Electric bike with mileage enhancement

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***Abstract*- This paper aims to convert the old bicycle into an eBike along with mileage enhacement capability. The eBike has two motors, one as a motor and the other as a generator. The main idea of this project is to produce some voltage while working on the eBike slope and stored energy generated in the battery, which will further enhance the mileage of the eBike. A variety of batteries provide the power needed for motor operation. The project consists of two battery sets, the first battery set is used to operate the motor and the second set is fully discharged, which is automatically charged when operating the slope eBike.**

***Index terms*- Electric bike, mileage improvement, bldc motor, battery, eBay controller, adxl345 sensor**

I.INTRODUCTION

The idea of making electric motors has attracted cyclists since the late 1800s, and many American inventors have attempted to combine electric motors with the usual mechanics of bicycles. Until the technological breakthroughs of the 20th and 21st centuries, this idea was finally coming true. Light motors, batteries, rechargeable, high capacity, drive trains smoothly, bicycle parts provide a way to enjoy the benefits of today's electric bikes and fitness and physical needs. A bicycle, electric bicycle, also known as exercise or part of a daily e-bike trip, has an electric motor that can be used for propulsion. There are many types of e-bikes available on the market, from small motor-only e-bikes to more powerful e-bikes that are closer to the modern cycle of operation than the human effort of pedal power. Electric bikes are a new and better alternative to urban transportation. These provide all the benefits of a regular cycle: fun exercise, zero elimination, lack of strength to eliminate the most serious shortcomings of cycling. When you go downhill, consider hiking up the hill and it's an e-bike experience. In most cases in the city, riding an electric bike is faster and cheaper than a car or public transport.

The basic design of the eBike and parts is similar to other bicycles and includes an additional electric motor It is powered by means of a rechargeable battery, which gives riders greater power and in the end a smoother, more cozy and much less biking experience. The Ebike is a better choice than traditional bicycles and traditional vehicles because they are environmentally friendly, require less maintenance, have less motor output noise and are more efficient. The main goal of eBike is to overcome and expand pollution. Instead of a traditional vehicle. These eBikes have a high reputation abroad and the alternative to traditional bicycles improves the user experience due to the eBike experience. An ebike combines the benefits of a regular bicycle with a motorbike. It is an ecological means of transportation, with low maintenance cost, allowing you to move freely and easily without sweat. It is almost as environmental as bicycle because it requires very little power to propagate electric motors efficiently; Batteries need to be disposed of properly. This is cheaper because the cost of recharging the battery from your main socket is very low. However you should buy a new battery every 2 or 3 years. Being able to combine electrical support with your own pedaling effort, increasing electric motor support when you are tired or on the road can help you regain your right size. There are also cases where Ebike is safer than a regular bicycle.

II. COMPONENTS OF EBIKE

The ebike has the following components

BLDC motor:-

The bldc motor used the rating of 250w.This motor has been fitted into tyre of ebike.

The specification of motor are as follow

FIGURE 1

Voltage: - 48v, 250w
Rpm:- 350rpm
Wheel size:16 inch
Design:- brushless

Lead acid battery :-

FIGURE 2

The batteries used are lead acid battery. the energy stored in this batteries is used to run the bldc motor. the specification of battery are as follow
Battery type:- lead acid
Rating:- 12v, 7amp hr

Frame of ebike :-

FIGURE 3

The frame is core structure on which the components as well as batteries are placed, it also provides the base for the passengers

Arduino uno;-

FIGURE 4

Arduino Uno is an open source microcontroller board based on the Microchip ATmega328P Microcontroller and developed by Arduino.cc. The board consists of a set of digital and analog input / output (I / O) pins that can interfere with various expansion boards (shields) and other circuits. The board can be programmed via a Type B USB cable with 14 digital pins, 6 analog pins and the Arduino IDE (Integrated Development Environment). It can be powered by a USB cable or by an external 9-volt battery, although it accepts voltages between 7 and 20 volts.

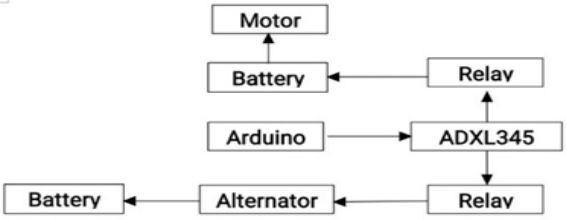
ADXL345:-

FIGURE 5

The ADXL345 is a small, thin, low power, 3-axis accelerometer with high resolution (13-bit) measurement at up to ±16g.The ADXL345 is used to detect the slope when the ebike is in operation. when the slope is detected the generation is started

Voltage and current sensor module:-
It is used to detect the voltage and current that is generated and it is displayed on lcd screen.

III. WORKING OF THE SYSTEM OF EBIKE



The Ebike works as normal electric bike on straight road i.e motor operates through battery and bike is running in normal condition. But when inclined or slope is detected the accelerometer sense the downhill movement and the relay turns off the motor and the same time the generator which is present is turned on due to which electricity generation is started and automatically when the downhill road comes to an end the bike automatically turns on the motor and the generator is turned off. The bike consist of two battery one which is fully charged and is used by motor and second battery is completely discharged which gets automatically charged during the downhill movement by the generator. The automatic switching process is done with use of Arduino, relay module and the accelerometer sensor i.e ADXL345 The Arduino is connected to accelerometer and relay module as soon as accelerometer sensor sense the change in road condition it automatically operates the relay module through Arduino so switching of motor and generator is done.

IV. MODES OF OPERATIONS

A) Normal mode
When the Ebike is operated on the normal surface road the Ebike operates as normal Ebike in which the Ebike runs through the bldc motor and the speed of bldc motor can be controlled using the throttle which is connected to the controller of Ebike. This controller is used to control the operation of ignition, speed, braking, headlight

B) Regenerative mode
When the Ebike is being operated on the slope the motor on the rear wheel is turned off this operation is performed by using the single channel relay and the same instant the generator on the front tyre starts generating the energy, the energy being generated is stored in the battery. The slope is being detected by using the accelerometer sensor i.e ADXL345.When the ebike comes at the end of slope it automatically turns on the rear tyre and switches off the generator on the front tyre

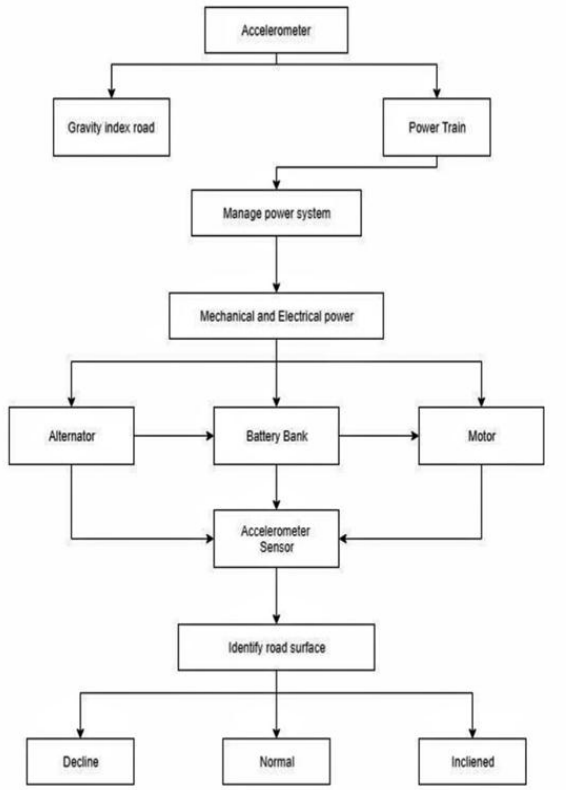
V. MATHEMATICAL CALCULATION & RESULT

As the BLDC Motor being used is of rating 250w and 350 rpm with voltage and current rating of 48v and 6 amperes.
P=2*3.14*N*T/60
350=2*3.14*350*T/60
T=6.82Nm OF TORQUE IS GENERATED

RESULTS OF VOLTAGE GENERATED ON SLOPE

SLOPE IN METERS	GENERATED VOLTAGE
35M	13V
43M	16V
50M	20V

VI. FLOWCHART OF SLOPE DETECTION MECHANISM



VII. CONCLUSION

It reduces the pollution from cities. The city has been defined to develop a battery power vehicle for daily use and to change ecofriendly methods for daily short term basis within cities. In conventional work, the concept of self-charging has been found in conventional battery power vehicles, which was the goal of changing the concept of plug in charging.

This work started with study of technology, the use of component and future of battery power electric car. On the basis of application used in accelerometer sensor ADXL345, relay, motor, motor controller as were dynamo were selected. From the result we can conclude that vehichle travels for long time. Alternator produces 12 to 14v, which uses rotational from wheel under fast motion. The result of fast motion is the charging of batteries.

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