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Smart Electric Bike Stand

Abhishek K¹, Nevin B Raj², Arun K³, Abdusamad T⁴, Jasmine P⁵

Under Graduate Students, Department of Electrical and Electronics Engineering, AWH Engineering College, Calicut,
Kerala, India¹²³⁴

Assistant Professor, Department of Electrical and Electronics Engineering, AWH Engineering College, Calicut,
Kerala, India⁵

ABSTRACT: This paper presents a pioneering development in bicycle engineering by integrating an automatic adjusting bike stand, powered by a linear actuator. The system incorporates sensors, microcontrollers, and a precisely calibrated actuator to autonomously fine-tune the bike stand's height and angle. As the rider navigates varying terrains, the stand dynamically adapts, providing stability and convenience during parking, reducing the risk of tipping, and enhancing the overall cycling experience. This innovative application of a linear actuator showcases the fusion of technology and mobility, redefining urban commuting and recreational cycling by prioritizing safety, comfort, and user-friendly design.

KEYWORDS: linear actuator, micro controller

I. INTRODUCTION

The side stand plays a major role while the vehicle is in rest position. The side stand is used for supporting a parked motorcycle. While the two-wheelers are concerned, accidents occur due to riding the vehicle at high speed, ignores to use helmets, does not maintain the speed limit and forgets to lift the side stand while riding the vehicles. These are the major sources for accidents, forgetting to lift the side stand causes huge accidents in rural areas partly in urban areas too, because all the other sources of accidents have preventive measures, but accidents due to side stands do not have proper preventive measures. Motorcycles are generally provided with a side stand to support when they are not in use. The side stand usually comprises a bar or rod which is attached to the lower portion of a motorcycle frame and movable to a laterally down widely extending portion so that the motorcycle can be tilted against and rest upon the bar. When the motorcycle is in use, the bar is swung upward and along the frame so that it will not interfere with the running of the motorcycle. A bike stand is a device designed to support bicycles when they are not in use. It provides stability, preventing the bike from tipping over and making it convenient for parking, storage, and maintenance. Bike stands come in various types, including kickstands, center stands, and racks, and they play a crucial role in promoting safe and organized cycling in both urban and recreational settings.

All over the world, motorcycles are used. The side stand plays a major role while the vehicle is in rest position. This is a new type of side stand which is automatically retracting the side stand through some mechanical and electronic arrangement. In this system microcontroller, speed sensor, dc battery is used. Through the speed sensor, the sensor senses the rotation of the wheel and sends the signal to the microcontroller which actuates the dc motor which is caused to disengage the stand from the road. A motorcycle side stand is a nearly universal method of allowing a motorcycle rider to park his vehicle easily. If this stand is in the park position while the motorcycle is ridden through a left turn a serious hazard exists. A new type stand side stand which is automatically retracting side stand is invented to prevent such type of accidents. Side stand is mounted behind the bottom bracket and can be bolted on either clamping the chain stays, or welded into place as an integral part of the frame.

Paper is organized as follows. Section II describes automatic text detection using morphological operations, connected component analysis and set of selection or rejection criteria. The flow diagram represents the step of the algorithm. After detection of text, how the text region is filled using an inpainting technique that is given in Section III. Section IV presents experimental results showing results of images tested. Finally, Section V presents a conclusion.

II. LITERATURE REVIEW

As per [1], An automatic side stands for motor bikes, which could be lifted up while the bike starts moving and retrieved back when it stops. The design consists of sensors, relay switches and regulators which are controlled by the Arduino UNO program. There is no need for an additional energy source or any other complexity since the designed system uses the necessary power from the motor bike battery. The paper by Jamaluddin Ahamed et al.[2] aims to enhance the efficiency of manual actuation and automation for sliding of side-stand to increase the safety of the rider. To overcome the limitations of the existing methods a new model of "Automated side stand retrieving device", an electromechanical system, is introduced by using electric circuits and gear mechanism. The automatic side stand retrieval system is powered by the same source as every other electrical component on the vehicle, namely the battery. Due to the gear mechanism, increased torque will help the motor to lift the side stand easily.

In [3] the components like sprockets, lifting lever, pushing lever, spur gear, chain and frame are added which are cheap in price. So the overall price after installing this idea in a vehicle is not affected.

III. METHODOLOGY

Based on the working principle of a two-wheeler i.e. the power is generated in the engine and it transmits power to the pinion and makes it rotate. The pinion transmits power to the rear wheel and makes the vehicle move. This is the basic principle followed in all types of two-wheeler. Based on this "automatic-side stand retrieve system" is designed because this system works by getting power from a rotating motor driver. When the power is supplied, the motor rotates in a clockwise direction, with the teeth of the motor another gear teeth is meshed which is connected to the side stand. The movement of the gear teeth makes the stand lift.

The proposed automatic side stand slider for the motorbikes has two major components, a mechanical design & an electronic control. To put this in other words control the normal bike side-stand by microcontroller through programming the Arduino board is discussed here. The principle of ultrasonic rangefinders is to measure the time it takes the signal sent by a transmitter and propagated back to the receiver. As the name implies, an ultrasonic sensor operates on ultrasonic frequencies. The Coriolis force or the Coriolis effect is used in the measurement of angular momentum. A gyroscope sensor works on the principle of conservation of angular momentum. It works by preserving the angular momentum. In a gyroscope sensor, a rotor or a spinning wheel is mounted on a pivot. The pivot allows the rotation of the rotor on a particular axis which is called a gimbal. Here, we will use two gimbals at a time. One gimbal will be mounted on another. This will give the rotor three degrees of freedom. Whenever we spin the rotor of the gyroscope, the gyroscope will continue to point in the same direction.

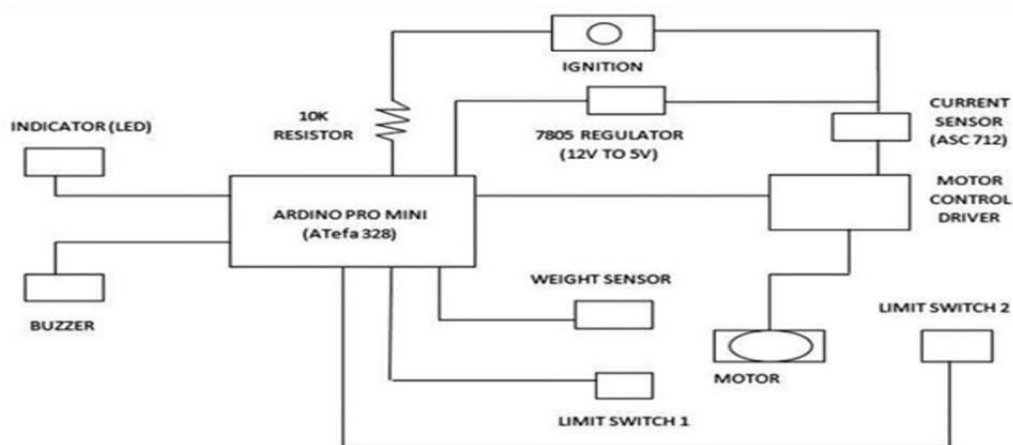


Fig 1. Block Diagram of Smart Stand

A control coil surrounds the iron core. The electromagnet starts energizing when the current flows through the control coil then intensifies the magnetic field. The electromagnet becomes connected to the power source through the contacts

to the load and a control switch. A servo consists of a Motor (DC or AC), a potentiometer, gear assembly, and a controlling circuit. First of all, we use gear assembly to reduce RPM and to increase torque of the motor. Say at initial position of the servo motor shaft, the position of the potentiometer knob is such that there is no electrical signal generated at the output port of the potentiometer. Now an electrical signal is given to another input terminal of the error detector amplifier.

A linear actuator actuates, or moves, in a linear straight line. Though the basic function of an actuator is the same, there are different ways that motion is achieved. The uses of linear actuators include wheelchair ramps to toys and technological instruments for spacecraft. The working principle of a buzzer depends on the theory that, once the voltage is given across a piezoelectric material, then a pressure difference is produced. A piezo type includes piezo crystals among two conductors.



Fig 2. Linear Actuator

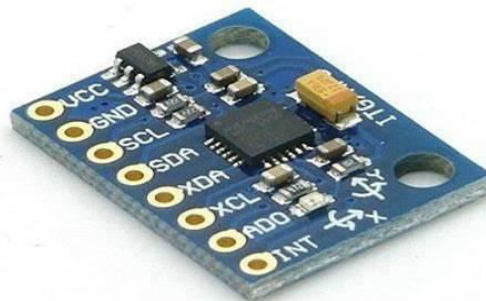


Fig3. Gyroscope Sensor

The primary goal of designing an electric bike is to create an eco-friendly and efficient mode of transportation. Electric bikes (e-bikes) are battery-operated vehicles that offer low maintenance costs, reduced pollution, and a fun way to travel.

Instead of a combustion engine, e-bikes use a Brushless DC (BLDC) motor. These motors are efficient, produce less noise, and have lower maintenance costs. E-bikes rely on rechargeable lithium-ion batteries. These batteries are lightweight, reliable, and provide the necessary energy for the motor. The frame supports all other components, including the motor, battery, and rider. It provides stability and strength for the entire system.

The stand incorporates a motorized system that operates the stand. When the bike starts, the side stand automatically slides from a vertical position to a horizontal one. A monitoring circuit detects when the bike is started. Upon ignition, the motor activates, moving the side stand into place. When turning off the key to lock the bike, the system reverses the motorized stand shaft to its original position.

To make the bike stand even smarter, Use sensors to detect the bike's orientation (upright or tilted). This information can trigger the motorized stand. Connect the sensors and motor to a microcontroller. The microcontroller manages the stand's operation based on sensor inputs. For advanced functionality, integrate the bike stand with the Internet of Things (IoT).

IV. CONCLUSION

During the time of riding a bike with a side stand in its uplift may create problems and accidents but with the help of our accessories we solve this problem. The objective of this project is to provide the rigid and safety mechanism without changing in any standard design of bike. It does not disturb the performance of the vehicle. And it is different from other mechanisms. Other systems require battery power or chain power but it does not require any external power. Moreover, it should be economical for every class of society. It is a new product that will promote employment and vast field development for new engineers in the daytime. By using this system, we avoid the accident which happened due to the side stand. Also, it's easy to install in any gear bike and economical. It is by observation that the side stand removal by electronic based circuit is better than removal by mechanical method. The system can be maintained by a little maintenance. Definitely this system could be used in all types of two wheeler. This paper could be a revolution

in the automobile industry because it provides a solution for the problem we are facing in our daily life but repeating it carelessly or unknowingly.

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