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Smart Electric Control For Two-Wheeler

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Abstract- This paper aims to enhance the efficiency of manual actuation and automation for the sliding of the side-stand to increase rider safety. In the rapidly evolving world of transportation, two-wheeler's (motorcycles and bikes) play a crucial role. The objective of the Automatic Side Stand Slider project is to design, develop, and implement an intelligent system for automatically deploying and retracting the side stand of a motorcycle. By automating this function based on predefined criteria and user preferences, the project aims to improve safety, convenience, and vehicle stability.

1. INTRODUCTION

Motorcycles offer riders an unparalleled sense of freedom and mobility, making them a popular choice for urban and long-distance travel. However, this convenience also comes with the responsibility of maintaining safety standards. One commonly overlooked yet essential component of motorcycle safety is the side stand. A side stand provides stability when parked, but if left deployed while riding, it can lead to serious accidents and mechanical damage.

The "**Automatic Bike Stand**" project introduces a smart and efficient solution to address this issue. By incorporating advanced sensors, motors, and control units, the system ensures automatic deployment and retraction of the side stand. The stand retracts as soon as the motorcycle starts moving and deploys securely when parked, minimizing the chances of accidents caused by human error. automation not only enhances safety.

When it comes to two-wheelers, crashes happen Collisions involving two-wheelers often result from excessive speed, failure to adhere to speed limits, and the absence of helmets. Additionally, one frequently overlooked yet significant cause of accidents is forgetting to retract the side stand while riding. Unlike other safety concerns, which have dedicated countermeasures, accidents caused by side stands lack comprehensive preventive measures. This oversight contributes to approximately 36% of fatalities in both rural and urban settings, highlighting the critical need for an automated solution.

Table 1: Cause of Accidents During The Year 2022-2023

Sr.No	The Accident's Cause	Accidents as a Percentage
1	Forgating to raise the side stand	36%
2	Does not maintain speed limit	38%
3	Does not obey trafic rule	22%
4	Others	04%

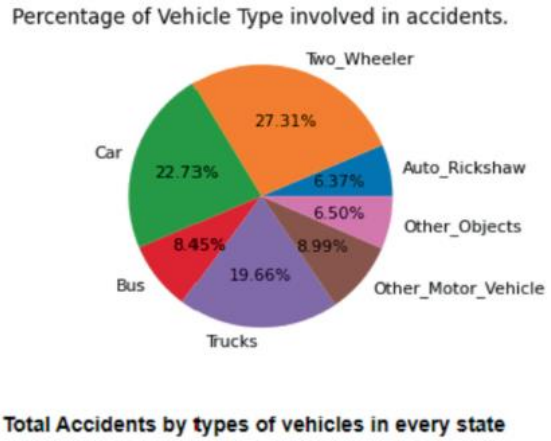


Fig.1: Types of vehicles involved in accidents

2.LITERATURE SURVEY

The "**Automatic Bike Stand**" project aims to develop a reliable and intelligent system for automating the deployment and retraction of a motorcycle's side stand. This innovation is designed to enhance rider safety, convenience, and overall vehicle stability.

Key Goals:

Enhanced Safety:

The automated system eliminates the risk of accidents caused by forgetting to retract or deploy the side stand. By integrating smart sensors, the system ensures the stand operates seamlessly based on the motorcycle's movement and status, significantly reducing potential hazards.

Improved Convenience:

Automating the side stand operation simplifies the rider's experience, particularly in frequent stop-and-go scenarios. By removing the need for manual adjustments, riders can focus entirely on their journey, making everyday commuting more effortless and stress-free..

The **Automatic Side Stand** Slider marks a significant technological breakthrough in motorcycle safety and convenience. By integrating sensors, actuators, and intelligent control mechanisms, this system automates the crucial task of side stand operation, offering riders a seamless and efficient solution.

Eliminating Common Safety Hazards :

One of the most common causes of motorcycle accidents is the failure to retract or deploy the side stand. The Automatic Side Stand Slider effectively mitigates this risk by ensuring that the stand automatically retracts before riding and deploys securely when the motorcycle stops. This intelligent automation significantly reduces the chances of tip-over accidents, enhancing overall rider safety.

User-Centric and Hassle-Free Design :

Designed with rider convenience in mind, the system eliminates the need for manual engagement of the side stand. Motorcyclists can park their vehicles effortlessly, without worrying about whether the stand is properly positioned. This streamlined operation minimizes rider error, making parking a simpler and more intuitive process.

Optimized Stability and Security :

Beyond convenience, the Automatic Side Stand Slider enhances the stability and security of parked motorcycles. The system intelligently adjusts the stand's position based on terrain conditions and motorcycle status, ensuring a secure hold even on uneven or sloped surfaces. By preventing accidental falls, it significantly improves the overall reliability and safety of the motorcycle, giving riders greater confidence in their vehicle's performance.

This mechanism allows the two-wheeler legs to be unfolded from their horizontal position to the vertical position and to force the mounting of the legs to a preset height that raises the two wheels and parks them up to their pre-set height, using the use of hydraulic cylinders or other methods such as Pneumatic Cylinders or Motorized Actuators. On the return path, the motor is reversed and, in the case of a hydraulically charged cylinder, the multiply inverses flow of the fluid, so the reversal of the operation sinks the stand to the previous position again and then unfolds it back to the horizontal position, which positions the two wheels ready to travel.

3. Methodology

Auto-Ignition and Battery Dependency in Modern Two-Wheelers Unlike older models that required a kick-start mechanism, modern motorcycles are equipped with auto-start or auto-ignition systems. These systems activate the engine as soon as the ignition key is turned on, eliminating the need for manual effort. The functionality of this system is entirely dependent on the motorcycle's battery, which powers the ignition and other electronic components.

Role of the Mechanical Side Stand

The mechanical side stand is a fundamental component of motorcycles, designed to provide stability and support when the bike is parked. It consists of a strong metal rod or lever that extends outward from the motorcycle's frame, touching the ground to prevent the bike from tipping over.

Construction and Durability

Mechanical side stands are typically crafted from high-strength materials such as steel or aluminum, ensuring durability and resistance to bending or deformation under the motorcycle's weight. They are designed to be robust and reliable, capable of handling varying loads and external forces without failure.

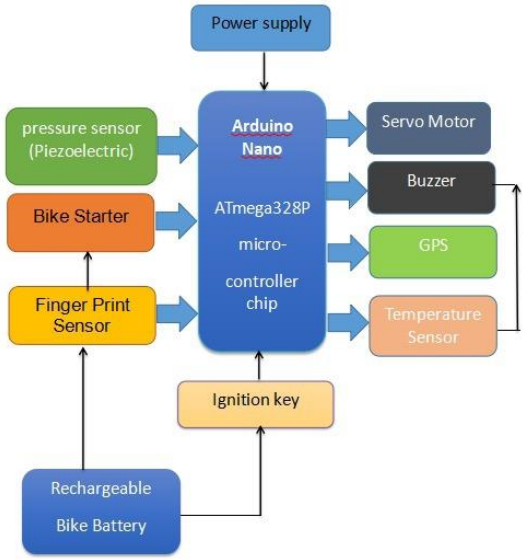
Operational Mechanism

When a rider parks the motorcycle, they manually engage the side stand by lowering it to the ground.

Fig:Mechanical side stand:

The components that are used for the fabrication of this model is shown in the table 2.

4. Block Diagram –



6.Working principle:

The Automatic Side Stand Slider operates
The Automatic Side Stand Slider functions by integrating a microcontroller, such as the Arduino Nano, which acts as the system's central processing unit. The microcontroller is programmed to analyze input signals from various sensors—including vehicle speed, side stand position, and terrain conditions—to determine when to deploy or retract the side stand.
Real-time data from accelerometers and position sensors enable the system to react dynamically to changing riding conditions. Actuators, such as servo motors or electric motors, execute the microcontroller's commands, ensuring the automatic movement of the side stand. This system is designed for compatibility with multiple motorcycle models, allowing for seamless installation without significant modifications.
Additionally, customization options allow users to adjust settings like deployment speed and terrain sensitivity, ensuring a tailored riding experience. Safety mechanisms, such as preventing engine ignition if the stand is deployed, further reduce accident risks.
In summary, the Automatic Side Stand Slider enhances safety, convenience, and reliability by automating side stand operation, providing riders with a smart and efficient solution for motorcycle stability.

7.Algorithm:

Automatic Side Stand Slider System

1. Start the system.

2. Initialize all components:

· Microcontroller (e.g., Arduino Nano)

· Sensors: Speed, Stand Position, Terrain

· Actuators: Motor or Hydraulic/Pneumatic Cylinder

3.Continuously read input from:

· Speed sensor to detect vehicle motion

· Position sensor to check current stand status

4.If the vehicle speed > 0 km/h:

Check if side stand is deployed.

If yes, retract the stand using actuator

5.If the vehicle speed = 0 km/h (stationary/parking):

Deploy the side stand securely.

6. Update side stand position in system status.

7. Update side stand position in system status.

8. Repeat this loop to monitor real-time changes.

9.Stop the system when the vehicle is turned off.

8.Advantages &Disadvantages of the Automatic Side Stand Slider

Advantages
- Reduced Rider Fatigue
- Faster Parking Process.

Smart Integration with Other Systems.
- Minimized Wear and Tear.
- Automatic Adjustment on Uneven Surfaces.
- Lower Risk of Accidental Damage.
- User-Friendly Operation.

Disadvantages
- Power Dependency.
- Weather Sensitivity.
- Potential System Lag.

- Additional Maintenance Requirements**.**
- Risk of System Malfunction.
- Higher Weight Addition.
- Complex Troubleshooting.

9.CONCLUSION:

The **Automatic Side Stand** Slider project marks a substantial innovation in motorcycle safety and convenience, offering riders an advanced, automated solution for side stand operation. Several key conclusions can be drawn from the project's development and implementation:

Enhanced Safety: Automating the deployment and retraction of the side stand reduces human error, preventing accidents caused by forgetting to engage or retract the stand. This significantly minimizes the risk of tip-over incidents, ensuring a safer riding experience.

Improved Convenience: The system eliminates the need for manual operation, streamlining the parking process and reducing the rider's effort. This contributes to a more seamless and user-friendly motorcycle experience.

Increased Reliability: With proper integration and maintenance, the automatic system ensures a consistent and reliable function, minimizing mechanical issues associated with traditional side stands.

Customization and Adaptability: The system can be tailored to suit different motorcycle models and user preferences, offering flexibility in its application.

Technological Advancement: This project highlights the role of automation in enhancing vehicle safety, paving the way for further innovations in the motorcycle industry.

Overall, the Automatic Side Stand Slider enhances safety, efficiency, and convenience, making it a valuable addition to modern motorcycles. However, proper maintenance and system durability remain essential factors for its long-term success.

10.REFERENCES :

・ Research Papers and Journals: Look for academic papers or journals that
discuss topics related to motorcycle safety systems, automation, or microcontroller based
projects. Include details such as authors, title, journal name, volume, issue,
publication year, and page numbers.
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microcontrollers, or automation. Include details such as author(s), book title, edition
(if applicable), publication year, and relevant chapters or sections.
For example:
Brown, M. (2018). "Motorcycle Engineering: Principles and Applications." New York:
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