Power Quality Analysis of a 250 W DC Motor Fed Electric Vehicle

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Abstract

The bicycle has gone from being an old-fashioned recreational product to a less polluting means of transport and a compact, ultra-light personal mobility tool. This is how electrical bicycles will be used as the pillar that could support individual public transport in large cities worldwide. The Electric bicycle uses an electric motor for the purpose of moving. People use their, muscular force to move the cycle and reach their destination. But by using the motor fed Electrical bicycle (Electric Vehicle), people do not have to use their muscular force to move the cycle because it uses electrical energy for motion. For the proposed work, a battery bank is used for supplying the electrical power (energy) to the DC Motor and is operated whenever required. With a conventional control strategy the DC motor is controlled and the test results will be presented. Electric bicycles have undergone a real boom in recent years and represent an important part in the area of sustainable mobility. In order to ensure long-term acceptance, a permanent improvement of safety is very important. This is the starting point for the Inter disciplinary research project Bike Safe. It aims at the development of an active braking dynamics assistance system. This system targets both critical situations front wheel lock up and nose-over falling over the handlebars.

Index Terms- Electric Vehicle and DC motor

1. Introduction

An electric bicycle, is known as an e-bike , the bicycle with an integrated electric motor which can be used for moving. There is a variety of e-bikes available worldwide, the e-bikes have a small motor to assist the pedal-power of rider's to somewhat more powerful e-bikes which tend closer to moped-style functionality. E-bikes use rechargeable batteries and the lighter varieties can travel up to 25 to 32 km/h (16 to 20 mph), depending on the laws of the country in which they are sold. While the other high-powered e-bikes can often do in excess of 45 km/h (28 mph). In today's world the consumption of resources like petrol, diesel and natural gas is more and it is getting reduced. In combination with this, environmental spoil is an additional factor which is contributing to the consumption of resources which is an alarming notification. Our paper proposes the solution for this above mentioned problems. which we innovated the Electric Bike system. By this project we can make awareness of using different modes of transport and have benefits to the members. The Electric Bike which works on the battery that is powered by the motor is the general mode of transport for a local trip. We can add solar panels as the alternative source for this. The Electric bike which will be running on battery, the power is supplied by the motor, thereby supplying this power to drive the other components. The main purpose of using this E-bike is that it is user friendly economical and relatively cheap. The efficiency of this system conclusive compared to other modes of transport. DC Machines can be tested by three different methods namely Direct Method, Indirect Method and Regenerative Method. Direct Method of testing of DC Machine, also known as Brake Test. Brake test or direct load test is executed on a DC shunt motor to find the efficiency of the motor below operating situations. Also, from we are going to calculate the output of the mechanical strength and we can know the electrical input. After the calculation we are implementing fuzzy logic to obtain characteristics of an e-bike.

1. E-Bike/Bicycle Hardware Components

1.1 Motor

Figure.1.Motor

Electric Motor With Gear Reduction Produces More Low-End Torque Than Your Standard Motor This Motor Is Capable Of Rotation In Either The Clockwise Or Counterclockwise Direction By Reversing The Motors Power Wires

1.2 Controller

Figure.2.Controller

This controller is used to control all the components like motor, accelerator, brake, battery, battery charging, brake light, power lock.

1.3 Batteries

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Figure.3.Battery

The battery we are using in this e bicycle is lithium ion. The battery operating voltage is 12V, 7Ah.

1.4 Throttle

Figure.4.Throttle

It has Durable, Spring Returned Twist Action. It is a 3-Wire Throttle For Most 12v-48v Electric bicycle. It is used for speed control of motor.

2. Block Diagram And Hardware Prototype

2.1 Block Diagram

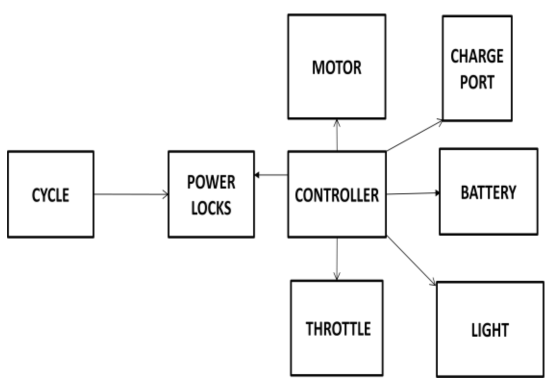

Figure.5.Block Diagram Of e-bike

In this block diagram we can see the connections of an e-bike in an schematic way ,we can observe from the block diagram that the components we are using in the e-bike clearly.

2.2 Hardware Prototype

Figure.6.Hardware Prototype

The electric vehicle consist of various components such as batteries, controller, throttles,250W dc motor, fuse, power lock and light.The construction of this electric vehicle is the batteries are series connected, motor, fuse and light all these are connected to controller all these connected equipment is kept in a black box .The working of this electric vehicle is that the controller can start with the help of power lock and by accelerating the throttle the bicycle can move from one place to another without using the muscular force.The maximum distance that electric vehicle can travel is 25kmph the maximum range of battery required is 28AH and 12V.The weight capacity of a electric vehicle is 60kg.

3. Simulation Results

[1] Input Power And Output Power

From fig.(7) we can observe that the input side yellow plots shows the membership functions referenced by the antecedent and output blue plots shows the membership function shown by the consequent and then from fig (8) we can observe that the input increase output also gradually increases. When It reaches the maximum point it will decrease .

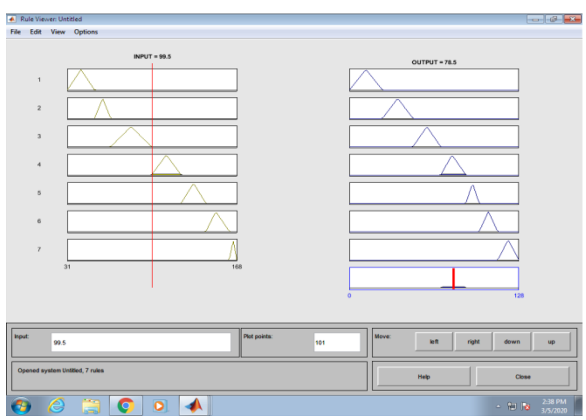

Figure.7. Rule Viewer Of Input And Output Power

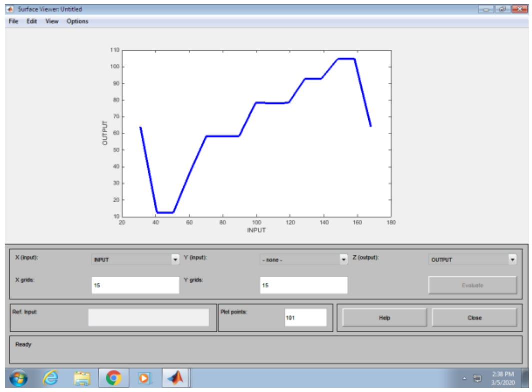

Figure.8.Surface Viewer Of Input And Output Power

[2] Speed Versus Efficiency

From fig.(9) we can observe that the input side yellow plots shows the membership functions referenced by the antecedent and output blue plots shows the membership function shown by the consequent and from the fig(10) we can observe that if speed increases efficiency also increases gradually .when it reaches the maximum point it will decrease. .

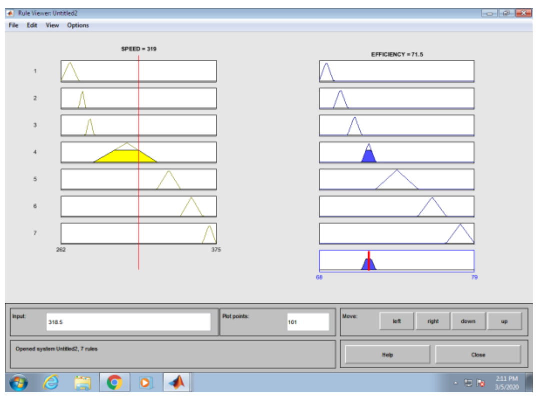

Figure.9.Rule Viewer Of Speed Versus Efficiency

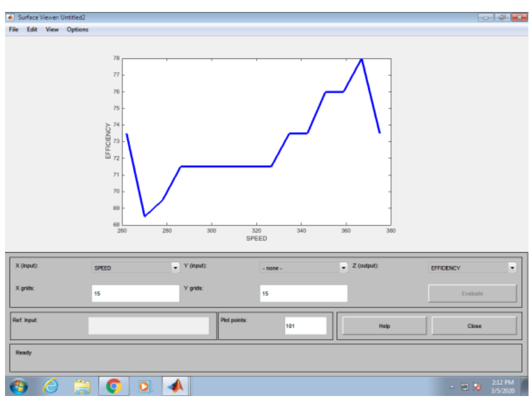

Figure.10.Surace Viewer Of Speed Versus Efficiency

[3] Torque Versus Speed

From fig.(11) we can observe that the input side yellow plots shows the membership functions referenced by the antecedent and output blue plots shows the membership function shown by the consequent and from the fig(12) we can observe that if torque increases speed is constant up to 65 later on it increases gradually . when It reaches the maximum point it will decrease.

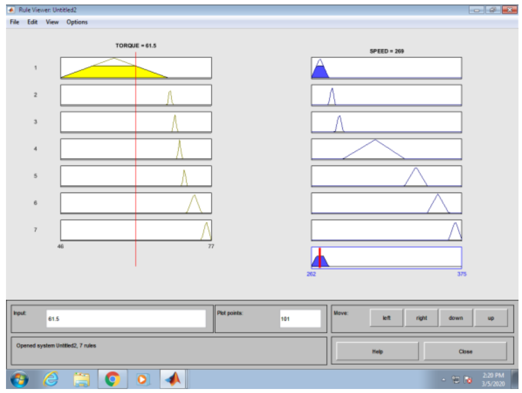

Figure.11.Rule Viewer 0f Torque Versus Speed

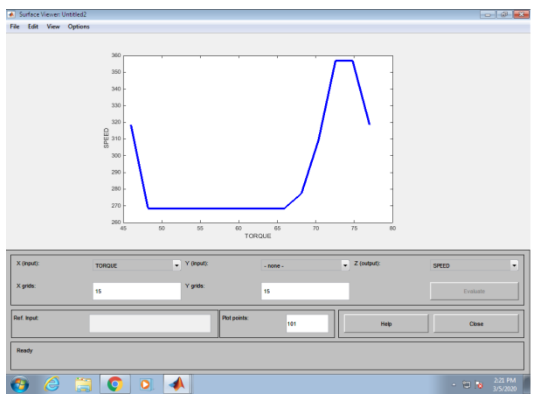

Figure.12.Surace Viewer Of Torque Versus Speed

[4] Torque Versus Efficiency

From fig.(13) we can observe that the input side yellow plots shows the membership functions referenced by the antecedent and output blue plots shows the membership function shown by the consequent and from the fig(14) we can observe that if torque increases efficiency is constant up to 68 later on it increases gradually . when It reaches the maximum point it will decrease.

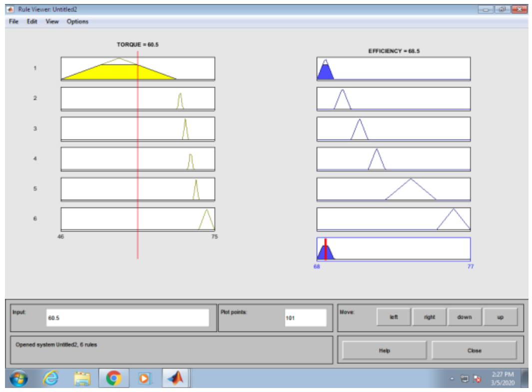

Figure.13.Rule Viewer Of Torque Versus Efficiency

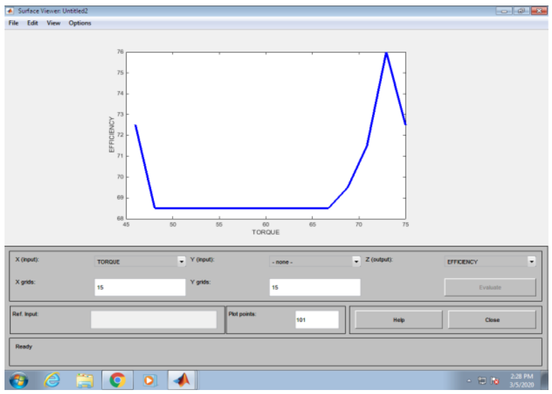

Figure.14.Surface Viewer Of Torque Versus Efficiency

4. Conclusion

As there is synchronization between the electric motor and ICE propulsions, less petrol consumption can be seen with less charging cycle of batteries (long life per charge).If one vehicle can save about an average of 30% of petrol fuel, then an average of about 40%-60% of national fuel can be conserved by using this type of vehicle. Also electric bill can also be saved, as the batteries last long per charge. An idea of charging the batteries through ICE can also be implemented here. The durability and convenience to consumer can be improved by using this type of vehicle. Charging of Lithium-Ion batteries can be done through idling or running ICE during the vehicle propulsion or by solar charging scheme discussed can also be used. This methodology of design can be relevantly adopted and verified for three-wheeler (Auto-rickshaws) and four-wheeler vehicles in future.

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