

SOLAIR (Self Charging Electric Bicycle)

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Abstract: Present version of Electric bicycle available in market is not self charging and this bicycle suffers with more weight. Such bikes used for short distance. The term "SOLAIR" (Self charging electric bicycle) is used to describe "electric-motor-powered bicycles," including both fully and partially motor-powered bicycles. This project is consist six separate parts: The Battery, Dynamo as a wind generator, the BLDC motor, controller, charging system and solar panel. Use of simplified Mechanical design and less weighted dry cell batteries to overcome the above problems. Wind-solar combination is used for self charging. Due to that bicycle become smart and speed is increased. Charging time required for battery of this bicycle is less and discharging time is more. Some components such as motor, controller, battery, governor were installed in common bicycle, it is called electric bicycle. The speed of electric bicycle is controlled by controller, which ensure the electric bicycle safety and it is also the core component. Accomplished function of capacity detection, under-voltage protection and so on, because of PIC16F72 was taken as the main control chip, make modern electric bicycle increasingly more tend to be intelligent. The driving force of traditional electric bicycle completely come from motor, it not only reduce battery life greatly but also waste more electricity energy. The design is very efficient, cost-effective, and one day mass-manufactured, especially in developing countries where automotive transportation is an impossible. Here, the self charging electric bicycle market would benefit from further research both on the battery and on the drive technology and their use with electric bicycles. A self charging electric bicycle based on a brushless dc motor drive which has high efficiency, zero pollution, clean and convenient, is then designed and implemented in this project.

Keywords: Self Charging, Zero Pollution, Wind -Solar Combination, Electric Bicycle, BLDC motor.

I. INTRODUCTION

When thinking of possible senior projects, we all decided that we wanted to do something that would somehow be beneficial to the planet. We decided that the electric bicycle would be the best fit. The electric bicycle offers a cleaner alternative to travel short-to-moderate distances rather than driving a gasoline-powered car. In recent years, the World has increasingly encouraged a cleaner environment and less dependence on foreign oil. The price of crude oil has increased significantly over the past few years and there seems to be no turning back. The environment has also been more of a focus throughout the world in the past few years, and it seems that cleaner alternatives have been steadily on the rise with no end in sight. The electric bicycle is a project that can promote both cleaner technology as well as a lesser dependence on oil. It will run on clean electric power with the ability to recharge the battery 3 separate ways: through the 230 VAC wall source, by generating power through the wind-solar combination. An extra benefit to building the electric bicycle is that it can also show the general public how much cheaper it would be to convert their regular bicycle into an electric bicycle rather than driving solely in their gas-powered vehicles. The greater importance of the environment in the world leads to an opportunity for students in our position. With the economy trying to get out of one of the worst depressions of the century, there are numerous opportunities for us to help out. This is our opportunity to contribute a greener and more efficient planet. Modern electric bicycles integrate many innovations from technology and design, particularly in the past year. These developments beckon for the attention of many consumers. The time is right—environmental and economic motivations favouring electric vehicles have never been greater, nor the choices so diverse, for so many people.

- Electric cyclists unfamiliar with latest developments have two reasons to look again.
- Millions of others have reason to investigate electric bicycles for the first time.

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The hope is that this design can become very efficient, cost-effective, and one day mass-produced, especially in developing countries where automotive transportation is an impossibility. Each of these will be built upon and improved further but this is our opportunity to contribute a greener and more efficient environment.

II. DESIGN REQUIREMENTS

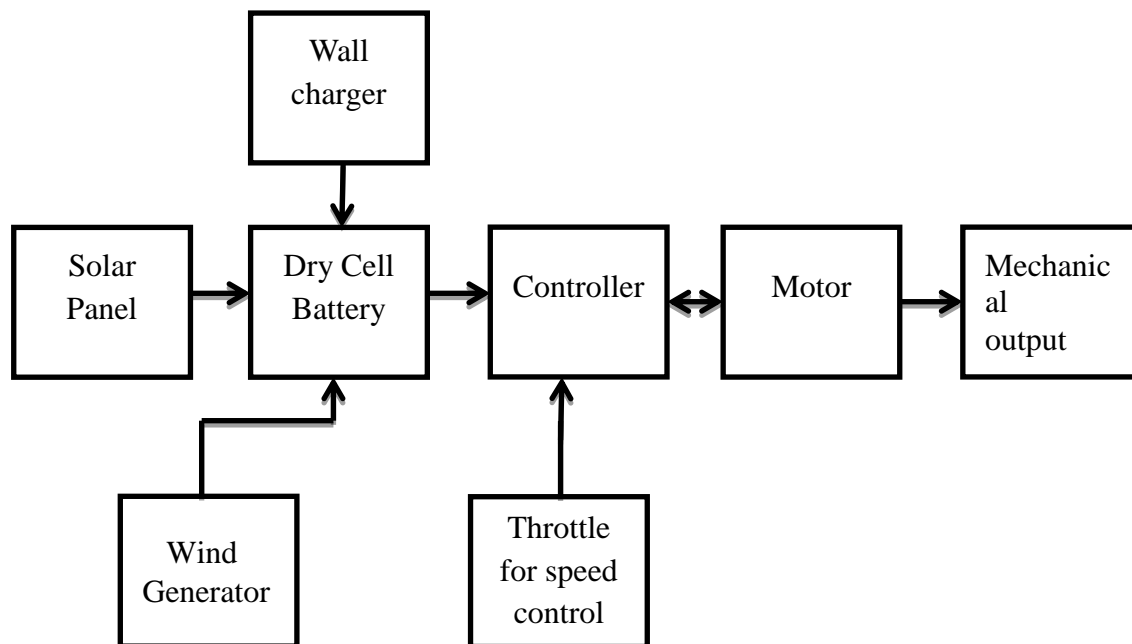


Figure.1 Overall Block Diagram.

There are many key components within the block diagram for this system as shown in Figure. They consist of a Dry Cell battery, motor-controller, photo-voltaic solar panel, wind generator and a brushless DC motor. The power throttle controller are simple systems that are used to trigger the functions for increasing speed, keeping the speed constant, and turning off the motor.

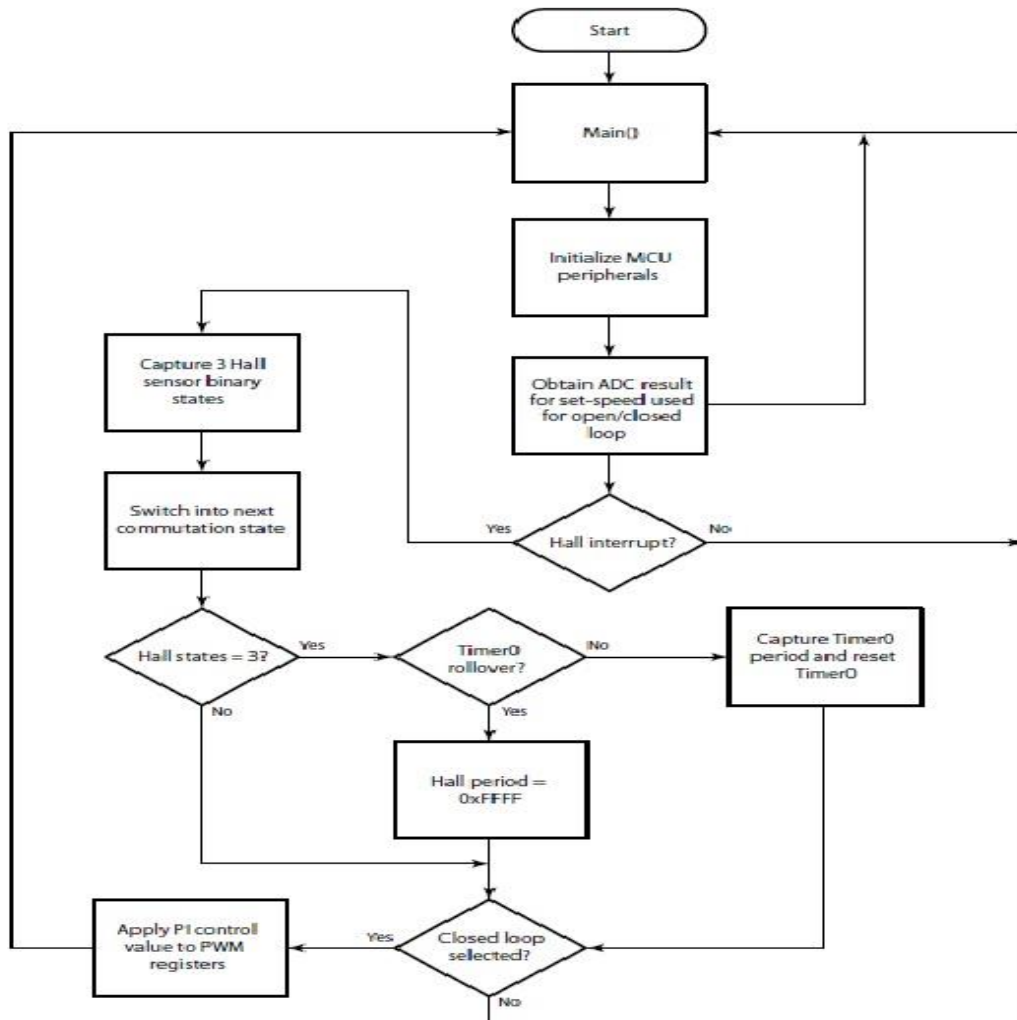
The power source for the system was a DC battery source chosen to output 48V. The battery block is interfaced with the motor controller block. The motor controller controls all the functional capabilities and is the central component of the system. The basic requirement for the control is to regulate the amount of power applied to the motor, especially for DC motors. The motor controller can be adjusted to synchronize with other brushless motors. There are also many built-in functions for this controller that vary from detecting any malfunctions with the motor hall sensors, the throttle and protect functions against excessive current and under-voltage.

The control allows the battery to interface with the motor to be bidirectional which can supply and receive power. Software is provided with the controller so that it can adjust the setting and operations for several of the controller's functions.

Another source of battery charging comes from the photovoltaic solar panel and wind combination. Initially a light-weight and flexible solar panel was desired. The solar panel with the same requirements of output 12V and 20 watts, 12V and 11W was found. This two solar combine with two 12V and 16W wind generator. All four are connected in series. Once a voltage and current is generated through the solar-wind block, it gives the 48V to battery. It is more efficient to have a higher current input to the boost converter but for the current budget and resources, it is not practical. Due to the

inefficient charging power supplied to the battery, it is not realistic for the solar-wind combination to fully charge the battery. Its primary purpose is to provide a longer life cycle for the battery and to provide some charge when access to an outlet is not available.

Flowchart:



Working Principle:

Initially we switch ON the key then 48V battery supply goes to Controller, Through Controller DC supply is converted into 3 Phase AC by using Thyristor. This generated AC is supplied to BLDC Motor Situated in Bicycle Wheel.

When Throttle is move then motor starts rotating, As throttle is varied then Motor speed also varies.

BLDC motors are a type of synchronous motor. This means the magnetic field generated by the stator and the magnetic field generated by the rotor rotates at the same frequency. The speed of BLDC motor controlled by PIC microcontroller and throttle. By using solar-wind combination we make it self charging

Applications:

It is a good option for motor cycle and heavy weighted electric bicycle.

It can be used for Physically Handicapped Peoples.

Advantages:

Long distance:-

An electric bicycle can take you longer distances (known as range) with less effort in a shorter period of time.

Less Human effort:-

In electric bicycle motor are used for reducing human efforts of pedalling for longer distances.

Health benefits:-

E-bikes can be a useful part of cardiac rehabilitation programs, since health professionals will often recommend a stationary bike be used in the early stages of these. Exercise-based cardiac rehabilitation programs can reduce deaths in people with coronary heart disease by around 27%; and a patient may feel safer progressing from stationary bikes to e-bikes. They require less cardiac exertion for those who have experienced heart problems.

- Eco friendly
- Light in Weight
- Self Charging by Solar- wind Combination.
- Disadvantages
- Only one Person can travel.
- No service center is Available.
- In rainy season Charging affects.

Comparison:

Table 1. Comparison between present models and our model

Sr. No.	Manufacture/ Brand	Model	Advertised Range	Power control	Battery Type	Motor or drivetrain
1	Eco-Brand Exim (China)	Multiple Models Samurai model cited at right	Not available	Pedelec or optional throttle	3*12 volt 8Ah sealed Lead acid, with NiMH or Li-Ion optional	250W
2	EcoBike (USA)	Vatavio Elegance Adventure	29-56 Km	Traditional PAS Throttle only	36V, 8A Li- MnO	290W-360W (700W peak) Hub Motor
3	Belize Bicycle (Canada)	E-RIDER MTB	Over 30 Km	Manual + pedelec	36V, 8A NiMH	350W Hub Motor
4	Bike Tec (Switzerland)	Flyer T8 Premium	36 Km	Manual	Li-Ion	Panasonic Drive 8-speed hub gear
5	PROJECT (Our Model)	SOLAIR	40 Km	Manual	Dry Cell 48V 7.5Ah	250W BLDC Hub Motor

III. CONCLUSION

The issues associated with electric bicycles may be addressed by custom-designed drives that are most efficient over a given operating cycle and there are less charging centers. These include city bicycles, hill bicycles, distance bicycles, and speedy bicycles. The results of the studies listed here can serve as a platform to improve electric bicycle performance if new drive systems are designed around key parameters that will result in improvement of the system performance. Furthermore, they can be used for comparison of existing drives in a systematically, comprehensive, and technical way.

This description has illustrated the controller which takes PIC16F72 as a core, introduced some important components and Circuit principle diagram. This controller has function of over-current protection, under-voltage protection, helping and so on. Experiment turned out controller has better dynamic characteristics and ran steadily.

There are multiple opportunities with this project and we hope that within a few years, this bicycle can become very efficient and marketable. We understand that this bicycle can be intimidating because of its weight and its ability to go 40 kmph but whoever takes it on in the future, we ask that you have an open mind and an open heart. This bicycle has become very special to all of us, and we hope that it will be well taken care of and improved upon.

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