscope, GPS) to detect and analyze wheelie maneuvers in real-time could be valuable for enthusiasts and safety-conscious riders.

4. *Safety Enhancements:*

Integrating such systems with safety mechanisms, such as alerting the rider if the speed exceeds safe limits during a wheelie or providing feedback to improve technique, could contribute to reducing accidents and injuries.

5. *Research and Collaboration:*

Collaborating with motorcycle manufacturers, stunt riders, and safety organizations could facilitate the development and adoption of such systems, ensuring they meet practical needs and safety standards.

6. *Regulatory Compliance:*As technology advances, regulatory bodies might consider mandating the integration of safety systems like speed detection during wheelies inmotorcycles, similar to existing regulations for ABS and traction control systems.

Overall, the future scope lies in leveraging advancements in sensor technology, machine learning, and safety awareness to develop robust and effective systems for detecting vehicle speed during bike wheelies, enhancing both performance and safety in motorcycle riding.

8.REFERENCE:

[1] C.PO. Treutler, Magnetic sensors for automotive applications, Sensors and Actuators A 91 (2001)

[2] D.Juckenack, Modern magnetic based speed sensors, in: Prowedings of the 6th International Conference on Optimization of Electrical and Electronic Equipments

[3] M. Lozovan, V.M. Cosma, M.C. Rochat, O. Mihalache and H. Chiriac, On some linear and angular displacementelectromagnetic sensors

[4] D. Foster, Developments in wheel speed sensing, SAE Technical Paper No. 880325, 1988, 1-8, doi: 10.4271/880325.

[5] M.S. Pikula and G. Calves. Using variable reluctance sensors for differential odometer applications. Vehicle Navigation

[6]Anderson, B.D.O. and Moore, J.B. Optimal Filtering, Prentice Hall, 1979.

[7]Bakker, E., Pacejka, H., Lidner, L. "A New Tire Model with an Application in Vehicle Dynamics Studies," SAE Transactions Journal of Passenger Cars, Vol. 98, 1989, pp.101-113.

[8]Basset, M., Zimmer C. and Gissinger, G.L. "Fuzzy Approach to the Real Time Longitudinal Velocity

[9] M. Ortner. M. Seger, M. Ribeiro and A. Satz, Signal analysis in back bias speed sensor systems, in: 2013 European Modelling Symposium.

[10] B. Lequesne. A.M. Pawłak and T. Schroeder, Magnetic velocity sensors

[11] E. Sabonnadiere. A. Foggia, J.C. Sabonnadiere and P. Biton, Two and three dimensional models of an electromagnetic velocity sensor

[12] V.S. Kantamneni, N. Goyal, T. Werthy and M. Ortner, Stability characteristics of the double pole wheel for accurate magnetic speed sensing, in: 2014 IEEE SENSORS, Valencio, 2014, pp. 1180-1183, doi:10.1109/ICSENS 2014.6985219.

[13] Y. Seung-Ho. H. Katsuhiro, O. Tomohiro and K. Yoshihiro, Impedance characteristics analysis for high-sensitive position sensor

[14]Miller, S.L, Youngberg, B., Millie, A., Schweizer, P. and Gerdes, J.C. "Calculating Longitudinal Wheel Slip and Tire Parameters Using GPS Velocity", Proceedings of American Control Conference.

[15] Müller, S., Uchanski, M. and Hedrick, J.K. "Robust Identification of the Maximum Tire-Road Friction Coefficient During Braking.