DESIGN AND FABRICATION OF AN AUTOMATIC BIKE STAND SLIDER

A thesis
by

Ranjan Kumar Sarkar
Salehin Sumon
Md.Jahangir Alam

DEPARTMENT OF MECHANICAL ENGINEERING
SONARGAON UNIVERSITY (SU)

SEPTEMBER 2025

DESIGN AND FABRICATION OF AN AUTOMATIC BIKE STAND SLIDER

A thesis

By

Ranjan Kumar Sarkar	ME2103025193
Salehin Sumon	ME2103025194
Md.Jahangir Alam	ME2103025131

Supervisor: Nuruzzaman Rakib

Assistant Professor

Submitted to the

DEPARTMENT OF MECHANICAL ENGINEERING

SONARGAON UNIVERSITY (SU)

In partial fulfillment of the requirements for the award of the degree

of

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

SEPTEMBER 2025

DECLARATION

We do hereby solemnly declare that, the work presented here in this project report has been carried out by us and has not been previously submitted to any University Organization for award of any degree or certificate

We hereby ensure that the works that has been prevented here does not breach any existing copyright.

We further undertake to indemnify the university against any loss or damage arising from breach of the foregoing obligation.

[Authors]

Ranjan Kumar Sarkar
ME2103025193

Salehin Sumon
ME2103025194

Md.Jahangir Alam
ME2103025131

ACKNOWLEDGEMENT

First, we started in the name of almighty Allah. This thesis is accomplished under the supervision of Nuruzzaman Rakib, Assistant Professor, Department of Mechanical, Sonargaon University. It is a great pleasure to acknowledge our profound gratitude and respect to our supervisor for this consistent guidance, encouragement, helpful suggestion, constructive criticism and endless patience through the progress of this work. The successful completion of this thesis would not have been possible without his persistent motivation and continuous guidance.

The authors are also grateful to Prof. Md. Mostofa Hossain, Head of the Department of Mechanical Engineering and all respect teachers of the Mechanical Engineering Department for their co-operation and significant help for completing the thesis work successfully.

[Authors]

Ranjan Kumar Sarkar
ME2103025193

Salehin Sumon
ME2103025194

Md.Jahangir Alam
ME2103025131

ABSTRACT

The Automatic Bike Stand System is an innovative solution designed to enhance rider safety, convenience, and vehicle stability. Traditional manual bike stands require physical effort and often lead to instability if not properly engaged, especially on uneven surfaces. This project introduces an automated mechanism that deploys or retracts the bike stand without manual intervention. Using a microcontroller (such as Arduino), and a motorized actuator, the system detects the bike's stationary or motion state and activates the stand accordingly. It helps prevent accidents caused by forgotten stands and reduces wear on the bike frame. The system is energy-efficient, reliable, and can be integrated into existing motorcycles with minimal modifications. Overall, the Automatic Bike Stand System aims to modernize two-wheeler parking practices, offering a smarter, safer riding experience.

TABLE OF CONTENTS

Declaration ii
Acknowledgement iii
Abstract iv
List of Figures vii
List of Table..... viii

CHAPTER 1 INTRODUCTION

1.1 Introduction..... 1
1.2 Problem Statement 2
1.3 Objectives..... 2
1.4 Methodology..... 3
1.5 Project plan..... 3
1.6 Report Overview..... 4

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction..... 5
2.1 Literature Review..... 5
2.1 Summary..... 8

CHAPTER 3 SYSTEM ARCHITECTURE

3.1 Introduction..... 9
3.2 Block Diagram..... 9
3.3 CAD Design…..... 10
3.3 Circuit Diagram..... 10
3.4 Working Principle..... 10

CHAPTER 4 HARDWARE & SOFTWARE ANALYSIS

4.1 Introduction.....12
4.2 Hardware & Software.....12
4.3 Arduino Pro mini.....12
4.4 Battery.....15
4.5 Gear Motor.....16
4.6 Motor Driver.....17
4.7 Wheel.....20
4.8 Arduino IDE.....21

CHAPTER 5 RESULTS AND DISCUSSION

5.1 Project Output.....26
5.2 Prototype Specifications Summary 26
5.3 Final Projecr.....27
5.4 Cost Analysis.....28
5.5 Advantages.....28
5.6 Limitation.....29
5.7 Application.....29
5.8 Discussion.....29
5.9 Operation of Bike Stand using Single Key.....30

CHAPTER 6 CONCLUSION

6.1 Conclusion 31
6.2 Future Scope.....31

REFERENCES.....32

LIST OF FIGURES

Figure No.

Page No

1.1 Bike Stand Accident percentage of Every Year 1
1.2 Project Implement Chart 3
3.1 Block Diagram of our project..... 9
3.2 CAD Design..... 10
3.3 Schematic Diagram of our project..... 10
4.1 Arduino pro Mini..... 13
4.2 Arduino Pro mini Pin Out..... 14
4.3 Battery 15
4.4 DC gear motor..... 16
4.5 Motor driver IC L98N..... 17
4.6 L298N Circuit Diagram 19
4.7 Wheel..... 20
4.8 Arduino Software Interface IDE..... 22
5.1 Project progress image 27
5.2 Complete Project prototype..... 27

LIST OF TABLES

Table No.

Page No

1 List of Without Component with Price 11
2 Specification of battery..... 16
3 Pin Configuration of Motor Driver..... 18

CHAPTER 1

INTRODUCTION

1.1 Introduction

In all over world everywhere motorcycle is used. The early history of the automobile is often divided into variety of eras, supported the prevalent means of propulsion. Later they were defined by the trends in styling of the exterior, body size, and utility preferences. The side stand plays major role while the vehicle is in rest position. But it has some disadvantages takes place as while the driver starting the motorcycle, there may be possibility of forget to release the side stand this will caused to unwanted troubles.

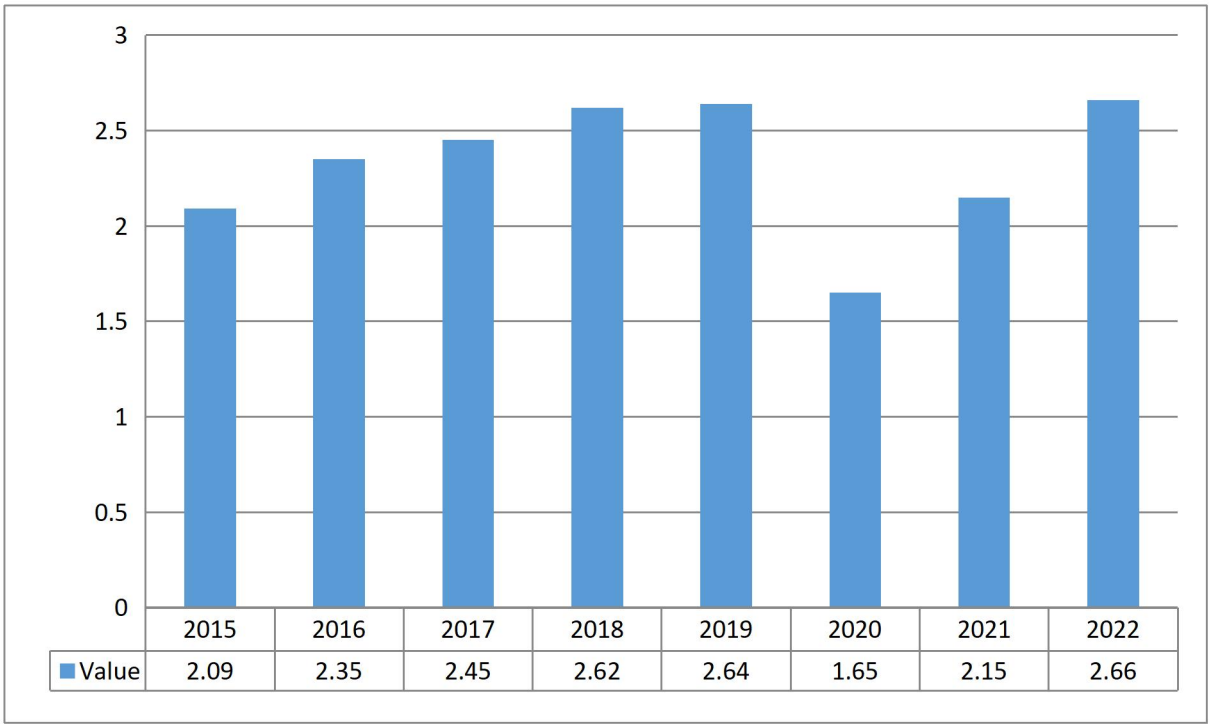


Figure 1.1 : Bike stand accident percentage of every year

The side stands work as a support for a parked vehicle. It has some disadvantages takes place as while the driver starting the motorcycle, there may be possibility of forget to release the side stands this may cause to unwanted troubles. Then the undistracted stand hitting the bottom and affected the rider's control during the turn. These are the major source for accidents. Forgetting to lift the side stand causes huge accidents in rural areas partly in urban areas too, because all the opposite source of accident has precautions, but accidents due to side stand don't have proper precautions.

1.2 Problem Statement

While the two-wheelers is concerned accidents occurs due to riding the vehicle in high speed, ignores to use helmets, does not maintains the speed limit and forgets to lift the side stand while riding the vehicles. These are the major source for accidents. Forgetting to lift the side stand causes huge accidents in rural areas partly in urban areas too, but accident due to side stand does not have proper preventive measure. If you see the accident status 36% of the accidents occur due to this problem. Some major reasons listed below as,

- Forget to retrieve side stand.
- Forget to place bike on side stand.
- Improper handling of side stands system.
- Irregular maintenance like faulty spring, worst lubrication.
- Use of damaged stand. (Bent stand).

1.3 Objectives

The objectives of this project are

- To Study , design and construct of a Automatic Bike Stand System.
- To automate the bike stand deployment and retraction process.
- To enhance rider safety by preventing accidental stand-related falls.
- To eliminate the need for manual effort while parking or starting the bike.
- To reduce wear and tear caused by improper use of manual stands.
- To develop a compact, cost-effective system suitable for retrofitting on existing bikes.

1.4 Methodology

Our used methodology for the project:

- Developing the concept and design of the Automatic Bike Stand System to enhance rider safety and ease of use. Creating a block diagram and circuit diagram to identify all required components.
- Selecting and collecting components such as Arduino microcontroller, DC motor, power supply, and related hardware. Writing and uploading the control program to the microcontroller to automate stand movement based on bike status.
- Assembling the circuit on a PCB or breadboard for testing. Connecting all sensors and actuators according to the designed circuit.
- Soldering and mounting the system on a bike frame prototype or model to ensure secure and stable integration.

1.5 Project Plan

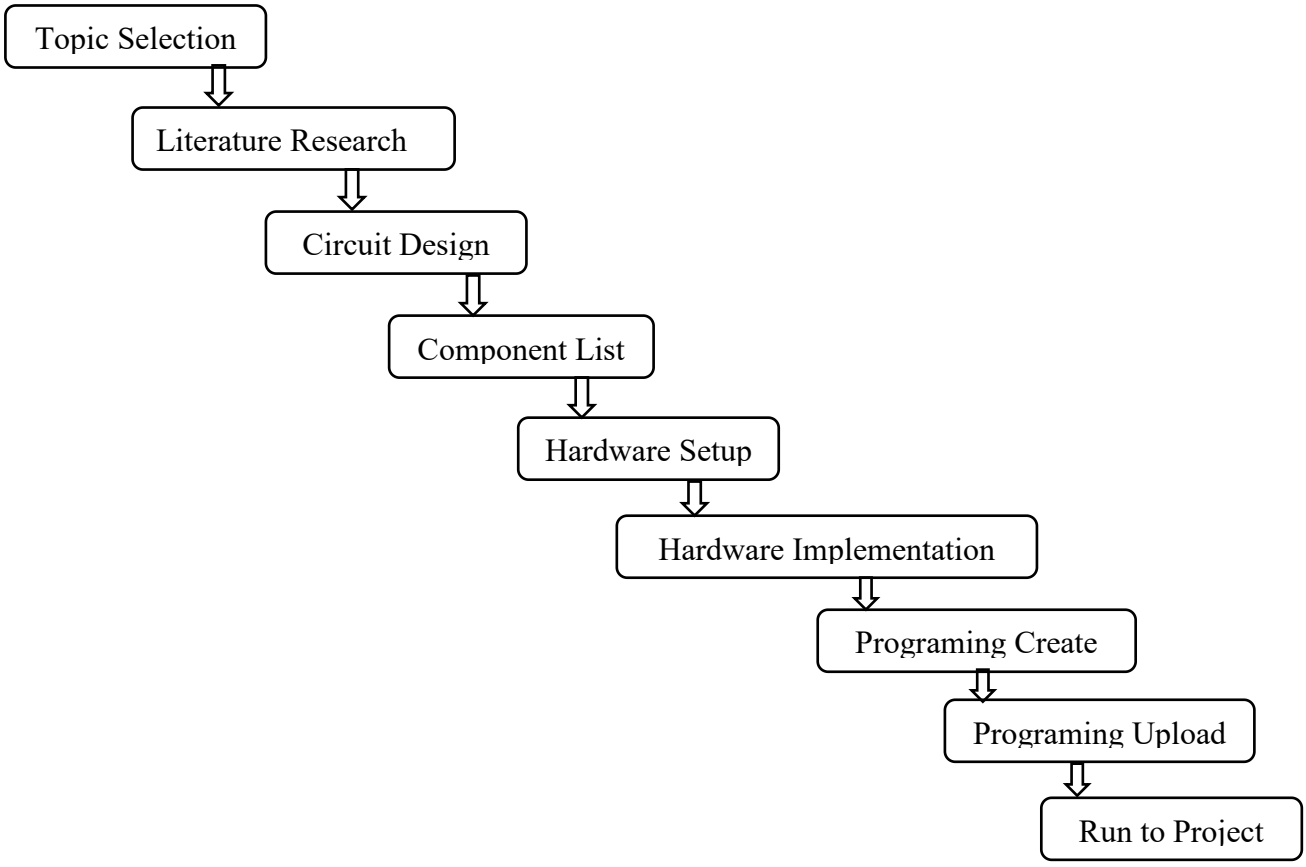


Figure 1.2 Project Implement Chart

1.6 Report Overview

This project book consists of Six chapter. The first chapter contains the statement of the Introduction,Problem Statement, Project plan, objectives of the study and Methodology. Chapter two contains system Literatur e Review details. Chapter three System Architecture, Discussed in Block Diagram,Circuit Diagram,Working principle and Cost analysis.Chapter Four describes the hardware implementation with component details and the software which we have used for our work. Chapter Five deals with the result Analysis,shows the complete prototype,Advantage, Application and Limitation of the project that we have built. In the final chapter, we have discussed the , Future Scope, conclusion of the project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter we discuss our system overview. In this paper we are also work about Automatic Bike Stand System. In below section we will describe some previous literature review. From previous literature we gather more knowledge to build this project and we successfully made it .

2.2 Literature Review

The new system "AUTOMATIC SIDE-STAND RETRIEVE SYSTEM" is to be Designed based on the working principle of bikes. Since all bikes transmit power from Engine to rear wheel by means of chain drive. Since the design setup is to be kept in Between chain drive, then setup (Sprocket) rotates and side stand get retrieves Automatically. This system can be implemented in all types of bikes by changing small variation in size and cost of this system also very low and so it will not affect the economic level also while compare to other system (K. DEVENDRA NATH) 2012 [1].

Now a day's sensor is used for ensure that the stand is in Released condition. The motorcycle side stand consists of a Metallic rod and helical spring which is offset from the center. Some side stand retracts automatically when the motorcycle is Lifted up the support some other are fit with electrical interlocks, Warning devices or special retracting mechanism. In this paper There is possibility to reduce the evident which is takes place by the Side stand Automatic stand is presently in use and quite successful. Although it has certain disadvantages. Automatic stand is presently in use and quite successful. (Vishal Srivastava), 2014 [2].

This automation is related to the limit switch. The system uses the two-limit switch which is placed two places of stand. When the limit switch is actuated, the stand will automatically place. If another limit switch is actuated the side stand will automatically returns to the initial position. When limit switch is actuated, the signal is passed to the micro controller from the

limit switch. The micro controller saves the data and actuates the relay. This relay is used to actuate the motor. Thus, by the stand is placed. If another limit switch is operated this sends the signal to the micro controller. So, this actuates the relay thus the motor is operated and the stand is return to the initial position. In this project, a novel method of automatic bike stand is been designed and developed for motorcycle bike drivers. As everyone in today's world is riding bike it is essential to take care of unwanted troubles. Each and every bike should have automatic bike stand. (Shubham Bagul1), 2017 [3].

To avoid this problem, we do the project practically for "Automatic Side Stand Lifting Mechanism System". This project is based on simple mechanism. This mechanism operated by the total manually means on the feet power of rider. So, it is not required any external power and it is more economical also easily installable in bike. In our India 20- 22% accident happened due side stand which is not removed by the rider after starting a bike. For preventing that problem, we installed this mechanism. It does not disturb the Performance of the vehicle. And it is different than other Mechanism. Other system requires battery power or chain Power but it is not requiring any external power. Moreover,it Should be economical for every class of society. It is new Product it will promote employment and vast field development for new engineer in day period. (Aniket Gulhane) 2017 [4].

So, we have Made the project of "Automatic Side-Stand Lifter for Two-Wheeler" is to be designed based on the working principle of Bikes. This mechanism is operated manually means on the Feet power of rider. After starting the bike immediately When the rider puts the first gear, the side stand lifts Automatically. 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 than other mechanism. Other system requires battery power or chain power but it is not required any external power. (Associate Professor – R. Selvendran) 2019 [5].

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 [6].

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 [7].

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 [8].

Sachin J. Ugale et al proposed a new system of “AUTOMATIC BIKE STAND FOR TWO-WHEELER” for lifting the side stand. In this process they used the micro-controller, sensors, etc., to lift the side stand. When the bike is lifted, the sensor senses the distance from stand to ground and sends signals to the microcontroller. The micro-controller activates the DC motor and through the DC motor the stand may be lifted [9].

V. Bhargav et al designed the “DESIGN OF AUTOMATIC MOTOR BIKE STAND SLIDER”. In this system he told the history of bikes and who proposed these bikes and he used the pro mini micro-controller to lift the side stand. In this system he used different components. When the Ignition key is turned on the side stand may lift up and when the ignition key is turned off the side stand may be retracted to its original position [10].

Shubham Jichkar et al introduced “AUTOMATIC SIDE STAND SLIDER ASSEMBLY” for lifting the side stand. In this system when the rider starts the ignition key, the sensor sends the signals to the micro-controller and the micro-controller activates the DC motor. When the ignition key is ON the side stand is rotated by 900 and when the ignition key is turned off the side stand may be retracted to its original position [11].

Amit Singh et al proposed the “AUTOMATIC SIDE STAND FOR TWO-WHEELER” to lift the side stand. In this system they used the Arduino based micro-controller to lift the side stand. The DC motor is connected to the vehicle battery. When the person turns ON the ignition switch the motor starts rotating in anticlockwise direction and the stand is retracted [12].

T. Ashok et al introduced the “AUTOMATIC SIDE STAND RETRIEVE SYSTEM” for lifting the side stand. In this they used the Micro-controller unit to lift the side stand. So, when the key is turned on the sensor senses the signals and send to a micro-controller chip, the chip activates the DC motor which is attached at the base part of the bike and through that the motor runs and stand is lifted up [13].

2.3 Summary

From the reviewed literature, we gained valuable insights and were inspired to develop this project. With collective effort and dedication, we successfully turned the concept into reality. The tireless work of every team member played a crucial role in overcoming challenges and achieving the project’s goals efficiently and effectively.

CHAPTER 3

SYSTEM ARCHITECTURE

3.1 Introduction

The project objectives, methods, literature evaluation, and other details were all clarified in the preceding chapter. The block diagram, circuit diagram, Working principle,Project final Image and cost analysis will all be covered in this chapter.

3.2 Block Diagram

Here is the block diagram of the Automatic Bike Stand System with all the essential components. All of the components are shown in below as a block in this diagram.Here we use Arduino Pro mini for main brain of our project. Other equipment's are attached with this micro-controller and work together for perform as our desire outcome.

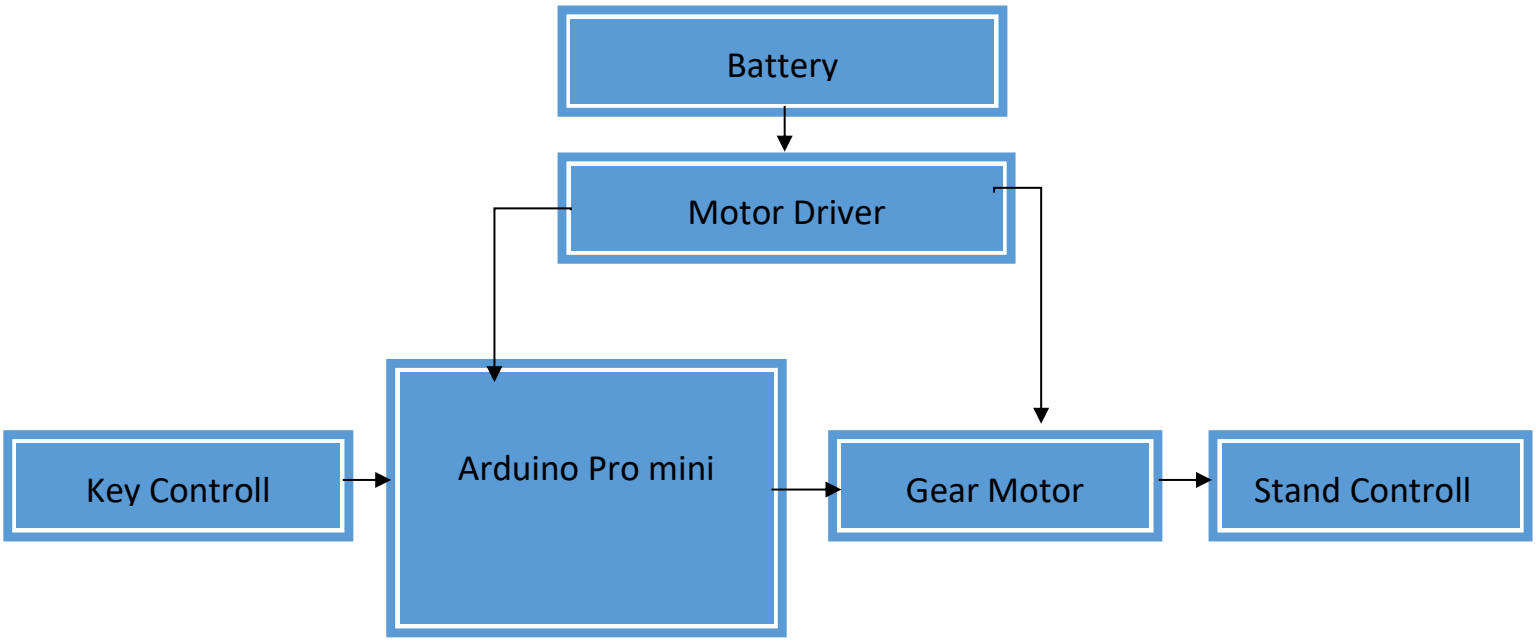
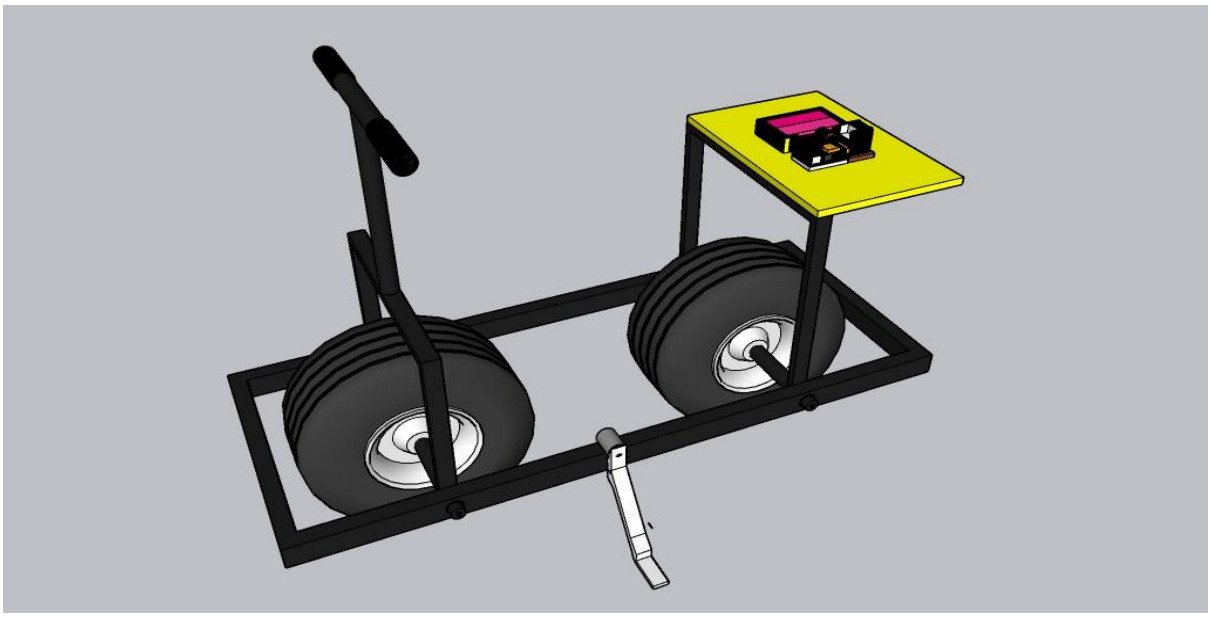


Figure 3.1: Block Diagram of Our Project

3.3 CAD Design



3.2 CAD Design

3.4 Schematic Diagram

In this part we show our project circuit design and connect out instrument through standard wire.

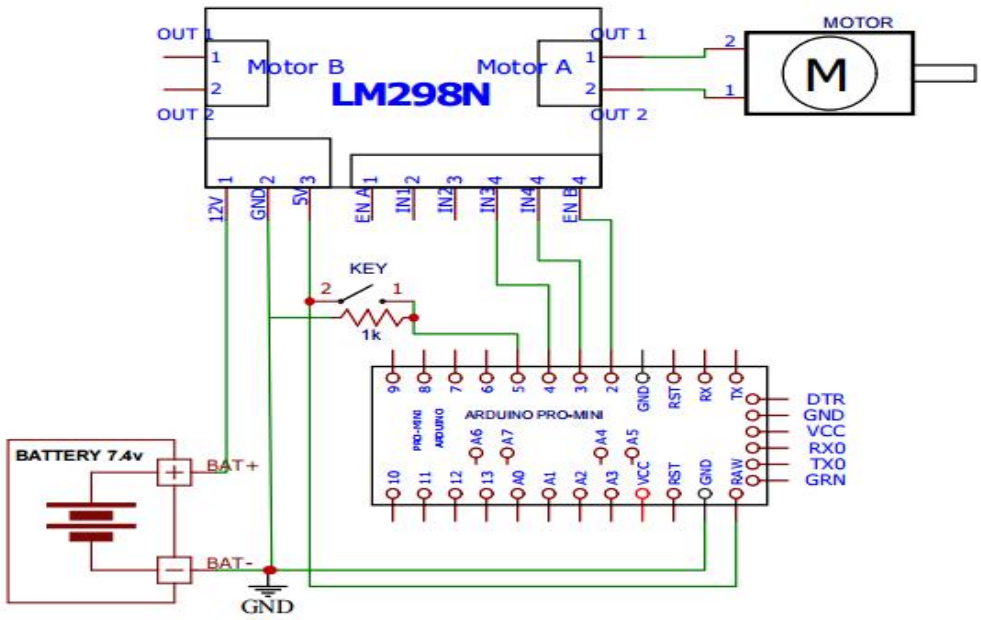


Figure 3.3 : Schematic Design of our Project

3.5 Working principle

The Automatic Bike Stand System operates by detecting the bike's motion and automatically deploying or retracting the stand. When the bike is turned off or tilted to a stationary position, a signal is sent to the Arduino Pro Mini, which processes the data and activates the motor driver. The motor driver controls a gear motor connected to the stand mechanism. The gear motor rotates to either lower or lift the stand based on the bike's status. The system is powered by a compact rechargeable battery, ensuring independent operation from the bike's main power supply. This automation eliminates the need for manual stand engagement and enhances rider safety. The compact design, reliable Arduino control, and smooth gear motor movement make this system practical for real-world application on two-wheelers.

CHAPTER 4

HARDWARE & SOFTWARE ANALYSIS

4.1 Introduction

In this section, we will discuss elaborately about " Automatic Bike Stand System" and the component description, features, working procedure of our all equipment. The system hardware fabricates composed of micro-controller unit, power unit, source unit, power store unite, sensor unit and many more related components.

4.2 Hardware & Software

Hardware

- Arduino Pro mini
- Battery
- Gear Motor
- Motor Driver
- Wheel

Software

- Arduino IDE

4.3 Arduino Pro Mini

The Arduino Pro Mini is a micro-controller board based on the ATmega168. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, an on-board resonator, a reset button, and holes for mounting pin headers. A six pin header can be connected to an FTDI cable to provide USB power and communication to the board.

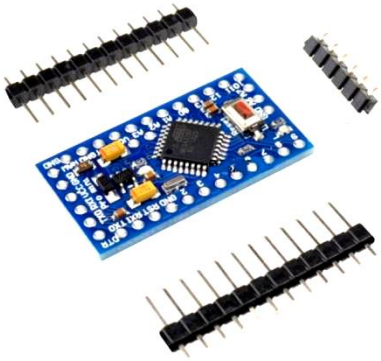


Figure 4.1: Arduino Pro Mini

Specification

- Micro-controller ATmega168
- Operating Voltage: 3.3V or 5V (depending on model)
- Input Voltage: 3.35 -12 V (3.3V model) or 5 - 12 V (5V model)
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- Flash Memory: 16 KB (of which 2 KB used by boot loader)
- SRAM: 1 KB
- EEPROM: 512 bytes
- Clock Speed: 8 MHz (3.3V model) or 16 MHz (5V model)

Pin Out

Each of the 14 digital pins on the Pro Mini can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 3.3 or 5 volts (depending on the model). Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the TX-0 and RX-1 pins of the six pin header.
- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt() function for details.

- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write function.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.
- LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- The Pro Mini has 6 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). Four of them are on the headers on the edge of the board; two (inputs 4 and 5) on holes in the interior of the board. The analog inputs measure from ground to VCC. Additionally, some pins have specialized functionality:
- There is another pin on the board:Reset. Bring this line LOW to reset the micro controller. Typically used to add a reset button to shields which block the one on the board.See also the mapping between Arduino pins and ATmega168 ports.

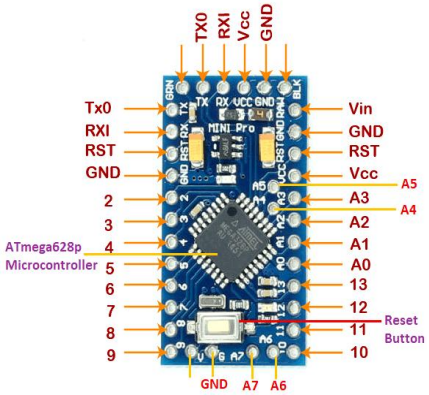


Figure 4.2: Arduino Pro Mini Pin Out

The high-performance Microchip Pico Power 8-bit AVR RISC-based micro controller combines 32KB ISP flash memory with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughput's approaching 1 MIPS per MHz, balancing power consumption and processing speed.

4.4 Battery

Lithium batteries are primary batteries that have metallic lithium as an anode. These types of batteries are also referred to as lithium-metal batteries. They stand apart from other batteries in their high charge density and high cost per unit. Depending on the design and chemical compounds used, lithium cells can produce voltages from 1.5 V (comparable to a zinc–carbon or alkaline battery) to about 3.7 V.

Disposable primary lithium batteries must be distinguished from secondary lithium-ion or a lithium-polymer,[1] which are rechargeable batteries. Lithium is especially useful, because its ions can be arranged to move between the anode and the cathode, using an intercalated lithium compound as the cathode material but without using lithium metal as the anode material. Pure lithium will instantly react with water, or even moisture in the air; the lithium in lithium ion batteries is in a less reactive compound.



Figure 4.3: 3.7V Battery

Lithium batteries are widely used in portable consumer electronic devices. The term "lithium battery" refers to a family of different lithium-metal chemistry, comprising many types of cathodes and electrolytes but all with metallic lithium as the anode. The battery requires from 0.15 to 0.3 kg of lithium per kWh. As designed these primary systems use a charged cathode, that being an electro-active material with crystallographic vacancies that are filled gradually during discharge.

Product Specification

Table 2 : Specification of Battery

Voltage	3.7 V
Product Type	Lithium-Ion
Battery Capacity	2200mAh
Weight	45 g
Model Number	ICR 18650-26C
Charging Time	Standard Charge : 2hour Rapid Charge : 2.5hour
Charging Current	Standard Charge : 1300mA Rapid Charge : 2600mA

4.5 Gear Motor

A DC motor is any motor within a class of electrical machines whereby direct current electrical power is converted into mechanical power. A 12v DC motor is small and inexpensive, yet powerful enough to be used for many applications.



Figure 4.4: DC Gear Motor

Gear Motor Backup

Load current = 2.5A

Battery capacity = 7 V

T = Battery Capacity / Motor current

= 7/ 2.5

= 2.8 hour

Specification

- Voltage: 12V DC
- Gear ratio: 1/31
- No-load speed: 200 RPM
- Rated Speed: 140 RPM
- Rated torque: 10 kg.cm
- Rated current: 2.5 Amp
- Length of Motor(including spindle): 106 mm/4.17″
- Diameter: 37 mm/1.45″
- Shaft length: 21 mm/0.82″
- Shaft diameter: 6 mm/0.24″

4.6 Motor Driver

The L298N is a popular 16-Pin Motor Driver IC. As the name suggests it is mainly used to drive motors. A single L298N IC is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently.

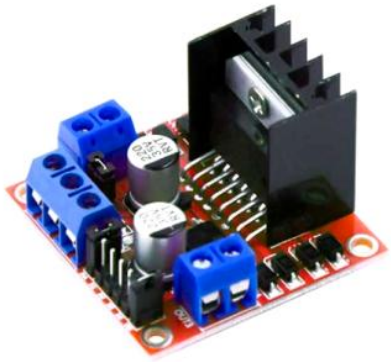


Figure 4.5: Motor driver IC L298N

Working Process

L298N IC is a typical Motor Driver IC which allows the DC motor to drive on any direction. This IC consists of 16-pins which are used to control a set of two DC motors instantaneously in any direction. It means, by using a L298N IC we can control two DC motors.

L293D Pin Configuration

Table 3 : Pin Configuration of Motor Driver

Pin Number	Pin Name	Description
1	Enable 1,2	This pin enables the input pin Input 1(2) and Input 2(7)
2	Input 1	Directly controls the Output 1 pin. Controlled by digital circuits
3	Output 1	Connected to one end of Motor 1
4	Ground	Ground pins are connected to ground of circuit (0V)
5	Ground	Ground pins are connected to ground of circuit (0V)
6	Output 2	Connected to another end of Motor 1
7	Input 2	Directly controls the Output 2 pin. Controlled by digital circuits
8	Vcc2 (Vs)	Connected to Voltage pin for running motors (4.5V to 36V)
9	Enable 3,4	This pin enables the input pin Input 3(10) and Input 4(15)
10	Input 3	Directly controls the Output 3 pin. Controlled by digital circuits
11	Output 3	Connected to one end of Motor 2
12	Ground	Ground pins are connected to ground of circuit (0V)
13	Ground	Ground pins are connected to ground of circuit (0V)
14	Output 4	Connected to another end of Motor 2
15	Input 4	Directly controls the Output 4 pin. Controlled by

		digital circuits
16	Vcc2 (Vss)	Connected to +5V to enable IC function

Features

- Can be used to run Two DC motors with the same IC.
- Speed and Direction control is possible
- Motor voltage Vcc2 (Vs): 4.5V to 36V
- Maximum Peak motor current: 1.2A
- Maximum Continuous Motor Current: 600mA
- Supply Voltage to Vcc1(vss): 4.5V to 7V
- Transition time: 300ns (at 5Vand 24V)
- Automatic Thermal shutdown is available

Use of a L298N Motor Driver IC

Using this L298N motor driver IC is very simple. The IC works on the principle of Half H-Bridge, let us not go too deep into what H-Bridge means, but for now just know that H bridge is a set up which is used to run motors both in clock wise and anti clockwise direction. As said earlier this IC is capable of running two motors at the any direction at the same time, the circuit to achieve the same is shown below.

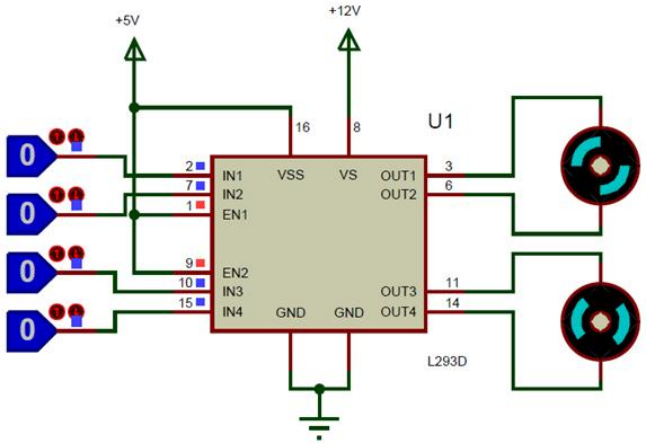


Figure 4.6: L298N circuit Diagram

All the Ground pins should be grounded. There are two power pins for this IC, one is the Vss(Vcc1) which provides the voltage for the IC to work, this must be connected to +5V. The other is Vs(Vcc2) which provides voltage for the motors to run, based on the specification of your motor you can connect this pin to anywhere between 4.5V to 36V, here I have connected to +12V.

The Enable pins (Enable 1,2 and Enable 3,4) are used to Enable Input pins for Motor 1 and Motor 2 respectively. Since in most cases we will be using both the motors both the pins are held high by default by connecting to +5V supply. The input pins Input 1,2 are used to control the motor 1 and Input pins 3,4 are used to control the Motor 2. The input pins are connected to the any Digital circuit or micro controller to control the speed and direction of the motor.

4.7 Wheel

In our Automatic Bike Stand System, we utilize a durable plastic wheel (sourced from ride-on vehicles) as a key mechanical component for ground support and motion simulation. The wheel is made of high-strength plastic, lightweight yet capable of bearing moderate loads, making it ideal for prototype development. It is connected to a gear motor that rotates the wheel during the testing phase to simulate real-life bike movement.



Figure 4.7: Wheel

This wheel provides a smooth and stable base for testing the automatic deployment and retraction of the bike stand. Its compact design ensures easy integration into the frame, while the treaded surface helps maintain grip during stand engagement. The low rolling resistance and firm structure make it suitable for use in controlled motion applications within our project.

SOFTWARE

4.8 Arduino IDE

The digital microcontroller unit named as Arduino UNO can be programmed with the Arduino software IDE. There is no any requirement for installing other software rather than Arduino. Firstly, Select "Arduino UNO from the Tools, Board menu (according to the microcontroller on our board). The IC used named as ATmega328 on the Arduino UNO comes pre burned with a boot loader that allows us to upload new code to it without the use of an external hardware programmer.

Communication is using the original STK500 protocol (reference, C header files). We can also bypass the boot loader and programs the microcontroller through the ICSP (In Circuit Serial Programming) header. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2. On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.The Arduino UNO is one of the latest digital microcontroller units and has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL at (5V) with serial communication, which is available on digital pins 0 -(RX) for receive the data and pin no.1 (TX) for transmit the data. An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an .in file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board.

The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial Communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus. Arduino programs are written in C or C++ and the program code written for Arduino is called sketch. The Arduino IDE uses the GNU tool chain and AVR Lab to compile programs, and for uploading the programs it uses argued. As the Arduino platform uses Atmel microcontrollers, Atmel's development environment, AVR Studio or the newer Atmel Studio, may also be used to develop software for the Arduino.

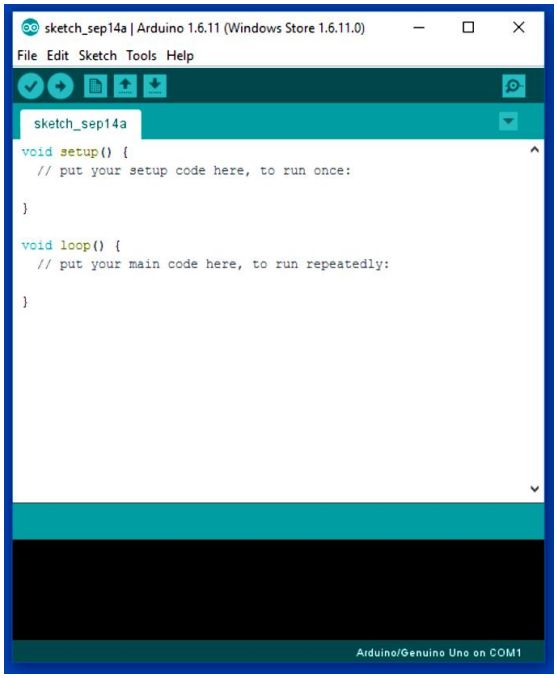


Figure 4.8: Arduino Software Interface IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Writing Sketches

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while

saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Sketchbook

The Arduino Software (IDE) uses the concept of a sketchbook: a standard place to store your programs (or sketches). The sketches in your sketchbook can be opened from the File > Sketchbook menu or from the Open button on the toolbar. The first time you run the Arduino software, it will automatically create a directory for your sketchbook. You can view or change the location of the sketchbook location from with the Preferences dialog. Beginning with version 1.0, files are saved with a .ino file extension. Previous versions use the .pde extension. You may still open .pde named files in version 1.0 and later, the software will automatically rename the extension to .ino.

Tabs, Multiple Files, and Compilation

Allows you to manage sketches with more than one file (each of which appears in its own tab). These can be normal Arduino code files (no visible extension), C files (.c extension), C++ files (.cpp), or header files (.h).

Uploading

Before uploading your sketch, you need to select the correct items from the Tools > Board and Tools > Port menus. The boards are described below. On the Mac, the serial port is probably something like /dev/tty.usbmodem241 (for an Uno or Mega2560 or Leonardo) or /dev/tty.usbserial-1B1 (for a Duemilanove or earlier USB board), or /dev/tty.USA19QW1b1P1.1 (for a serial board connected with a Keyspan USB-to-Serial adapter). On Windows, it's probably COM1 or COM2 (for a serial board) or COM4, COM5, COM7, or higher (for a USB board) - to find out, you look for USB serial device in the ports section of the Windows Device Manager. On Linux, it should be /dev/ttyACMx , /dev/ttyUSBx or similar. Once you've selected the correct serial port and board, press the upload button in the toolbar or select the Upload item from the Sketch menu. Current Arduino boards will reset automatically and begin the upload. With older boards (pre-Diecimila) that lack auto-reset, you'll need to press the reset button on the board just before

starting the upload. On most boards, you'll see the RX and TX LEDs blink as the sketch is uploaded. The Arduino Software (IDE) will display a message when the upload is complete, or show an error.

When you upload a sketch, you're using the Arduino boot loader, a small program that has been loaded on to the microcontroller on your board. It allows you to upload code without using any additional hardware. The boot loader is active for a few seconds when the board resets; then it starts whichever sketch was most recently uploaded to the microcontroller. The bootloader will blink the on-board (pin 13) LED when it starts (i.e. when the board resets).

Libraries

Libraries provide extra functionality for use in sketches, e.g. working with hardware or manipulating data. To use a library in a sketch, select it from the Sketch > Import Library menu. This will insert one or more #include statements at the top of the sketch and compile the library with your sketch. Because libraries are uploaded to the board with your sketch, they increase the amount of space it takes up. If a sketch no longer needs a library, simply delete its #include statements from the top of your code.

There is a list of libraries in the reference. Some libraries are included with the Arduino software. Others can be downloaded from a variety of sources or through the Library Manager. Starting with version 1.0.5 of the IDE, you do can import a library from a zip file and use it in an open sketch. See these instructions for installing a third-party library.

Third-Party Hardware

Support for third-party hardware can be added to the hardware directory of your sketchbook directory. Platforms installed there may include board definitions (which appear in the board menu), core libraries, bootloaders, and programmer definitions. To install, create the hardware directory, then unzip the third-party platform into its own sub-directory. (Don't use "arduino" as the sub-directory name or you'll override the built-in Arduino platform.) To uninstall, simply delete its directory.

For details on creating packages for third-party hardware, see the Arduino IDE 1.5 3rd party Hardware specification.

Serial Monitor

This displays serial sent from the Arduino or Genuino board over USB or serial connector. To send data to the board, enter text and click on the "send" button or press enter. Choose the baud rate from the drop-down menu that matches the rate passed to Serial.begin in your sketch. Note that on Windows, Mac or Linux the board will reset (it will rerun your sketch) when you connect with the serial monitor. Please note that the Serial Monitor does not process control characters; if your sketch needs a complete management of the serial communication with control characters, you can use an external terminal program and connect it to the COM port assigned to your Arduino board.

CHAPTER 5

RESULTS AND DISCUSSION

5.1 Project Output

After finally completing this project, we ran it & we observed the output of this project. We can see that it is working well as expected. After making our project we observe it very careful. It works as we desire. Our project give output perfectly and all equipment are work perfectly. We check how much it works and we get perfect output from this project.

- Finally, we have completed our project successfully & check our project its run accurately according to our objective.
- At first, we start our system.
- Following are The outputs of our project.
- The stand automatically deploys and retracts based on bike movement status.
- Arduino Pro Mini successfully processes data and controls the motor.
- Gear motor provides smooth and reliable stand operation.
- Motor driver efficiently manages power flow to the gear motor.
- Battery offers stable power supply without affecting bike's main system.
- Manual errors like forgetting to lift the stand are completely avoided.
- Prototype proves the concept is feasible for real-time application.

5.2 Prototype Specifications Summary

Parameter	Value
Degree of Freedom (Stand)	90°
Movement Time	0.66 seconds
Battery Backup Time	2.8h
Total Weight (Prototype)	4.8 kg
Weight of Stand	0.95kg
Weight without Stand	3.85 kg

5.3 Final Projecr



Figure 5.1 Project Progress image

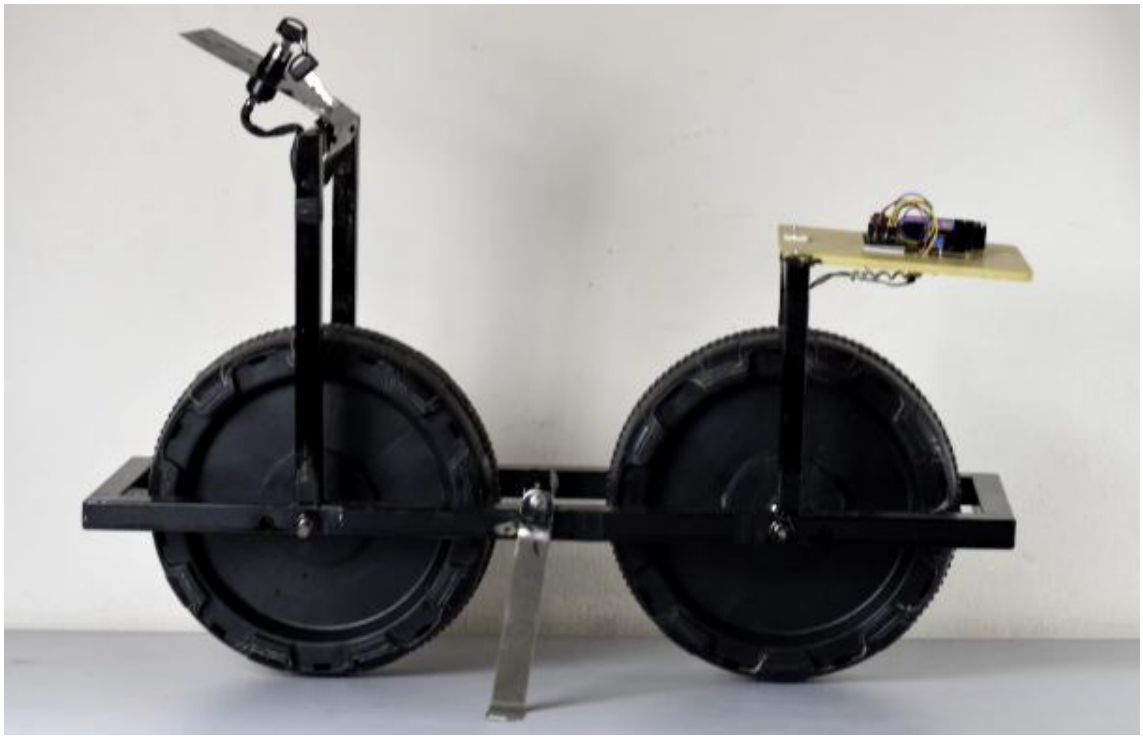


Figure 5.2: Complete Project Prototype

5.4 Cost Analysis

Sl.no	Particulars	Specification	Qty.	Unit Price (Taka)	Total Price (Taka)
1	Battery	3.7V	2	100	200
2	Arduino Pro mini	Atmega328p	1	550	550
3	Gear motor	25GA	1	750	750
4	Motor Driver	L298N	1	400	400
5	Frame			2500	2500
6	Wheel		2	1000	2000
7	Others				1000
				Total	7400/=

Table 1:List of Component with Price

5.5 Advantages

There are certainly many advantages of our project and some of the major ones have been given below -

- Enhances rider safety by preventing stand-related accidents.
- Fully automatic operation removes need for manual effort.
- Reduces chances of forgetting to lift the stand.
- Increases the lifespan of the bike stand mechanism.
- Compact and lightweight design suitable for all bikes.
- Arduino-based system ensures accurate and quick response.
- Gear motor provides smooth and controlled movement.
- Battery-powered system operates independently from bike's main power.
- Can be retrofitted to existing two-wheelers.
- Improves overall user experience and comfort.

5.6 Limitations

It is a demo project so we found some limitation. In future we will work for reduce this kind of limitation. These limitations are -

- This project can now be only used for small scale purposes
- No energy backup.
- Limited to low- and mid-weight bikes due to motor torque capacity.
- May not perform well on uneven or sloped surfaces.

5.7 Applications

Some of the application areas of the project has been pointed out below-

- Motorcycles and Scooters
- Electric Bikes
- Delivery and Courier Bikes

5.8 Discussion

While working on our project, we did face some difficulties as it is a very complex system but the end results, we came up with were quite satisfactory. We have put the whole system through several tasks to validate our work and also have taken necessary notes for future improvements. Some future recommendations that we have involves improvement in system design and wiring, adding features for more efficient.

The Automatic Bike Stand System is a smart innovation aimed at improving rider safety and convenience. Traditional bike stands require manual effort and are often forgotten, leading to accidents or damage. This project automates the process using an Arduino Pro Mini, gear motor, motor driver, and battery, enabling the stand to retract or deploy based on bike movement. During testing, the system responded accurately to stop and start conditions. Its compact design and low power consumption make it suitable for real-world application. However, the system may face challenges on rough terrain or heavy bikes without additional motor torque and weather protection.

5.9 Operation of Bike Stand using Single Key

In this project, the bike stand is controlled through a single key switch instead of manual effort. When the rider turns the key, it sends a signal to the Arduino, which activates the motor driver. The motor driver then rotates the gear motor connected to the stand, making it either rise or fall. This single-key control ensures simplicity, ease of use, and reliable automation for parking the bike safely [14],[15] .

- **Key Switch Connection:**

1. The key switch is the bike's ignition switch. It usually has 2 or 3 pins (ON/OFF or ON/ACC/OFF). For this project, we use:
2. Power/Signal Pin: Sends +12V or +5V to the system when the key is ON.
3. Ground Pin: Connected to Arduino or circuit GND.

- **Connection Steps:**

1. Key Switch Output → Arduino Input Pin
2. When the key is ON, it should send a HIGH signal to the Arduino.
3. Connect to an Arduino digital pin (e.g., D2).
4. If the key outputs 12V, use a voltage divider or relay to reduce it to 5V suitable for Arduino input.
5. Arduino GND→ Bike GND (All components must share a common ground.)

- **Arduino → Motor Driver**

1. Arduino digital output pin (e.g., D9) → Motor Driver input
2. Motor Driver GND → Arduino GND
3. Motor Driver VCC → Power supply as required
4. Motor driver (like L298N or H-Bridge) controls the gear motor direction (UP/DOWN) based on the Arduino output.
5. Motor → Bike Stand
6. Motor Driver output → Gear Motor terminals
7. The gear motor moves the bike stand up or down depending on the command.

CHAPTER 6

CONCLUSION

6.1 Conclusion

The Automatic Bike Stand System successfully demonstrates how automation can enhance safety and convenience for two-wheeler riders. By integrating an Arduino Pro Mini microcontroller, a motor driver, and a gear motor powered by a battery, the system intelligently detects bike motion and automatically deploys or retracts the stand. This eliminates common issues like forgetting to lift the stand or manually operating it, reducing the risk of accidents and damage. The project highlights the feasibility of retrofitting existing bikes with automated technology at a reasonable cost. Testing confirmed reliable and smooth operation, with quick response times and energy-efficient performance. However, some limitations remain, such as the need for adaptation to different bike models and terrain challenges. Overall, the project provides a practical and innovative solution for improving rider safety and ease of use, paving the way for further advancements in smart two-wheeler technologies.

6.2 Future Scope

We are thinking about adding many features to our project in the future to get more desirable out comes. Some of the steps that we are thinking about taking are given below:

- In future development this project can be develop by sensor System (Ultrasonic Sensor / IR Sensor, Load Cell module).
- In future, I will try it to apply in real field.
- In Future develop add extra power system (Renewable energy , Solar Panel).
- In future integration with IoT for remote monitoring and control via smartphone apps.
- In future ,Adding GPS tracking to enhance security and theft prevention.

REFERENCES

[1] (K. DEVENDRA NATH) (12KQ1A0323) M.M. SRINIVAS (12KQ1A0328) P. RAJASEKHAR (12KQ1A0338) G. VINAY KUMAR (12KQ1A0313) V. SRIKANTH (122Q1A0345) (AUTOMATIC SIDE STAND RETRIEVING SYSTEM FOR TWO WHEELERS . Submitted to Jawaharlal Nehru Technological University, Kakinada) 2012.

[2] (Vishal Srivastava), Tejasvi Gupta, Sourabh Kumar, Vinay Kumar, Javed Rafiq, Satish Kumar Dwivedi) (Automatic Side Stand . International Journal of Engineering and Advanced Technology (IJEAT)ISSN: 2249 – 8958, Volume-3, Issue-4, April 2014)2014.

[3] Shubham Bagul1, Nikhil Dhake2, Deepak Mengal3, Padmakar Jadhav4, Ms. Divya R. Dhagate5, Prof. Sunil M.More6) (AUTOMATIC BIKE STAND . Third Year Electrical Students, 5,6 Assistant Professor, Department of Electrical Engineering, Guru Gobind Singh Polytechnic Nashik, Maharashtra, India) 2017K.

[4] Aniket Gulhane1, Ganesh Gawande2, Bhagwat Gawande3, Shraddha Dhule4, Chaitanya Deshmukh5 (Fabrication of Automatic Side Stand Lifting Mechanism) 2017.

[5] Associate Professor – R. Selvendran.M.E., (Ph.D.)UG Scholar- Anlin J P, Mohamed Ashik N, Mohamed Riyas K (Design and Fabrication of Automatic Side Stand Lifter for Two-Wheeler . Department of Mechanical Engineering,Hindusthan Institute of Technology.Coimbatore, Tamilnadu, India.)2019.

[6] Mathavan, J.J. *et al.* (2020) 'Arduino based hardware implementation of automatic side stand for Motor Bike', *2020 Fourth International Conference on Computing Methodologies and Communication (ICCMC)* [Preprint]. doi:10.1109/iccmc48092.2020.iccmc-000116.

[7] MURALIDHARAN, B. and POKHAREL, R. (2012) 'Automatic Side Stand Retrieve System', *Paripex - Indian Journal Of Research*, 3(2), pp. 114–115. doi:10.15373/22501991/feb2014/35.

[8] Rashad, Dr.A. and Habib, Dr.S. (2017) 'Evaluate the associated deformities in motor bike riders', *International Journal of Contemporary Research and Review* [Preprint]. doi:10.15520/ijcrr/2017/8/12/382.

[9] Sachin J. Ugale, Yogesh R. Pawar, Harshal B. Deore, Saurabh D. Patil, Prof. Shailesh S. Parkhe are published "AUTOMATIC BIKE STAND FOR TWO-WHEELER", International Research Journal of Engineering and Technology (IRJET), Volume: 09, Issue: 05, e-ISSN: 2395- 0056, p-ISSN: 2395-0072, Page No:3715 – 3720, May 2022.

[10] V. Bhargav, Sudhakar. N, Manoj Naik. M, Shreyas. V, Sudarshan. T. A. are published "DESIGN OF AUTOMATIC MOTORBIKE STAND SLIDER", International Research Journal of Engineering and Technology (IRJET), Volume: 08, Issue: 06, e-ISSN: 2395-0056, p-ISSN: 2395-0072, Page No:2664 – 2668, June 2021.

[11] Shubham Jichkar, Rushikesh Dhawale, Deepesh Kumar, Hrishikesh Deshmukh, Prof. M.M. Dange are published "AUTOMATIC SIDE-STAND SLIDER ASSEMBLY", International Journal of Advance Scientific Research and Engineering Trends (IJASRET), Volume 5, Issue 4, ISSN (Online) 2456-0774, Page No:23 – 32, April 2020.

[12] Amit Singh, Ankit Kumar Rai, Chandan Yadav, Jayhind Yadav, Prasoon Choudhary is published "AUTOMATIC SIDE STAND OF TWO-WHEELER", International Research Journal of Engineering and Technology (IRJET), Volume: 05, Issue: 04, e-ISSN: 2395-0056, pISSN: 2395-0072, Page No:1315 – 1317, Apr-2018.

[13] V. Chandrika, T. Ashok, SK. Jilani, V. Harish are published "AUTOMATIC BIKE SIDE STAND RETRIEVE SYSTEM", Journal of Emerging Technologies and Innovative Research (JETIR), Volume 6, Issue 3, (ISSN-2349-5162), Page No:374 – 379, 2019.

[14] https://youtu.be/xKKMb5aJQX8?feature=shared

[15] https://youtu.be/o5CqXAUwvEw?feature=shared