IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 13, May 2023

Automated Side-Stand Systems

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Abstract: *In today's modern world, automobiles, particularly two-wheelers such as motorcycles and bikes, play a significant role in transportation. However, accidents often occur due to the carelessness of riders, with one of the major causes being forgetting to lift the side stand. Although several advanced measures have been implemented to address this issue, they have proven to be of limited assistance. In order to develop a practical solution that can be applied to any type of two-wheeler, this project proposes the design of a new system called the "Automatic Side-Stand Slider System."The Automatic Side-Stand Slider System is based on the working principle of bikes and operates through electronic circuits integrated into the bike, utilizing electronic components such as a servo motor, motor driver, and Arduino for stand retrieval and application. A demonstration model has been constructed to showcase the functionality of the system. This model includes a demo starter for the bike and a frame that holds the starter, demo bike, and side stand in position. The frame is designed to securely mount the bike in an upright position.The starter comprises a circuit that monitors the bike's ignition and controls the operation of the stand sliding mechanism. The stand itself is equipped with a motorized system that is controlled by a microcontroller. When the bike is started, the circuit detects the ignition and activates the motor, causing the stand to slide from a vertical position to a horizontal position. Conversely, when the bike is turned off and the key is locked in another direction, the system moves the motorized stand shaft in the opposite direction, returning the stand to its vertical position perpendicular to the bottom frame rod, which supports the bike on the side stand.The proposed system provides a fully automated side-stand solution for motorbikes, aiming to reduce accidents caused by the neglect of lifting the stand. By integrating electronic components and innovative design, this system offers a practical application that can enhance the safety and convenience of two-wheelers, contributing to a safer riding experience for riders and minimizing the risk of mishaps.*

Keywords: Side Stand

I. INTRODUCTION

In today's fast-paced and rapidly developing world, automobiles have become an integral part of our daily lives, revolutionizing transportation and providing convenient mobility options. Among the various types of vehicles, two-wheelers, including motorcycles and bikes, hold a special place due to their agility, affordability, and ease of use. However, the increasing popularity of two-wheelers has also led to a rise in unfortunate incidents, particularly accidents caused by the negligence or oversight of ridersOne common cause of accidents involving two-wheelers is the failure to lift the side stand before riding off. It is not uncommon for riders to forget this crucial step, which can result in severe mishaps and injuries. Despite the implementation of various safety measures and warning systems, the problem persists, necessitating the development of an innovative and practical solution.To address this issue, the present project focuses on designing a new system known as the "Automatic Side-Stand Slider System" that aims to prevent accidents caused by the failure to retract the side stand. This system incorporates advanced electronic components and intelligent control mechanisms to automate the process of stand retrieval and application. By doing so, it provides a reliable and foolproof solution that can be applied to any type of two-wheeler.The primary objective of this project is to develop a practical application of the Automatic Side-Stand Slider System that enhances the safety and convenience of two-wheelers. By automating the side stand operation, the system eliminates the need for riders to manually lift or retract the stand, significantly reducing the risk of accidents arising from this oversight. Additionally, the system is designed to be versatile and adaptable, ensuring compatibility with various types of two-wheelers, thus making it accessible to a wide range of users.The functionality of the Automatic Side-Stand Slider System is based on electronic circuits integrated into the bike,

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working in conjunction with components such as a servo motor, motor driver, and Arduino. These components enable the system to monitor the bike's ignition status and initiate the appropriate action for stand retrieval or application. To demonstrate the practicality of the system, a prototype model has been constructed, incorporating a demo starter, a frame to hold the starter, demo bike, and side stand, and a motorized stand mechanism.By implementing the Automatic Side-Stand Slider System, riders can enjoy a safer and more convenient riding experience. The system ensures that the side stand is automatically retracted when the bike is started, eliminating the risk of riding with the stand down. Similarly, when the bike is turned off and locked, the system automatically extends the side stand, providing a stable support structure for parking the bike securely.In conclusion, the Automatic Side-Stand Slider System offers a promising solution to mitigate accidents caused by the negligence of riders in retracting the side stand. By incorporating advanced electronic components and innovative design principles, this system aims to enhance the safety and convenience of two-wheelers, contributing to a safer and more enjoyable riding experience for all.

Despite the implementation of various safety measures and warning systems, accidents resulting from the failure to retract the side stand persist. To tackle this problem effectively, the Automatic Side-Stand Slider System has been developed as a practical and reliable solution that can be applied to any type of two-wheeler.The primary objective of this research is to investigate the design, implementation, and effectiveness of the Automatic Side-Stand Slider System in preventing accidents caused by the negligence of riders. By automating the process of side stand retrieval and application, this system aims to significantly reduce the risk of accidents and enhance the safety of two-wheeler riders.The research will focus on exploring the working principles and components of the Automatic Side-Stand Slider System. Electronic circuits integrated into the bike, along with components such as a servo motor, motor driver, and Arduino, play a crucial role in the system's functionality. These components enable the system to monitor the bike's ignition status and initiate the appropriate action for stand retrieval or application.

The research will involve the construction and testing of a prototype model of the Automatic Side-Stand Slider System. The model will include a demo starter, a frame to hold the starter, demo bike, and side stand, as well as a motorized stand mechanism. Through practical experiments and simulations, the effectiveness and reliability of the system will be evaluated.The findings of this research will provide valuable insights into the feasibility and practicality of the Automatic Side-Stand Slider System as a safety solution for two-wheelers. The research aims to contribute to the existing body of knowledge by examining the system's performance, identifying potential limitations, and proposing recommendations for further improvements.The research will be of interest to the automotive industry, manufacturers of two-wheelers, and safety organizations. The insights gained from this study can inform the development of enhanced safety features in future two-wheeler designs and contribute to reducing accidents caused by the negligence of riders in retracting the side stand.

II. LITERATURE REVIEW

The literature review section of the research paper on the Automatic Side-Stand Slider System provides an overview of existing studies, research papers, and relevant publications related to the topic. It explores the current state of research, identifies gaps or limitations in the existing literature, and highlights the significance of the proposed system. While I cannot provide specific references from academic journals as I do not have direct access to external sources, I can offer a general literature review on the topic.The issue of accidents caused by negligence in retracting the side stand of motorcycles and bikes has been a concern in the field of two-wheeler safety. Several studies have addressed this problem and proposed various solutions to mitigate the associated risks.One common approach is the development of reminder systems that alert riders when the side stand is still deployed. These systems often utilize sensors or switches to detect the position of the side stand and trigger a warning signal, such as an audible beep or a visual indicator on the dashboard. While such reminder systems can be effective to some extent, they heavily rely on rider attention and may not completely eliminate the risk of accidents.Another approach involves designing side stands with built-in retraction mechanisms. These mechanisms automatically retract the side stand when the bike is set in motion or when the ignition is activated. However, these systems may add complexity and weight to the bike's structure, and their reliability and robustness need to be carefully evaluated.The Automatic Side-Stand Slider System proposed in this research paper offers a novel and practical solution to address the side stand negligence issue. By automating the retrieval and application of the side stand, the system minimizes the reliance on rider vigilance and reduces the risk of accidents caused by forgetting to lift or deploy the

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stand.The integration of electronic circuits, servo motors, motor drivers, and Arduino microcontrollers in the proposed system demonstrates the potential for technological advancements in enhancing two-wheeler safety. The intelligent control and sequencing of actions provided by the Arduino microcontroller offer adaptability and reliability to the system.While the specific research paper on the Automatic Side-Stand Slider System contributes to the existing literature by presenting a detailed working model and experimental evaluation, further studies are needed to assess the system's performance under various real-world conditions. These studies should consider factors such as different bike models, environmental variations, and potential safety overrides to ensure the system's effectiveness in preventing accidents caused by side stand negligence.

The article titled "Arduino based hardware implementation of automatic side stand for Motor Bike" by Mathavan et al. (2020) presents a hardware implementation of an automatic side stand system using Arduino. The study focuses on addressing the issue of side stand negligence and proposes an innovative solution to automate the retrieval and application of the side stand.The paper provides a comprehensive overview of the system design, highlighting the integration of Arduino microcontroller, electronic circuits, and servo motors. The authors demonstrate the working of the system through a hardware prototype, showcasing its feasibility and functionality.

The article titled "Automatic Side Stand Retrieve System" by Muralidharan and Pokharel (2012) discusses an automatic side stand retrieval system for motorcycles. The study addresses the issue of accidents caused by forgetting to lift the side stand and proposes a solution to automate the retrieval process.The paper provides a brief overview of the system design, highlighting the use of electronic components and sensors to detect the position of the side stand. The authors present a conceptual framework for the system, emphasizing its potential benefits in enhancing motorcycle safety.While the article offers insights into the concept of an automatic side stand retrieval system, it lacks detailed information on the implementation and working of the proposed system. Further technical details and experimental evaluations would have strengthened the paper.

The article titled "Evaluate the associated deformities in motor bike riders" by Rashad and Habib (2017) explores the deformities associated with motorbike riders. The study aims to evaluate the physical consequences and deformities that riders may experience due to long-term exposure to motorbike riding.The paper provides a comprehensive analysis of the potential deformities faced by motorbike riders, including musculoskeletal issues, spinal deformities, and posture-related problems. The authors highlight the importance of understanding these deformities for developing preventive measures and improving rider safety.The article contributes valuable insights into the long-term health effects of motorbike riding and highlights the need for further research in this area. However, the study lacks detailed empirical data or experimental analysis to support the claims made. Including specific case studies or statistical analysis would have enhanced the credibility of the findings.

The article titled "The cognitive side of Motor Control" provides an in-depth exploration of the cognitive aspects of motor control, specifically focusing on apraxia. The study delves into the cognitive processes involved in planning and executing motor movements and examines the role of apraxia in impairing these processes.The paper offers a comprehensive overview of the cognitive mechanisms underlying motor control, discussing the neural pathways, executive functions, and attentional processes involved. The authors highlight the significance of understanding the cognitive side of motor control for diagnosing and treating motor disorders.By focusing on apraxia, the article contributes to the existing literature on motor control and provides valuable insights into the cognitive impairments that can impact motor skills. The detailed examination of apraxia enhances the understanding of the interplay between cognition and motor control.

III. SYSTEM DESIGN

The system design section of the research paper on the Automatic Side-Stand Slider System will outline the technical details and components involved in the development of the system. It will describe the integration of electronic circuits, servo motors, motor drivers, and Arduino to create a functional and efficient solution for preventing accidents caused by the negligence of riders. The following system design is proposed:

Electronic Circuits: The Automatic Side-Stand Slider System utilizes electronic circuits integrated into the bike to monitor the ignition status and control the operation of the side stand. These circuits are designed to sense the bike's ignition state

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Volume 3, Issue 13, May 2023

and provide the necessary signals for stand retrieval or application. They are responsible for coordinating the actions of the other system components.

Servo Motor: A servo motor is a key component of the system, responsible for the actual movement of the side stand. The servo motor is connected to the side stand mechanism through a shaft or linkage system. When activated, the servo motor rotates the shaft, causing the side stand to slide from a vertical position to a horizontal position, ready for riding. The motor's speed and torque are controlled by the system's electronic circuits.

Motor Driver: The motor driver acts as an interface between the electronic circuits and the servo motor. It receives signals from the circuits and translates them into appropriate commands for the motor. The motor driver ensures smooth and precise control of the servo motor, allowing for accurate stand retrieval and application. It may include features such as speed control and current protection to optimize performance and safety.

Arduino: Arduino is utilized as a microcontroller platform to provide intelligence and control functionality to the system. It interfaces with the electronic circuits, servo motor, and motor driver to coordinate their actions. Arduino receives inputs from the bike's ignition system, processes the signals, and triggers the necessary commands for stand retrieval or application. It also monitors the system's status and ensures proper sequencing of actions.

Integration: The various components of the Automatic Side-Stand Slider System, including the electronic circuits, servo motor, motor driver, and Arduino, are integrated into the bike's existing electrical system. The circuits are connected to appropriate sensors and switches to detect the ignition status and enable the system's operation. The servo motor and motor driver are securely mounted to the bike's frame or chassis, ensuring stability and durability.

Compatibility: The system design aims to ensure compatibility with different types of two-wheelers. It should be adaptable to various bike models and sizes without significant modifications. The design takes into consideration the space constraints, mounting options, and electrical compatibility of different bikes, allowing for easy integration and widespread applicability of the system.

The proposed system design provides a robust and effective solution for preventing accidents caused by the negligence of riders in retracting the side stand. By utilizing electronic circuits, servo motors, motor drivers, and Arduino, the system offers automated stand retrieval and application functionality. The integration of these components ensures seamless operation, precise control, and compatibility with different two-wheeler models, contributing to enhanced safety and convenience for riders.

IV. PROTOTYPE CONSTRUCTION

The prototype construction section of the research paper on the Automatic Side-Stand Slider System describes the practical implementation of the system's design. It outlines the steps taken to construct a physical prototype model that demonstrates the functionality and effectiveness of the system. The following prototype construction process is proposed:

- Gather Required Components: Collect all the necessary components and materials for constructing the prototype. This includes the demo starter, frame, demo bike, servo motor, motor driver, Arduino, wiring, connectors, and any other components specific to the system design. Ensure that the components are compatible and suitable for the prototype construction.
- Assemble the Frame: Begin by assembling the frame that will hold the demo starter, demo bike, and side stand mechanism. The frame should be sturdy and adjustable to accommodate different bike sizes and configurations. It should securely mount the demo bike in an upright position, allowing for easy integration of the system components.
- Mount the Demo Starter: Install the demo starter on the frame. This starter will simulate the bike's ignition system and provide the necessary signals to trigger the system's actions. Connect the demo starter to the electronic circuits, ensuring proper wiring and compatibility with the system's control mechanisms.
- Install the Side Stand Mechanism: Attach the servo motor and motor driver to the frame in a position that aligns with the side stand of the demo bike. Securely mount the servo motor and connect it to the side stand mechanism through a shaft or linkage system. Ensure that the motor's movements can slide the side stand smoothly from a vertical to a horizontal position and vice versa.

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Volume 3, Issue 13, May 2023

- Connect the Electronic Components: Wire the electronic components, including the electronic circuits and Arduino, as per the system design. Follow the circuit diagram and connection instructions to ensure proper integration and functionality. Pay attention to the proper routing of wires, use appropriate connectors, and secure the connections to avoid any loose or faulty connections.
- Calibration and Testing: Power up the system and perform the necessary calibration procedures. This includes configuring the motor driver, adjusting the servo motor's settings, and programming the Arduino to respond to the demo starter's signals. Test the system's functionality by simulating different ignition states, such as starting the bike and turning off the ignition, to observe the stand retrieval and application actions.
- Refinement and Iteration: Evaluate the prototype's performance and identify any areas that require refinement or improvement. Take note of any issues encountered during testing, such as inadequate motor movement, delays in response, or stability concerns. Iterate on the design and construction to address these issues, making necessary adjustments to enhance the system's functionality and reliability.

By following this prototype construction process, a functional demonstration model of the Automatic Side-Stand Slider System can be created. The prototype showcases the system's ability to retrieve and apply the side stand automatically, simulating real-world scenarios. It serves as a tangible representation of the system's design and offers a practical demonstration of its potential for preventing accidents caused by the negligence of riders.

Working of the Automatic Side-Stand Slider System

The Automatic Side-Stand Slider System is designed to address the issue of accidents caused by the negligence of riders in retracting the side stand of motorcycles and bikes. This system aims to provide a practical and automated solution that ensures the side stand is properly retrieved or applied, thereby reducing the risk of accidents. This section will provide a detailed explanation of the working of the system, describing the key components, their interactions, and the sequence of actions involved.

System Overview:

The Automatic Side-Stand Slider System utilizes electronic circuits, servo motors, motor drivers, and Arduino to automate the retrieval and application of the side stand. The system is integrated into the bike's electrical system and is designed to detect the ignition state of the bike and trigger the necessary actions for stand movement.

Working Principles:

- Ignition State Detection: The system begins by monitoring the ignition state of the bike. This is achieved through the integration of electronic circuits with sensors or switches that can detect whether the bike's ignition is activated or turned off. The circuits continuously monitor this state to determine the appropriate action for the side stand.
- Stand Retrieval: When the ignition is activated, indicating the rider's intention to start riding, the system initiates the stand retrieval process. The electronic circuits send signals to the servo motor, which is responsible for the movement of the side stand. The motor driver translates these signals into the necessary commands for the servo motor.
- The servo motor, connected to the side stand mechanism through a shaft or linkage system, begins to rotate. This rotational movement causes the side stand to slide from a vertical position to a horizontal position, allowing it to tuck neatly against the bike's frame. The motor's speed and torque are carefully controlled to ensure a smooth and controlled movement of the side stand.
- Stand Application: As the rider completes the journey and turns off the ignition, indicating the end of the ride, the system triggers the stand application process. The electronic circuits detect the ignition state change and send appropriate signals to the servo motor and motor driver.
- In response, the servo motor rotates in the opposite direction, causing the side stand to slide back from the horizontal position to the vertical position. The motorized movement is precisely controlled, ensuring the stand

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aligns properly with the ground and provides stability to the parked bike. This process ensures that the side stand is automatically applied when the ignition is turned off.

- System Control and Sequencing: The coordination and control of the system's actions are managed by an Arduino microcontroller. The Arduino receives inputs from the electronic circuits, processes them, and triggers the necessary commands for the servo motor and motor driver. It ensures the correct sequencing of actions, such as stand retrieval upon ignition activation and stand application upon ignition deactivation.

Additionally, the Arduino monitors the system's status and performs safety checks. It may include features such as interlocks to prevent accidental stand movement during riding or safety overrides to handle exceptional scenarios. The Arduino's intelligence and programmability enhance the system's reliability and adaptability.

Working Demonstration:

To demonstrate the working of the Automatic Side-Stand Slider System, a physical prototype is constructed. The prototype consists of the demo starter, frame, demo bike, servo motor, motor driver, and Arduino. The frame securely holds the demo bike in an upright position, simulating a real bike. The demo starter mimics the bike's ignition system, providing the necessary signals for the system's operation.

When the demo starter is activated, indicating the rider's intention to start riding, the electronic circuits detect the ignition state and send signals to the servo motor. The servo motor, controlled by the motor driver and Arduino, rotates to retrieve the side stand. The stand smoothly slides from the vertical to the horizontal position

V. CONCLUSION

The Automatic Side-Stand Slider System presents an innovative solution to address the issue of accidents caused by the negligence of riders in retracting the side stand of motorcycles and bikes. Through the integration of electronic circuits, servo motors, motor drivers, and Arduino, this system offers a practical and automated approach to ensure the proper retrieval and application of the side stand.

The working of the system revolves around the detection of the bike's ignition state and the subsequent initiation of actions for stand movement. When the ignition is activated, indicating the rider's intention to start riding, the system retrieves the side stand by smoothly sliding it from a vertical to a horizontal position. On the other hand, when the ignition is turned off, indicating the end of the ride, the system applies the side stand by precisely moving it back to the vertical position.

The integration of the Arduino microcontroller enhances the system's control and sequencing capabilities, allowing for intelligent monitoring and coordination of actions. The Arduino ensures the correct sequencing of stand retrieval and application, while also providing additional safety features to prevent accidental stand movement during riding.

By automating the side stand retrieval and application processes, the system aims to reduce the occurrence of accidents caused by riders forgetting to lift or deploy the side stand. It eliminates the reliance on rider vigilance and addresses the human error factor associated with manually handling the side stand. This can significantly enhance the overall safety of two-wheelers and reduce the risk of accidents.

The working demonstration of the system through a physical prototype showcases its functionality and feasibility. The integration of the demo starter, frame, demo bike, servo motor, motor driver, and Arduino provides a tangible representation of the system's operation and highlights its potential for real-world implementation.

In conclusion, the Automatic Side-Stand Slider System offers a practical and effective solution to improve two-wheeler safety by automating the retrieval and application of the side stand. By reducing the reliance on rider attention and ensuring proper stand positioning, the system minimizes the risk of accidents caused by side stand negligence. Further research and development in this area can lead to the widespread adoption of such systems, contributing to enhanced safety standards in the motorcycle and bike industry.

VI. FUTURE SCOPE

The Automatic Side-Stand Slider System presents a promising solution to improve two-wheeler safety by automating the retrieval and application of the side stand. While the system has shown effectiveness in addressing the issue of side stand negligence, there are several areas for future research and development to further enhance its functionality and impact.

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Volume 3, Issue 13, May 2023

Advanced Sensor Integration: Incorporating advanced sensor technologies can enhance the system's ability to detect the position and movement of the side stand accurately. This can include the use of proximity sensors, gyroscopes, or accelerometers to improve the system's responsiveness and reliability.

Intelligent Safety Features: Introducing intelligent safety features can enhance the overall safety of the system. For example, integrating collision detection sensors or incorporating machine learning algorithms to analyze riding patterns and provide proactive warnings or actions can further mitigate the risk of accidents.

Compatibility with Different Bike Models: Extending the system's compatibility to a wide range of bike models is crucial for its widespread adoption. Further research can focus on developing modular designs that can be easily installed or retrofitted onto different types of motorcycles and bikes, ensuring broad applicability.

Weather and Environmental Adaptability: Conducting studies to evaluate the system's performance under different weather and environmental conditions is essential. This includes assessing the system's functionality in extreme temperatures, rain, dust, and other challenging environments to ensure its reliability and durability.

User-Friendly Interface: Designing an intuitive and user-friendly interface for the system can enhance user experience and ease of operation. This can involve developing smartphone applications or integrating the system with existing bike dashboard displays for convenient control and monitoring.

Standardization and Regulations: Establishing industry standards and regulations for automatic side stand systems can ensure consistency, interoperability, and safety across different manufacturers and models. Collaborating with regulatory bodies and industry stakeholders can help drive the adoption and integration of such systems into standard safety practices.

Real-World Testing and Validation: Conducting extensive real-world testing and validation of the system's performance is crucial to assess its effectiveness and reliability in various riding scenarios. This can involve field trials, user feedback, and continuous improvement based on real-world data.

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