

Smart Hybrid Bike

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Abstract - Mechatronics, which is also called mechatronic engineering, is a multidisciplinary branch of engineering that focuses on the combination of electronics, electrical, mechanical, robotics, computer, control and product engineering. The contemplated entity of this project is to flourish a system that works using two sources. Internal combustion engine produce appreciable emissions and are also less efficient. While considering electric drives, it is having zero emission but also has very limited range. Hence by combining the best aspects of both results in the augmentation of a hybrid motorcycle. Optimum strategy is needed to use electric drive during slow moving city traffic, hill climbing etc. and Internal combustion(IC) engine for cruising in highways. Thus it would result in a reduction of pollutions in cities along with an improved mileage. As the name resembles a combination of fingerprint scanner and a micro-controller makes the motorcycle SMART by providing keyless feature. This project outlines the design and construction of a "SMART HYBRID MOTORCYCLE" by clubbing the two technologies.

Keywords—Curve roads, accident prevention, sensor, mountain road, hill roads, alerting the driver. (Key words)

I. INTRODUCTION

The Majority of the population uses two-wheeler as the basic and cheap mode of transport as it is more economical than other transports. Presently the fuel prices are rocketing high, the daily running cost of a vehicle and the cost of ownership are hitting the roof but the alternative means of transport are very few. The hike in fuel price adversely affected the majority as the alternate fuelling technologies has mainly centered around the four-wheel industry, the two-wheelers have been left behind unseen in spite of the fact that fuel cell technology in it is a distant dream in India and electric two-wheelers are slow, expensive and plagued with a limited range of full charge. [1]The main concern is that there is a dire need for protecting our environment. The solution for all those issues comes in the form of a SMART HYBRID MOTORCYCLE. Which intern refers to a motorcycle which uses both the power generated by an Internal Combustion Engine and an Electric Motor? There are alternate fuelling technologies like LPG (Liquefied Petroleum Gas), CNG (Compressed Natural Gas). Which offers much lower running cost as well as approved by the market also, but it requires huge customization to make the engine compatible with that and has an adverse effect on Engine. So as an alternative a Smart Hybrid Motorcycle can make a revolutionary change in the two-wheeler industry.

A Smart Hybrid Motorcycle is nothing but a system that works on using two sources. It is a combination of an Internal Combustion Engine and an Electric Motor in which Electric drive can be mostly used in slow moving city traffic, hill climbing, etc... and IC engine

can be utilized to cruise around highways. Thus it results in the reduction of pollution in cities and improved mileage which is the primary concern of everyone nowadays.

II. RELATED WORKS

A. Electric Bike

Most electric bikes and scooters today are powered by rechargeable lithium-ion batteries, though some early models used nickel-metal hybrid batteries. Alternative types of batteries are also available. All electric bikes provide for recharging by plugging into ordinary wall outlets, usually taking about eight hours to recharge (i.e. overnight). Electric bike suffer considerable disadvantage in range, since batteries cannot store as much energy as a tank of gas. The earlier version of e-bikes or technically low quality e-bikes operated mostly on less effective lead acid batteries, which has less sturdiness to give full power to the motor, besides they are heavy and bulky, but in newer models there have been mostly selected NiMH, NiCad and Lithium-ion batteries, because they are light, powerful, and dense in their capacity, giving possibility to drive long and fast, giving maximum durability in terms of power and performance. [5]The developments in computer, electronics and sensors, have enhanced the space for developing better version of e-bikes that can compete with confidence. We are now equipped with developed power controllers, torque sensors, and big capacity batteries than what we had before, is also sufficiently supporting e-bike to grow as sophisticated, better and advanced. Now many big companies are involving to manufacture and commercialize this product, therefore it is gaining its popularity lot better. By the huge market success in India and China, many strong competitors are coming in the race to produce even better quality product. This is not just helping to get superior product there are plenty of e-bikes available nowadays that could reach 20 miles of speed quite easily, and can climb steep roads very comfortably. In 2018, the USA has created an electric bike known as opt bike and they use the 5th generation of lithium ion batteries. The Government of India has made clear its intention to transform the nation that runs only by electric vehicles by 2030.

III. SYSTEM DESCRIPTION

A. PRINCIPLE

The Motorcycle is developed by the combination of both the Internal Combustion Engine and an Electric Motor. The battery is connected towards the Electric Motor to start and make the vehicle move. The working of the hybrid system is simple, it consists of two phases. In the first phase, it works as a normal electric motorcycle. When the battery gets drained out the second phase begins. In the second phase, it works on the IC engine and in both case alternator is connected to regenerate the power so that the battery will get charged simultaneously.

B. BLOCK DIAGRAM

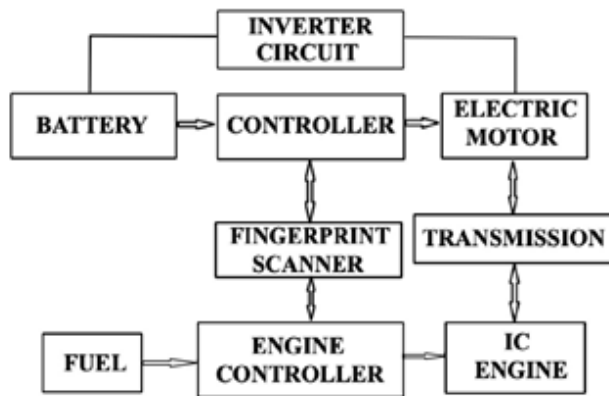


Fig.1 :Block diagram

B. IC ENGINE(Internal Combustion Engine)

An internal combustion engine is a heat engine where combustion of fuel occurs with an oxidizer in a combustion chamber. The expansion of the high temperature and high pressure gases produced by combustion applies direct force to components of engine and the force is typically applied to a rotor which moves the components over a distance.

There are certain specifications for IC engine and they are displacement, maximum power, maximum torque, number of cylinders, number of gears, etc. This IC engine provides a displacement of 105.6cc. It has maximum power 7.6ps @ 7500 rpm and maximum torque 7.8nm @ 6000 rpm. The number of cylinders and number of gears are 1 and 4 respectively. It provides a ground clearance of 173 mm and has a weight of 119 kg. The fuel tank capacity is 11 litres and it gives a top speed of 87 kmph.

C. BLDC MOTOR (BRUSHLESS DC MOTOR)

Brushless DC electric motor are synchronous motors that are powered by a DC electric source via an integrated inverter/switching power supply, which produces an AC electric signal to drive the motor. In this context, AC, alternating current, does not imply a sinusoidal waveform, but rather a bi-directional current with no restriction on a waveform. The rotor part of a brushless motor is often a permanent magnet synchronous motor, but can also be a switched reluctance motor, or an induction motor. Brushless motors may be described as stepper motors; however, the term stepper motor tends to be used for motors that are designed specifically to be operated in a mode where they are frequently stopped with the rotor in a defined angular position. This page describes more general brushless motor principles, though there is overlap. Two key performance parameters of brushless DC motors are the motor constants K_v and K_m (which are numerically equal in SI units). The four poles on the stator of a two-phase brushless motor. The rated voltage and speed of this BLDC motor is 48 V and 550W respectively. This also provides a maximum speed of 30 kmph.

D. LITHIUM ION BATTERY

Lithium-ion batteries (LIB) are a family of rechargeable batteries having high energy density and commonly used in consumer electronics. Unlike the disposable lithium primary battery, a LIB uses intercalated lithium compound instead of metallic lithium as its electrode. When a LIB is

discharging, lithium ions move from the negative electrode (anode) to the positive electrode (cathode). When a LIB is charging, lithium ions move in the opposite direction, and the negative electrode becomes the cathode, while the positive electrode becomes the anode. Usually, LIBs are significantly lighter than other kinds of rechargeable batteries of similar size. LIBs are heavily used in portable electronics. These batteries can be commonly found in PDAs, iPods, cell phones, laptops, etc.

E. BLDC MOTOR CONTROLLER

The rated voltage, power and current of BLDC motor controller are DC48V, 550W and 30 A respectively. It gives an efficiency greater than 83 percentage. Under voltage protection range is DC41.5V+0.5V. Under voltage occurs when the average voltage of a three-phase power system drops below intended levels. The current is limited to 30 A+0.5A and the power it consumes is less than 1.5 W. The controller category is brushless direct current. This model is applicable in electric bicycle, electric scooter, electric vehicle, electric tricycle etc.

There are certain features for this controller i.e, it has super low noise when starting up, provides under voltage and under current protection and also it is water proof.

F. FINGER PRINT SENSOR

R307 Fingerprint Module consists of optical fingerprint sensor, high-speed DSP processor, high-performance fingerprint alignment algorithm, high-capacity FLASH chips and other hardware and software composition, stable performance, simple structure, with fingerprint entry, image processing, fingerprint matching, search and template storage and other functions.

There are certain features for this finger print sensor i.e, they are small in size, ultra-low power consumption, development of application is simple, the security level is adjustable, strong anti-static ability and sensing circuit standby current is very low, less than 5uA.

The technical parameters include supply voltage, supply current, fingerprint image input time, window area etc. The supply voltage given is DC 4.2~ 6.0V. In supply current the working current is 50mA and peak current is 80mA. The fingerprint image input time is less than 0.3 seconds. Characteristic and template file size is 256 and 512 bytes respectively. Also the host interface is UART.

G. ARDUINO UNO

Arduino UNO is a micro-controller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button.

H. RELAY MODULE

A relay is an electrically operated switch that can be turned on or off letting the current go through or not. Here the number of I/O channels is 1. The type of relay used is digital and the control signal is TTL level. The maximum allowable voltage is 250 VAC/110VDC. The maximum allowable power force is 800VAC/240W (from C) and 1200VA/300W (from A). The relay status is indicated using LED.

IV. RESULT AND DISCUSSION

In traffic and city commutation the probability of attaining speed is very less. At that time if the vehicle is running in IC engine, more fuel is wasted due to the variation in acceleration and due to the combustion of fuel more pollutants, are produced. If we can run the vehicle in electric motor through a battery source, the wastage of fuel can be reduced as well as the pollutants. During less load condition vehicle can be easily run by the means of an electric motor instead of an IC engine, when high torque is required we can switch back to IC engine mode.

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