



# International Journal of Multidisciplinary Research Transactions

(A Peer Reviewed Journal)

www.ijmrt.in

## Adaptive Speed Control Mechanism Accomplish in Electric Vehicle using Internet of Things

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### Abstract

The main aim of this project is to give the exact view by bridling the various sources of energy available to mankind. In today's modernized world travelling is very essential for human beings in order to protract in this world. And to do so his travelling should be done in minimum possible way. This project details about the Electric Bike which runs on the battery thereby providing voltage to the motor. This project compromises with design and fabrication of Electric Bike which makes use of Electric energy as the primary source. The electrical power generated which is used to run the bike can give better fuel economy compared to conventional vehicle, better performance and also causes less pollution. To reduce the air pollution and the noise pollution. It provides an ecofriendly vehicle and reduces the usage of fuels. Thus here transmission is also used as to control the speed of the vehicle as by increasing and decreasing. The speed can be varied as like gas powered motorcycle.

**Keywords:** Electric Vehicle, IoT, SoC, Intelligent Controller.

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### 1. Introduction

#### 1.1 Preamble

Energy crisis is one of the major concerns in today's world due to fast depleting resources of petrol, diesel and natural gas. In combination with this, environmental decay is an additional factor which is contributing to the depletion of resources which is an alarming notification. Our project proposes the solution for this above perilous problems. The system which we innovated is the Electric Bike. This project has various benefits both to the members of the team and also external benefits thereby making awareness of using alternative modes of transport. The Electric Bike which works on the battery that is powered by the motor is the

general mode of transport for a local trip. The solar panels can be alternative source for this by adding it to the system. The Electric bike which will be running on battery, the power is supplied by the motor, thereby supplying this power to drive the other gear components. The main purpose of using this E-bike is that it is user friendly, economical and relatively cheap. The efficiency of this system undeniable compared to conventional modes of transport.

The Electric bike is a bike which is driven with the help of battery which is coupled to electric motor. Main principle: It works on the principle that the electromotive force of an A.C. motor which receives electrical energy stored in D.C. battery is converted with the help of D.C. to A.C. converter. Working medium: Here for the motivation of prime mover the chemical reaction takes place from which an energizing current is evolved which is responsible for the working. The working medium is sulphuric acid which is separated into columns of H ions and negative SO<sub>4</sub> ions when mixed with water. If the poles of the cell are connected by a load, the flow of the electrons is from negative to positive.

A bivalent positive lead is produced from neutral lead when combined with bivalent negative of SO<sub>4</sub> group to form lead sulphate. This results due to scarcity of electrons at negative pole. Through the electron supply a bivalent positive lead is produced at positive pole from quadrivalent positive lead. A combination of SO<sub>4</sub> comes into existence thereby ruling the combination of O<sub>2</sub> which leads to formation of PbSO<sub>4</sub>. The atoms of oxygen and hydrogen from electrolyte are released together to form water thereby decreasing the density of battery acid.

In this a DC waveform which is obtained is made sinusoidal due to operational transistorized D.C. to A.C. amplifying circuit by switching the electric energy in the form of electric current which flows from battery to D.C. to A.C. converter circuit. By using amplifier circuit the small A.C. current is amplified again. In order to drive the circuit through the condenser, this amplified current is fed to the stator winding of the A.C. motor. The condenser which is used acts as storage of electric energy and delivers at the time of requirement. The sprocket wheel installed on motor shaft is driven by the motive power of the electric energy. The rear sprocket wheel is being rotated by the chain drive mechanism on which the other two remaining sprocket wheels are installed. The wheel is driven by the rear wheel installed on the rear sprocket. Thus the electric bike is mobilized by using electric power.

India is the second most popular nation in the world. Like many other countries where agriculture is the main activity, biomass and other non – commercial fuels constitute around 40% of energy requirements in India. Around 85.49% of Indian villages are electrified. People use bicycles as the main medium of transportation in villages. In addition in cities, where most people use exercise bikes, the energy can be productively used to power electronic gadgets, which require less power.

In India, many of the villages are still without electricity and most of them use bicycle as their medium of transportation. In such places, our system will be of great help. Charging of the battery can be done by a layman by just connecting the circuit to the output of the dynamo which is connected to the bicycle. This would charge the li-ion batteries.

World is a storehouse of energy. And according to energy conversion law, energy neither be created nor be destroyed but can be transformed from one form to another. But we are wasting resources that can produce energy as if they are limited. Humans are able to generate approximately 150W of power while riding bicycle. However, this power goes waste without any use. If this is making use of this energy, would be able to power many electronic devices. A dynamo or an alternator can be used for harvesting the energy generated by a cycle rider while riding. We can charge mobile phones or a small lighting device with the power. Not only in bicycle but also in alternator bikes, cars and exercise bikes use this principle.

## **1.2 Internet of Things (IoT)**

The Internet of things (IoT) is a system of interrelated computing devices, mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The definition of the Internet of things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things.

In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", covering devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one

or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smart phones and smart speakers. There are a number of serious concerns about dangers in the growth of IoT, especially in the areas of privacy and security, and consequently industry and governmental moves to begin to address these. Home automation or domestics is building automation for a home, called a smart home or smart house. A home automation system will control lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things ("IoT").

A home automation system typically connects controlled devices to a central hub or "gateway". The user interface for control of the system uses wall-mounted terminals, tablet or desktop computers, a mobile phone application, or a Web interface, that may also be accessible off-site through the Internet. While there are many competing vendors, there are very few worldwide accepted industry standards and the smart home space is heavily fragmented. Manufacturers often prevent independent implementations by withholding documentation and by litigation. Therefore automation of routines through IoT is a field that is attaining immense growth and one such work is taken up.

## **2. E-Bike Evolution**

### **2.1 Existing Systems**

In any planning process, before solutions or predictions can be developed, there is a necessary ingredient: facts, or data. Transportation planning is no exception to this requirement for data, and in the past, frequently half of an urban transportation planning study's budget has been allotted for data collection. These data can take the form of home interviews, roadside check points, parking lot surveys, postcard questionnaires, and similar techniques. Planning for the bicycle's return to the road as a viable means of transportation similarly requires information on the characteristics of the bicycle rider, his trip purposes and lengths of the trips, and where and when the trips are being made.

Literature in the area of bicycling has increased rapidly. Luebbers prepared a bibliography of bicycling material for the period 1957-1973. This report includes articles from such diverse publications as *Esquire*, *Popular Mechanics*, and *Civil Engineering*. Another bibliography was prepared by the U.S. Department of the Interior that deals mostly with trail planning. As part of another report; the Pan-Technology Consulting Corporation included an 11-page

bibliography that covers all aspects of bicycling, including an extensive section on bicycle safety.

There is a scarcity of data concerning actual mileage traveled by a regular bicycle user and his or her trip characteristics. A 1971 University of North Carolina study researched the riding habits and accident experiences of school age children. The subjects in this study, which was conducted in Raleigh, North Carolina, rode an average of 199 miles a year. More recently, the A. C. Nielsen Company, as mentioned earlier, conducted samples of bicycling activity in three different states.

Nielsen, in addition to determining the percentage of users in a state or area, also examined trip purposes and the number of days ridden in a one-month period. However, only limited mileage data were collected. Hanson and Hanson of the State University of New York at Buffalo have reported on detailed travel data gathered in Uppsala, Sweden. The study used a self-administered travel diary kept by all household members over 16 for a five-week period. The findings show that about 300 randomly selected households from six predefined life cycle groups used bicycles to account for over 11 percent of their total movements in any typical week period. Over 21 percent of all trips were made by bicycle. No trip length figures were reported in the Uppsala study.

In the past two to three years, many studies, reports, and projects have been written describing the construction methods, materials, and design standards and geometric characteristics that will provide the "best" bikeway for the money. Criteria for locating bikeways are being developed, intersection redesigns are under consideration, and specific signing for the bicyclists use is being discussed. Other studies have sampled potential bicycle users to determine latent demand for bicycle facilities. While many times this latter type of data may provide a "feel" of what potential bicyclists may do if certain special bicycle facilities are constructed or improved, it also can often lead to unreliable results due to the subjectivity of the survey.

Current trends in transportation planning processes are leading away from the efforts to collect massive amounts of data and are emphasizing a more refined process, i.e., disaggregate data sampling. Disaggregate data collection is the process of collecting sample data in order to establish generalized relationships between variables that can then be applied in similar

situations without having to collect basic data again. For example, the number of trips per household is directly related to the number of automobiles owned. This relationship, once determined from previous study, can then be used in similar undertakings, and trip making can be predicted on the basis of auto ownership.

## 2.2 Evolutions The Electric Vehicle System

Our In the market of Electric Vehicles, there are huge number of models of different variations in size, speed, shape, etc. In the future there will not be Gasoline engines because of scarcity of availability. The compactness in driving is also difficult compared with the Electrical Vehicles. Therefore, the peoples are interested in Electrical Vehicles with rated Speeds and Size. The Motto of this project is to build a ‘ELECTRIC BIKE’ which can work effectively, requires less maintenance, having more life and also with low price compared to any other product in the market. The title of this Project is to “Design and Fabrication of Electric Bike”. It contains two parts, first one is designing the bike and the second one is fabricating the necessary components. Initially designing of the expected view of Bike is completed. Then the collection of the parts and the fabrication process is started. After completion of the fabrication, inspection is done by test driving it and had succeeded in achieving the motto of the project.

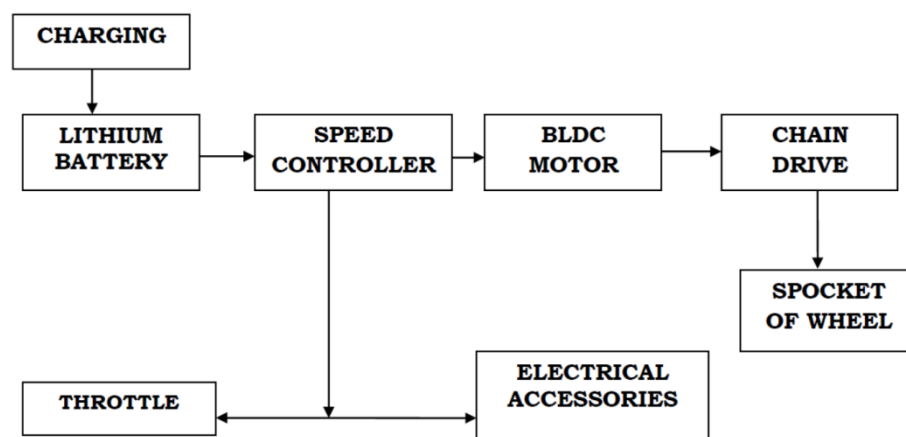


Figure.1. Block Diagram of the Electric Bike

## 2.3 Fabrication of Self-Charging Electric Bike

The frequent news about the extinction of fossil fuels has increased the importance of usage of electricity in the future. Electric bikes will be utilized to a greater extent. Office going people and people who travel moderate distances will be benefitted from the electric bike. The electric bike contains motor to help the vehicle move forward and various power sources are

being used. The batteries provide power to the motor and the motor drives the vehicle. When the battery is fully discharged the battery is recharged again by using a battery charger. In this project, we have used a DC motor/generator attached to the rear wheel of the bicycle. Two sets of batteries are connected to the setup such as A and B. When one of the batteries gets discharged another battery will provide the power required. During that time, the rotation of the wheel rotates the shaft of the dc motor/generator which produces an output of voltage. This voltage helps in the charging of the battery thus by increasing the mileage of the electric bike.

## **2.4 Campus Mobility for the Future**

This project presents the various outcomes and results of the study containing visions into the scheme. Electric bikes, of much sort have been surveyed by and by in a semi-open contract conspire on the Nanyang Technological University campus in Singapore. According to this campus, it is a famous and helpful administration, with a few models of electric bike being exceptionally very much utilized. Riders contemplate the premier of the electric bikes to be both agreeable and engaging while at the same time utilizing it, and extremely suitable for campus travel. Understudies and general society alike view the plan unhesitatingly, and creators have seen a lessening in the quantity of miles driven via auto inside the grounds for the dominant part of clients who are additionally drivers.

In this Project, authors have sensibly inspected the utilization of bikes on campus, displaying and investigating review results that endeavor to clarify blocks to bigger acknowledgment of the bike. Authors likewise bolster the general public by giving arrangement that if this information is coordinates with a portion of the qualities of the campus encompassing, it is conceivable to suggest specialized, arranging and reasonable arrangements that together should help the more prominent acknowledgment of bike transport. This is the concentration of the rest of the project.

### **2.4.1 Design and Fabrication of Dual Chargeable Bicycle**

In this project, we discussed about the crucial components and its experiments of e- bike, alternator and batteries. First, alternator which is an electromechanical device that transforms mechanical energy to electrical energy in the form of alternating current. The brushes of a DC generator carries a small fraction of the current, which carry the generator's whole output. A set of rectifiers (Diode Bridge) is essential to alter AC to DC. Produce a waveform similar to a

square wave as an alternative of a sinusoid. Author used alternator of Yamaha bike which workings are done at high RPM since authors' electric bicycle is restricted to low RPM so they changed the windings of alternator and upsurge the drive ratio. Hence, it can function at low RPM.

Another important part is discussed is regarding batteries Electric bicycles industrialized in Switzerland in the late 1980s for the Tour de Sol solar vehicle race accompanied sunlight based charging stations yet these were later settled on rooftops and associated in order to nourish into the electric mains. The scope of an electric bicycle is typically expressed as somewhere close to 7 km (tough on electric power only) to 70 km (minimum assistance) and is profoundly subject to regardless of whether the bicycle is tried on level streets or slopes.

The vitality expenses of working electric bikes are little; however there can be noteworthy battery substitution costs. In lots of available preferences authors selected 2 lead acid batteries of 12 volt 5 amp because of its easy availability and low cost and connected in series to get an output of 24 volt. Overall experimented results of this project are: Speed of 10-15 km/hr is achieved when battery is fully charged. When coming down the hill the charging can be achieved in 1hr. Driven mechanism wheel wear rapidly due to friction.

#### **2.4.2 Design of Electric Bike with Higher Efficiency**

From this project it can be found that they are focused on the improvement of efficiency of E-bike. Generally the speed of E-bike is in the range of 40-45 km/hr at maximum. So there they increase the speed of E-bike and design the aerodynamic shape in such a way that the efficiency of E-bike is improved. For the increasing the speed they are done the comparison of power transmission system. In that they found four power transmission systems. Based on Application the out of four any one of them power transmission system is used in E-bike. Generally the chain drive is used for transmitting the power. Along with that there are three different types of motor is also used like Gear hub motors, Crank drive motors and direct drive motors. So after completing experimental study it can be found that due to the specifications like light weight, inexpensive, compact, offering non-slip the chain drive is more efficient as compared to belts or gears. In this project they also show the design procedure of aerodynamic shape of E-bike. The importance of aerodynamic shape for the improvement of efficiency of E-bike is unavoidable. They mentioned the distribution of percentage of aerodynamics of E-bike enlisted below: Aerodynamic in total (It means the combination of rider aerodynamic as well as bike aerodynamic) - 65 %, Wheels - 7 to 8 % of total aerodynamic, Fork - 6 to 9 % of



total aerodynamic, Frame - 4 to 9 % of total aerodynamic, Other – 2 to 4 % of total aerodynamic.

## **2.5 Operation Principle of Bike**

If you have dynamo-powered bicycle lights, you already own an electric-powered bicycle. You pump your legs up and down on the pedals, you make the wheels rotate. A small dynamo (generator) mounted on the rear wheel produces a tiny current of electricity that keeps your back safety lamp lit in the dark. Now suppose you could run this process backward. What if you removed the lamp and replaced it with a large battery. The battery would kick out a steady electric current, driving the dynamo in reverse so that it spun around like an electric motor. As the dynamo/motor turned, it would rotate the tire and make the bike go along without any help from your pedaling. It may sound a bit farfetched, but this is more or less exactly how electric bikes work.

The batteries are the most important parts of the bike, because (if you don't do any pedaling) they contain all the power that will drive you along. Typical electric bike batteries make about 350–500 W of power (that's about 35– 50 volts and 10 amps), which is about a quarter as much as you need to drive an electric toaster. In theory, you could use any kind of battery on a bicycle. In practice, however, you want to use something that stores lots of power without being too heavy or you'll be using half your power just moving the battery along! That tends to rule out heavy lead acid batteries like the ones that start cars, though some electric bikes do use them. Light weight lithium-ion batteries, similar to those used in laptop computers, mobile (cellular) phones, and MP3 players, are now the most popular choice, though they're more expensive than older rechargeable battery technologies such as nickel-cadmium ("NiCad"). With a neat survey of the literature all the existing systems have been studied and by understanding their limitations, the gap that needs to address has been identified in this chapter.

## **3. Hardware Output**

### **3.1 Introduction**

More than 80% of the world's sale for gasoline motorcycle is connected in the Asian region. In the modern days, the primary concern of government is to find out a way by which we can minimize consumption of fossil fuel and promote the use of electric vehicle in our daily life.

They will be produce air pollution caused by gas exhaust from motorcycle has come a serious problem. Recent petrol price have hit the people hard economically.

### **3.2 Problem Solution**

Even after intense subsidies (not in India) these vehicles failed to make definite market why. Some of their biggest minuses of these vehicles are underpowered performance, the heavy weight of batteries, which consequently drags the performance even further, poor driving range per charge of the batteries and inability to offer all the devices that gasoline/diesel powered cars offer since they will drain the battery and charge needs to be saved for the main purpose of driving the car. It lacks practicality and luxuries that gasoline powered vehicles have been able to offer.

Other problems include less availability of spare parts and qualified mechanics, bad dealer network, even though it is claimed maintenance free, problems with electrical kits often occurs. Very importantly these vehicles are priced too high for instance Reva is priced on par with a well established car like Zen estilo makes it unattractive. But the manufactures estimated that production of higher volumes of EVs will reduce the cost by 10-15%. The switch is switched ON and the battery connected to the motor supplies energy to the motor.

The motor starts and the cycle start moving the shaft through the housing and make the sprockets at the other end move and thus the rear wheel. When the motor is switched ON, the motor draws current from the batteries connected in series that would give an effective discharge of 12V. The motor uses maximum current during starting and later on the current drawn reduces to 12Ah. The generator is mounted on side shaft of the bicycle, supports in such a manner that dynamo shaft is touching the back wheel tire. The battery pack 1 supplies energy to the motor and when the battery is fully discharged the 2 way switch is turned ON the other battery pack.

Then the generator wires are connected to the discharged battery. As the battery runs the rotation of the shaft produces an alternating voltage and to be passed through the bridge rectifier. The bridge rectifier converts the alternating voltage into direct voltage which is then charged into the battery. As the electric bike runs the voltage will be produced by the generator and the battery discharged will be recharged. When the second battery runs out, the

motor will rotate with the help of energy charged by the generator thus by increasing the mileage of the bike.

### 3.3 Hardware Prototype



Figure.2. Final Assembled Prototype



Figure.3. With BLDC Motor



**Figure.4. Full View of the Model**



**Figure.5. Full View Throttle**

### **3.4 Working**

The battery and the other circuits are given correctly according to the connections. When the motor of the switch is made on then the motor starts to rotate. It then rotates the gears for speed reduction and rotates the small sprocket wheel. Then the small sprocket rotates the wheel through chain. It is the motor and battery that make a bike an electric bike. The motor

provides most of the effect when pedaling. There are four main parts of an electric bicycle. Two of these parts are common on standard bikes--the frame and spokes and the brakes. An electric bicycle has two other parts--the motor and batteries.

An electric bicycle uses a wide range of motors and batteries. The motor of an electric bike is usually in the hub of the front wheel or the back wheel. The hubs on an electric bike are much larger to accommodate the motor. The battery used for an electric bicycle needs to be powerful, yet lightweight. If the battery is heavy most of the power is used to carry the extra load. Lithium-ion batteries are a good choice, but they are expensive.

These batteries can give you a range of 10 to 40 miles before recharging is needed depending on speed and terrain. As for the frame, the seat is usually made of aluminum, a lightweight material which helps keep the bike lighter. But the spokes are a lot stronger than those on a regular bike. The brakes on the electric bike are similar to those on standard bike. With an electric bike once you turn on the motor you can use the bike.

#### **4. Results and Discussions**

As the future of automobiles will be mostly of electrical and electronics this would help in such way. While the market abounds in motorbikes, electric bikes will soon be the mode of communication for almost every household. Thus the cost of the fuel and the economical affects that are being faced can be reduced .Electric bike is quite eco friendly and it can bring a huge development to the society in the future here in our project the charging is being the major drawback and the alternate source can be found and it will be rectified as soon as possible.

##### **4.1 Recommendation**

We recommend this work to all mechanical engineering students, technicians and engineers who would want to embark on the production of electrically motorized bike. This work is also recommended to all mechanical engineering students who were scared of workshop practice for them to understand that the relevance in this profession is in its practical output. This recommendation also goes to engineers who cannot prove their work in the workshop but only on projects. We hereby recommend that the school management should help to equip the mechanical engineering workshop with every necessary tools needed for practical works.

## 5. Conclusion

With the increasing consumption of natural resources of petrol, diesel it is necessary to shift our way towards alternate resources like the Electric bike and others because it is necessary to identify new way of transport. Electric bike is a modification of the existing cycle by using electric energy and also solar energy if solar panels are provided, that would sum up to increase in energy production. Since it is energy efficient, electric bike is cheaper and affordable to anyone. It can be used for shorter distances by people of any age. It can be contrived throughout the year. The most vital feature of the electric bike is that it does not consume fossil fuels thereby saving cores of foreign currencies. The second most important feature is it is pollution free, eco – friendly and noiseless in operation. For offsetting environmental pollution using of on – board Electric Bike is the most viable solution. It can be charged with the help of AC adapter if there is an emergency. The Operating cost per/km is very less and with the help of solar panel it can lessen up more. Since it has fewer components it can be easily dismantled to small components, thus requiring less maintenance.

We finally recommend that the government should motivate and sponsor trained, skilled and talented engineers in this country to invigorate them to put their best in the fabrication of components and maintenance to minimize importation.

### 5.1 Future Scope

- As the global warming is increasing day by day and the reservoir of fossil fuel tends to end, the eBikes, solar bikes etc. will be better options.
- As compared to the fuel driven vehicles, the electricity driven vehicles are better when we talk about the pollution.

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