



KARNATAKA STATE COUNCIL FOR SCIENCE AND TECHNOLOGY

Title for Project

FitJet

'Speed for Range'

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INTRODUCTION

E-bikes are classified according to the power rating of the electric motor rating. With power-on-demand, the motor is activated by a throttle, usually handlebar-mounted just like on most motorcycles or scooters.

E-bikes use rechargeable batteries and the lighter varieties can travel up to 25 to 30 km/h. A low-cost alternative to an automobile is a bicycle. However, the use of bicycles has been limited to very short trips or as a recreational activity. The global electric bike market size is expected to reach \$28.51 billion by 2027. In developed countries, over 50% of all bike sales are electric bikes.

Therefore, very broadly, e-bikes can be classed as:

- **Pedelecs:** Have pedal-assist only, motor assists only up to a decent but not excessive speed (usually 25 km/h or 16 mph), motor power up to 250 W (0.34 hp).
- **S-Pedelecs:** Have pedal-assist only, motor power can be greater than 250 W (0.34 hp), can attain a higher speed (e.g., 45 km/h or 28 mph) before motor stops assisting, sometimes legally classed as a moped or motorcycle.

OBJECTIVES

The objectives of making electric bikes are multifaceted. First and foremost, electric bikes aim to provide a sustainable and eco-friendly transportation option that reduces carbon emissions and air pollution. They also promote physical fitness and well-being by encouraging individuals to engage in physical activity, while still providing an assisted mode for those who require it. Electric bikes also offer greater convenience and flexibility for transportation, allowing individuals to navigate through traffic more easily and cover greater distances. They can also help reduce traffic congestion and the associated time and financial costs. Lastly, electric bikes can provide a cost-effective transportation option, as they typically require less maintenance and have lower operating costs compared to traditional vehicles. The objectives of making automatic gear systems are to provide convenience, comfort, and safety to drivers by eliminating the need for manual gear shifting, enhancing driving experience, improving safety, and making driving more accessible to individuals with physical limitations. Overall, the main objective is to build a great product having multiple automated specifications.

INNOVATION

Integrating Automated Manual Transmission (AMT) technology into gear cycles brings a noteworthy innovation. AMT offers a semi-automatic shifting system that eliminates the need for manual gear changes, simplifying the cycling experience. With AMT, cyclists can effortlessly shift gears through electronic controls, enhancing convenience and reducing distractions. The system intelligently adapts to riding conditions, automatically selecting the most suitable gear ratio. This feature optimizes power delivery, improves efficiency, and enables smoother gear transitions. By implementing AMT in gear cycles, riders can focus more on the road ahead, experience seamless gear shifts, and enjoy a more intuitive and user-friendly cycling experience.

NOVELTY

- The e-bike will have an automatic gear transmission system.
- Initially, the basic mountain terrain bike is converted into an E-Bike and then the gear is shifted automatically as the speed of the cycle varies giving it a higher range in a single battery charge.
- The concept of gear system in the geared motor vehicles are being implemented in E-Bike for automatic gear transmission.

COMPONENTS

Lithium-ion Battery (36 volts): The advantage of a 36V lithium battery over other batteries is that it can operate in a wide temperature range.

Hub motor BLDC (250 watts): BLDC motor controller is an electronic device used to regulate the speed and torque of a BLDC motor, enabling efficient and precise control.

Motor controller: The microprocessor is the central unit of a computer system that performs arithmetic and logic operations, which generally include adding, subtracting, transferring numbers from one area to another, and comparing two numbers.

Servo Motor (MG995): A servo motor is a type of motor that can rotate with great precision.

Throttle: Typically located on the grip or the handlebar, the throttle provides direct power to the motor up to its top speed without the need to pedal.

Arduino Uno: Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects

Arduino IDE: The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

SCHEMATIC DIAGRAM

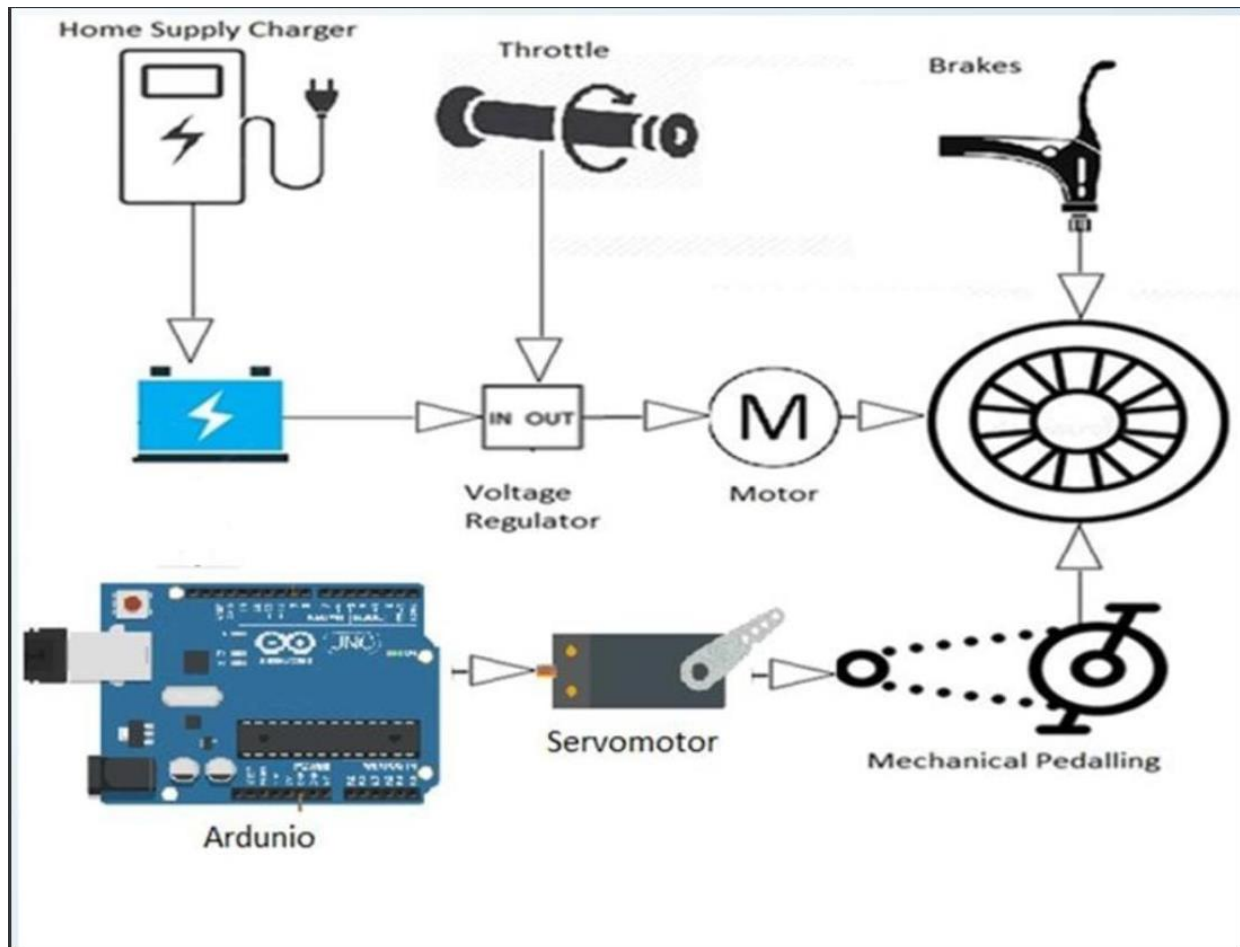


Fig 1. Schematic diagram of the project

- Figure 1 illustrates the power and signal flow of the project. The home supply charger is used to charge the battery. The battery is connected to the voltage regulator which regulates the voltage supply and powers the hub motor.
- The motor is fitted to the back wheel of the bicycle. Dynamo is attached to the front wheel of the bicycle which under free flow movement, additionally recharges the battery.
- When throttle is opened, the voltage gets regulated and the power is supplied to the motor and eventually the wheels start to move.
- When the battery is discharged, it is charged with the home supply charger or else the dynamo can be used for regeneration of charges for the battery.

METHODOLOGY

PHASE 1

- Converting a traditional bike into an e-bike typically involves adding an electric BLDC hub motor and battery to the frame.
- When the cycle will be turned on, the battery will supply power to the BLDC motor making the vehicle to move.
- This power from battery will be controlled by a voltage regulator acting as throttle in the cycle to increase the speed or decrease the speed.
- A controller is also necessary to regulate the motor and battery output.

PHASE 2

- The gear system of a general vehicle has manual shifter, where the gear will be shifted by the rider.
- This system will be automated, that is the gear in the vehicle will shift automatically keeping the speed of the cycle in reference.
- This will be achieved as the gear wire will be tweaked using a servo motor and micro controller.
- The micro controller will be programmed in such a way that when the input from the speedometer is received to microcontroller.
- Depending on the speed, the servo motor angle will change and the gear wire tension will be affected and thus changing the gear.

RESULTS

- We have successfully implemented our ideology on our cycle by mounting few of the necessary components.
- Testing is currently going on to check if all the operating conditions are intact and all the features are implemented.
- Checking with the components ratings (that is best suited for our project) and mounting that rated component accordingly.
- Checking the stability of mounting and the working of AMT w.r.t all the riding conditions is to be done.
- Figure 2 depicts the overall working model of the project.



Fig 2. Working model of the E-bike.

CONCLUSION

Electric bikes, also known as e-bikes, have become increasingly popular in recent years due to their numerous advantages over traditional bicycles and motorized vehicles. E-bikes use a battery-powered motor to assist with pedaling, allowing riders to travel further and faster with less effort. This makes them a great option for commuting, recreational cycling, fitness, and more. One of the main advantages of e-bikes is their ability to promote physical activity and improve overall health and well-being. E-bikes can also provide increased mobility, cost savings, and eco-friendliness. They are a versatile transportation option that can be used in a variety of situations, and can be helpful for individuals with physical limitations or disabilities. Additionally, e-bikes are fun and enjoyable to ride, and can reduce stress and improve mood, which can have positive impacts on mental health.

As technology and infrastructure continue to improve, e-bikes are becoming more accessible and affordable, making them a viable transportation option for a wider range of individuals and communities. With their numerous advantages, e-bikes have the potential to help reduce traffic congestion, improve air quality, and promote sustainable transportation. As such, they are an important part of the growing movement towards more efficient, eco-friendly, and healthy modes of transportation.

FUTURE SCOPE

- Electric bikes, or e-bikes, are rapidly gaining popularity around the world as a sustainable and efficient mode of transportation.
- The global e-bike market is expected to grow at a compound annual growth rate of over 7% between 2021 and 2026, driven by increasing concerns about climate change and rising fuel prices.
- E-bikes offer numerous benefits, including reduced emissions, lower operating costs, and improved health and fitness outcomes.
- As battery technology continues to improve, e-bikes are becoming increasingly efficient, with longer ranges and faster charging times.
- E-bikes are also becoming more versatile, with a growing range of models designed for off-road use, commuting, and even cargo transport.
- In urban areas, e-bikes are seen as a practical and convenient alternative to cars and public transportation, offering greater flexibility and lower costs.
- The rise of e-bikes has also led to a growing demand for bike-friendly infrastructure, such as bike lanes, parking facilities, and charging stations.
- With the increasing popularity of e-bikes, some cities are even introducing e-bike sharing schemes, allowing residents and visitors to rent e-bikes for short journeys.
- E-bikes are also gaining traction in the tourism industry, with many operators offering e-bike tours and rental services to explore local attractions.
- The growth of the e-bike industry is also creating new job opportunities in areas such as manufacturing, design, sales, and maintenance.
- Some experts predict that e-bikes could even replace traditional bicycles as the primary mode of transportation in many parts of the world.
- Overall, the future of e-bikes looks bright, with increasing demand for sustainable and efficient transportation solutions driving continued growth and innovation in the industry.