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IOT ELECTRIC VEHICLES

Dr. M. SAI VEERRAJU

PROFESSOR, S.R.K.R. ENGINEERING COLLEGE, BHIMAVARAM-534204, W.G.DIST., A.P., India

Abstract : Several bicyclists are killed and injured each year when their bicycles collide with automobiles on curving roadways. The major goal of this study is to devise an IOT-based e-bike that is both viable and extremely flexible. This fact demonstrates the significance of traditional vehicle system innovation. An Arduino-based innovative bicycle safety system is shown in this research. Using gestures and a drive, the program displays the rider's turn direction, alerts them if they are in danger, and lets them know whether it is safe to take a turn or not. The technology is incredibly cost-effective and assures the safety of low-end vehicle users, such as cyclists. The number of people who travel by automobile is increasing rapidly over the globe. Cars are a significant source of air pollution in urban areas, as well as a major source of weather greenhouse gases in the atmosphere and methane. So an Electric cell-based internet of things bicycle is proposed in this paper.

Introduction: The price of crude oil has been steadily rising in recent years. Users love electricity over oil as a fuel source. In order to operate transportation in India, the electric bike sector has significantly increased in the last ten years. E-bikes are designed with sustainability in mind. BLDC motors provide power for electric cars. BLDC motors offer several benefits over DC brushed motors since they do not need brushes. To name only a few advantages, there is a higher ratio of torque to engine size, a higher lifetime, reduced EMI (Electro-Magnetic Interference) emission, quieter operation, and much less pollution Figure 1. depicts the internal workings of a BLDC motor. A unique control circuit is required to run BLDC motors, three-phase motors. When the control circuit is activated, the appropriate coils are energized.

BLDC Motor

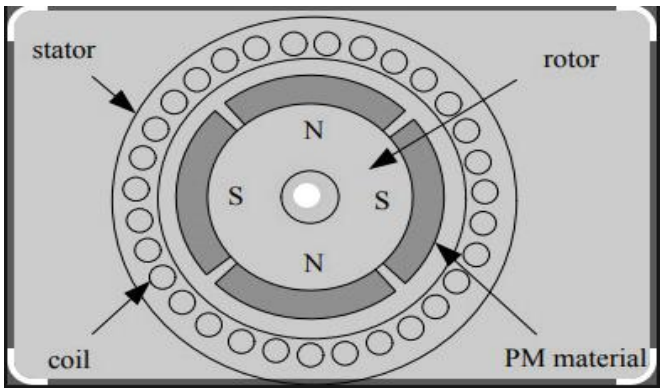


Figure 1 : Components of BLDC Motor

An motorized bicycle motor needs a variety of beginning torque, as a result hall effect video display units are utilized to gauge pace. Engine velocity is potentiometer-adjustable; confined overall performance of the controller is used for correct velocity manage; and logic is built in to guard the battery from damage as a result of voltage spikes, cutting-edge surges or thermal runaway are all commonplace features of electric bicycle processors. It's miles feasible to utilize a pedal anxiety detector to allow motor help proportionate to provided torque, despite the fact that the low mass of bikes limits the amount of strength that can be amassed throughout brakes.

This may be accomplished via the PWM sequence produced by taking readings from rotor position detectors. The E-top Bike's speed is from 60 to 100 kilometers per hour. After two hours of battery charge, the bicycle is ready to ride for 50 kilometers.

E-bike goods at the moment:

a) Efficiency: One of the advantages of E-Bicycles is that their motors are more than 90% efficient, compared to the 40% efficiency of internal combustion engines. Such engines can withstand almost any sort of road and weather conditions.

b) Environmentally friendly: If non-conventional forms of electrical energy are used to recharge the batteries, it is. As a result, electric cars are beneficial to the environment.

c) Cheaper: This means that electric vehicles are simpler and friendlier to ride than traditional vehicles because of their high efficiency. For example, an electrical bike called the Yoy-smart model of Electric-bicycle costs just 0.09 Paisa/km. Nicest of all modes of transportation, electric cars, are almost unheard of[ ].

Possible future e-bike benefits:

Batteries decompose in an environmentally unfriendly manner. Electric bicycles do not travel at the same velocity as gasoline or diesel-powered vehicles, so they are not as fast. An extra 2 to 3 hours of charging time is needed for the batteries. It is still a long time, even if you do not consider the lack of intelligent charging. Difficulties with the battery: Most notably, lead-acid batteries deteriorate rapidly in the long run (600-900 charge-fulfill cycles). So a Electric bicycle with lead-acid cells will need to be replaced every two to three years. Moreover, half of the bike's weight is batteries[ ].

Proposed design of e-bike:

The authors have presented a new design for an IOT based E-bicycle based on extensive consideration of the De-merits. Motor: 24 V, 250 Watts BLDC Motor, 24 Volts 12 Amp Hour Cell Pack, Acceleration circuit, Charger Indicators Key. Battery: 24 V 12 Amp Hour Battery Pack. Closed system operation is achieved by driving and connecting them to a 24 V controller. The heart of the E-bike is the Controllers, which governs all of the subsystems' activities and power. Slider is acceleration in the form of a control box.

In an electric motor, moving magnets are connected to the rotor (the revolving portion), and fixed magnets are attached to the stator alternate orientation to generate torque. An inductor is a magnetic field generated by a coil of cable wrapped around an flatten core. To power the motor, the magnetic field is produced by the DC travelling through the cables and windings. When the rotor turns 180 degree (a half rotation), the north and south poles on the rotor switch places. The rotor would not turn if the poles' magnetic fields remained unchanged, resulting in a torque inversion on the rotor after each half-turn. In a DC motor, the path of electric present from side to side the windings must be overturned every 180-degree rotation of the rotor to provide torque in one order. There is no need to change the direction of the electric force to maintain thrust force on a rotating object. The IOT circuit controlled by Arduino processor will take care of exchange of information for the betterment of user experience.

2. Advantages of a brushless motor over brushed motor:

The influence to weight ratio is relatively high.

Low-Maintenance

Throttle control

Low Upkeep

3. Applications:

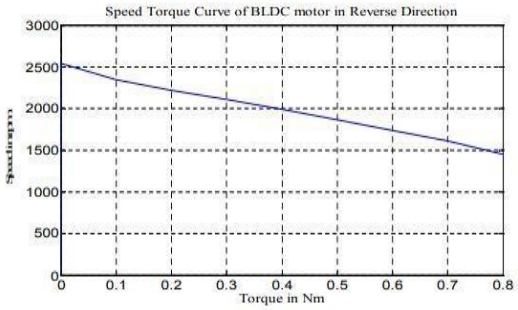
Peripherals used for computers

Power equipment that can be carried about easily

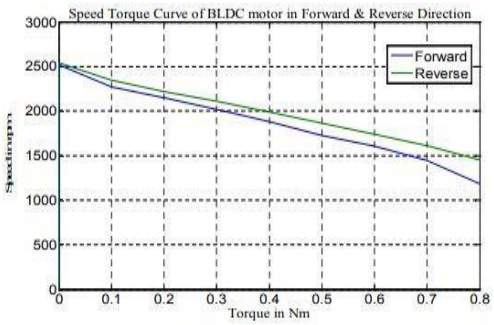
All kinds of vehicles, from toy aero planes to automobiles

4. Characteristics:

The following is Speed Torque distinctiveness of BLDC Motor in Reverse Direction



The following is Speed Torque distinctiveness of BLDC Motor in forwarding and Reverse Direction.



3. LEAD - ACID BATTERIES:

The first rechargeable cell was the lead-acid battery created in 1859 by French physicist Gaston Plante. Because its capacity to deliver strong surge currents has an enormous power to weight ratio while having a low energy to weight relation and a low energy to volume ratio. As a result of these properties and their inexpensive cost, they are ideal for automobile starting motors.

Lead-acid batteries are often utilized even though alternative designs have better energy densities and are more costly than newer technology. Emergency power supply in cell towers, clinics, and stand-alone power systems often employ large-format lead-acid designs for storage. Storage times may be improved, and servicing needs to be reduced by using customized versions of the conventional cell.

Lead is the most often used metal in lead-acid batteries. Modern Lead–Acid Battery Consortium (ALABC) has been developing and promoting lead-based batteries for ecological industries such as hybrid electric vehicles (HEV), start-stop automotive systems, and grid power storage. For more than a decade, ALABC has been focusing on adding carbon to the negative plate of lead-acid batteries to lengthen their life and improve their variable charge absorption. New lead–carbon (LC) batteries have begun to appear on the market, and the technique has been shown in them. US DOE-funded project ALABC proved in 2013 that UltraBatteryTM, initially conceived by CSIRO in Australia and Furukawa Battery in Japan, was ready for sale as a 12-V Super Hybrid LC battery installed inside a Honda Civic HEV. Additionally, ALABC is attempting to create a mild hybrid with a 48-volt lithium-ion battery pack to improve fuel efficiency by 25%. As part of the Advanced Diesel Electric Power train Project (ADEPT), Ford Motor Company and ALABC will apply the reduced idea of "intelligent electricity" to diesel cars for the very first time.

Intelligent power grid control facilities and (uninterruptible power supply) UPS systems have grown in demand for lead-acid cells in recent years. The absorptive glass-mat (AGM) batteries for deep-cycling have also been created by ALABC. With these advancements, lead-acid cells can fulfill every need for power storage from renewable power. For improved lead-acid batteries, the global capacity factor is predicted to expand from 77 megawatts in 2013 to 5044 megawatts in 2020.

The potential difference between PbO_2 and pure lead and liquid sulfuric acid is where the battery's oxidative phosphorylation is housed in the plasma plume. Water (H_2O) atoms are created from H^+ ions of the acid and O_2^- ions of PbO_2 when lead-acid batteries discharge, generating electricity. However, the battery serves as a moisture device while it is recharging.

4. CONTROLLER:

An electrical controller or ESC is an electronic circuit that reins the rate of the vehicle motor. Dynamic stopping and motor reversal are two further possibilities. Electrically powered radio controlled modules make use of tiny electronic speed controllers. Similarly, full-size electric cars feature devices for regulating the rate of their motors. We utilized a 24 V controller for this project. It is possible to adjust the switching rate of a field-effect transistors (FETs) network by using a control lever, controller, or other physical input (FETs). Transformer duty cycle and duty cycle are used to modulate engine speed. The high-pitched whining of the engine is caused by the fast switching of the current flowing through the motor, particularly evident at low rpm.

Brushed DC motors and brushless DC motors need different sorts of speed controls. The potential is applied to the armature of a brushed motor may be varied to adjust its speed. Although magnets are used in most industrial engines, the intensity of the field current may be adjusted in order to regulate how fast the motor spins.) Brushless motors have a unique set of requirements when it comes to operation. The motor's speed may be changed by varying the time of the pulses sent to the various coils.

To function motor, cordless esc structures generate 3-phase ac power the use of a variable frequency power. Radio-managed aircraft fans select brushless motors because of their efficiency, energy, lifespan, and minimal weight. In contrast to textured motor controllers, brushless dc motor controllers are plenty greater sophisticated.

The esc ought to take into consideration the reality that the right phase of the current provided to the motor changes as the motor rotates. Differences arise that hire independent magnetic (corridor impact) sensors or optical detectors to degree the rotation of the armature winding. Patron choices, along with low voltage cut-off limits, timing, acceleration, brakes, and rotating orientation, are commonplace on device speed controls. Any two of the 3 leads from the esc to the motor may be switched to opposite the motion of the car.

Arduino:

Known for its single-board microcontrollers and microcontroller kits, Arduino is an open-source hardware and software startup with a devoted network of people and contributors. GNU Lesser General Public License (LGPL) or GNU General Public License (GPL) licences allow anybody to make and distribute Arduino boards and programs. CC BY-SA licences are used for items. From the official website or through authorised dealers, Arduino boards may be purchased.

The microprocessors and drivers used in Arduino board designs come from a wide range of manufacturers. To facilitate prototyping, the panels provide digital and analogue input/output (I/O) pins that may be connected to a variety of latest infrastructure and circuit boards. In addition to serial ports for exchanging data, the panels provide U.S. Digital Bus (USB) ports on their variants. C and C++ programming tools may be used to control the microchips using a standard API defined as the Arduino ide software, which is based on Verbal ability and is used with a modified version of the Processing IDE. Along with typical compiler toolchains, Arduino offers a comprehensive programming environment (IDE) and a command-line tool written in Go for users' convenience.

Interaction Design Institute Ivrea, Italy, students started the Arduino project in 2005 to make it simple for beginners and experts alike to build products that connect with their surroundings via sensors. Simple bots, thermometers, and alarm systems are all excellent examples of equipment designed with beginning amateurs in mind. The above arduino microcontroller is embedded in our design to get information processing.

The Proposed working model of Smart Electric Vehicle:

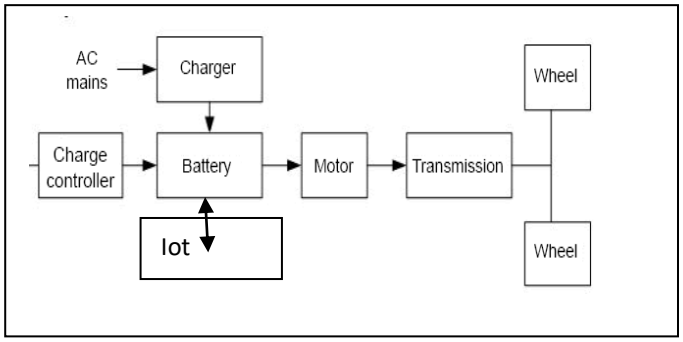


Fig 2: The Proposed working model of Smart Electric Vehicle

CONCLUSION:

The proposed IOT Smart vehicle is useful because 77 percent of Indian travelers go for less than 10 kilometers, a high portion of everyday pollutants can be decreased by switching from traditional motorized two wheels to a proposed plug-in hybrid electric cycle. There is a reduction of 2168 tonnes of CO2, 180 tonnes of NOX, and 4.1 tonnes of PM. In addition, daily reductions of 120 tonnes of HC, 14.7 tonnes of CH4, and 1.05 tonnes of SO2 are possible. The arduino controller was very much useful in particular to control the entire vechicle as required and note the important parameters. In particular, the feasibility of converting the cycle to the suggested plug-in hybrid electric bicycle, as well as the sizing of electric power refers to a chain, are explored in detail. A motor with a power output of 250W and a charge with a capacity of 7.2AH and a voltage of 12V is sufficient for a distance of 11 km at a peak speed of 11 km/h.

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