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AN POWER CONSUMED MICRO CONTROL UNIT FOR ELECTRICAL VEHICLE

Dilavar Basha K[1], Gowtham Babu V[2], Lalith B[3], KaniMuthu G[4]

[1-4]*Department of Electrical and Electronics, R.M.K College of Engineering and Technology, Thiruvallur, India*

Abstract– PIC is a family of microcontrollers made by microchip technology. The name PIC initially referred to Peripheral Interface Controller, and is currently expanded as Programmable Intelligent Computer. The main purpose is to make a dashboard of electric motorcycle using PIC microcontroller with various facilities such as battery percentage and range indicator, motor and battery temperature indicator and modes of riding. The electric motorcycle is monitored by mobile application through GSM and CAN bus. If any fault occurs in electric motorcycle, an alert message sent through GSM.

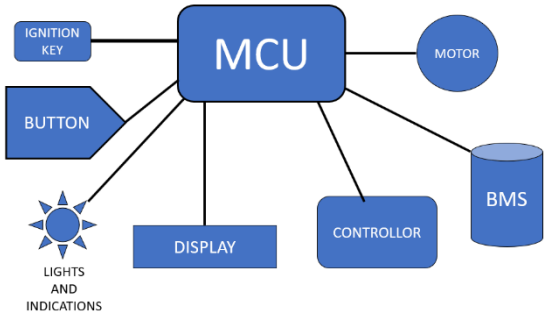
I. INTRODUCTION

Increasing gasoline car exhaust caused excessive emissions, air pollution are not fresh news at all, so pure electric vehicles, pure electric motorcycles these new energy vehicles are increasingly impacting on the vehicle market. Electric motorcycle is one of the most common traffic in our daily life. The traditional electric motorcycle's battery aging fast and its anti-theft coefficient is not high enough. This paper presents an electric motorcycle system based on PIC microcontroller and GSM technology to solve these problems in traditional electric vehicles.

In the system, where the data from all sensor and hardware of the electric motorcycle are collect by the PIC microcontroller. Then, the software inside the microcontroller receive the value to process the task. LCD display is use to write the output of electric motorcycle such as speed of the vehicle, rpm of motor, state of charge, exceed temperature of motor and battery. Where the riding mode of electric motorcycle can be change and display by microcontroller. Global positioning system (GPS) is a new generation of high precision satellite navigation and positioning system with the rapid development of modern science and technology. GPS began in a US military project. Compared to other navigation and positioning system, GPS has the characteristics of global ground continuous coverage;multi-function; high precision; fast locating speed; good anti-interference performance; strong secrecy and so on. So, it has been widely used .EV charging stations are built to support the EV pilot programs. Regardless of any topology of EVs, the prime objective is to satisfy the driver's power demand by managing the power flows and simultaneously satisfying other constraints such as the state of charge (SOC), state of energy (SOE) of the energy storage, emission control and drivability. In the case of two-wheel vehicles such as bicycle and motorcycle, the costs, robustness and dimensions become constraints that hindered the spreading of electronics in replacing their existing mechanical systems .With the advancement of electronic components in the automobile industry, the electronics control techniques for existing motorcycle changes from being limited to the electrical system of specific parts such as lamps, display and etc. to energy management devices, drives, brakes and other subsystems. The data are transfer to the mobile application through the GSM technology and any fault occur in the electric motorcycle that also transmitted to the mobile. The area of the vehicle where located by the GSM and transmitted along with the fault data. This paper introduces the PIC microcontroller and GPS technology into the electric motorcycle system, which greatly improves the anti-disturbance and safety performance of the whole vehicle system.

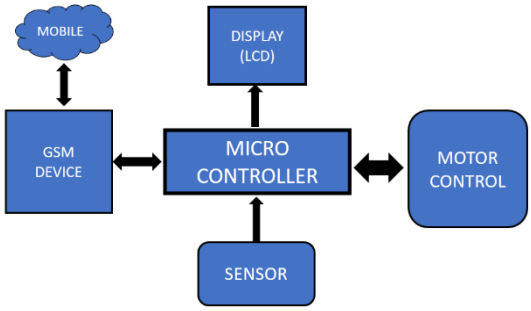
II. PROPOSED SYSTEM DESIGN AND OPERATION

The electric motorcycle functions are displays in the LCD display. where the speed of the vehicle is measure from the wheel axle by using speed sensor. Sensor where transfer analog data to PIC microcontroller. The EV has the average range of 48v ~ 72v battery voltage, but microcontroller can read up to 5v. So, the battery voltage range is converted to 5v range to known the state of charge (SOC). Then, it as calculated to the percentage and shown in the LCD display.



The electric motorcycle as two riding modes of economy mode and sports mode. In the eco mode the EV runs at low speed and gives high range, in sports mode the EV runs at high speed and gives low range. This mode change data is transfer to the motor drive controller from the microcontroller. The state of the mode is shown on the LCD display.

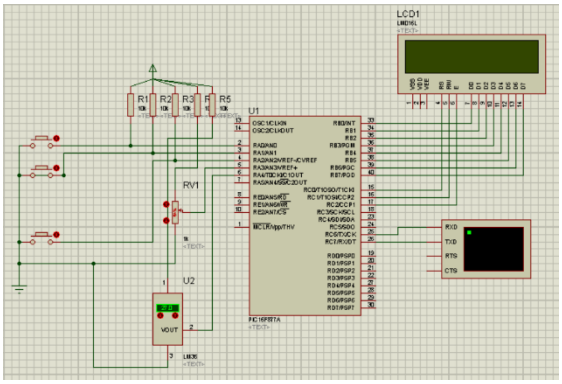
While driving the electric motorcycle the temperature of the motor and battery increase. If the temperature is exceeding the rated limit, it will damage the components. So, the temperature of motor and battery is monitor by the microcontroller. The temperature sensor is attached on both motor and battery, where the analog data is transfer to the microcontroller and the temperature is compare with rated limit of both motor and battery. When temperature cross the rated limited it indicate in the display and gives alert signal in the mobile through the GSM technology.



In the normal vehicle, we need ignition key to turn on or off the system, but in this electric motorcycle we can start or stop by mobile application through the GSM device. Where the accident is detected by microcontroller using vibration sensor in the motorcycle and the location is sent to the mobile number which is fed to the system.

III. SIMULATION LAYOUT

This simulation layout is made with ISIS Proteus 7 and consist of LM016L (LCD), PIC16F877A (PIC Microcontroller), Virtual Terminal (GSM module), potentiometer, normally opened push button, 5V Power supply, resistance. Push button has two side, one is connected with the power supply and the other is kept grounded. In LM016L the pins are individually connected with the individual pins of PIC16F887A (D0 is connected with PB.0, D1 is connected with PB.1, D2 is connected with PB.2, D3 is connected with PB.3, D4 is connected with PB.4, D5 is connected with PB.5, D6 is connected with PB.6, D7 is connected with PB.7) The rest three pins of LM016L are also connect with the pins of PIC16F877A (RS is with PC.0/T1OS0/T1CK, RW is connected with PC.1/T1OS1/CCP2, E is connected with PC.2/CCP1.

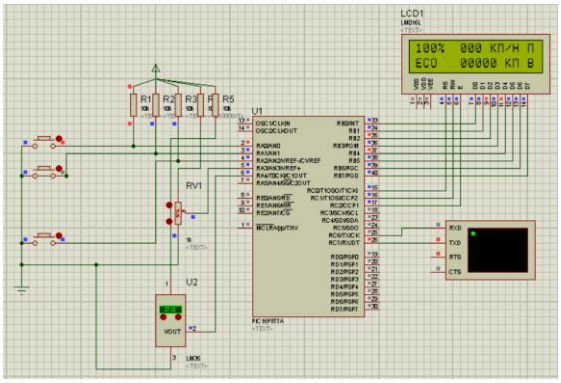


The push button is connected with the PIC16F877A via PA.0/AN0, PA.1/AN1, PA.2/AN2 pin. Temperature sensor of motor is connected with PIC16F877A via PA.4. Temperature sensor of battery is connected with PIC16F877A via PA.3. Virtual terminal is connected with PIC16F877A via PC.6/TXD, RXD and PC.7/RXD, TXD.

The microcontroller receives the analog data from the sensor through the analog pin of the PIC microcontroller. In microcontroller there are some analog ports to read the analog data. Port A and port E are the only ports to read the analog data in the PIC microcontroller. So, any analog signal are read through these ports. Where the temperature sensor and speed sensor of the electric motorcycle is connected to the analog pins in the PIC microcontroller.

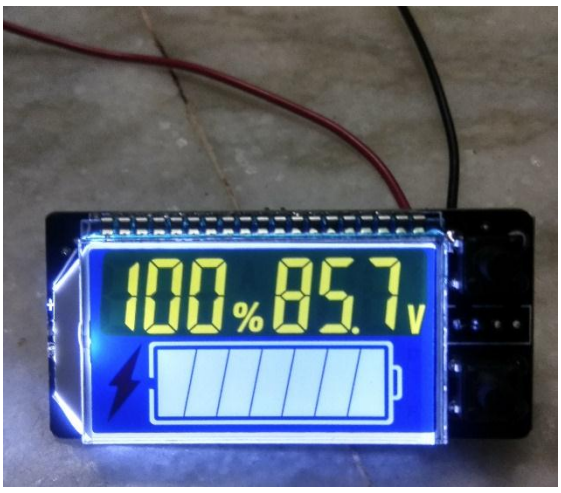
In LCD display, there are 14 pins to control and display. D0 to D7 are data transfer pins from microcontroller to display. RS pin in the display is to choose the data or command.RW pin is to read or write to the display. EN pin is an enable pin to enable the process. Vss is ground

pin, Vdd is power supply pin to the display and Vee pin is to adjust the brightness of the LCD display.

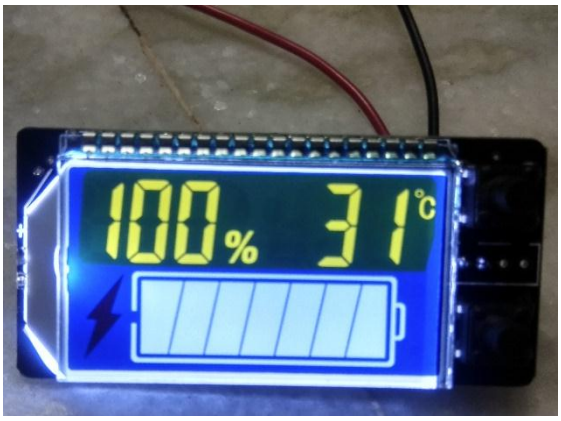


IV. SYSTEM HARDWARE DESIGN

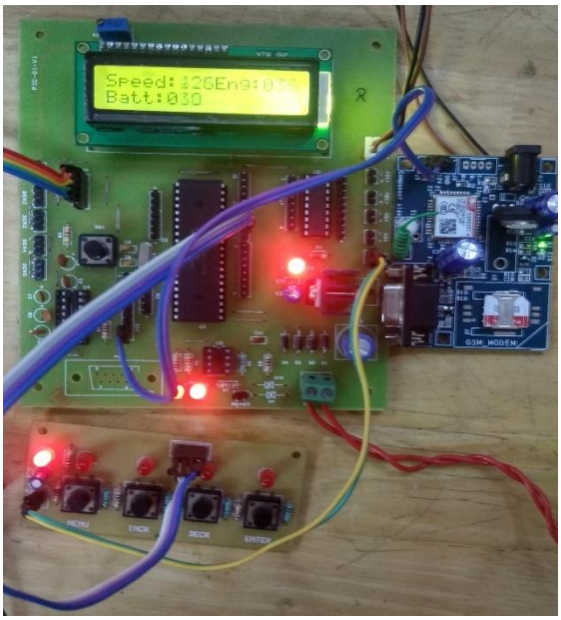
Power supply design in the entire hardware circuit design occupies a large proportion. It is related to the reliable operation of the system and the safety of the equipment. The input power of the system is taken from the 220V civil AC power supply, which is used to charge the battery pack of the electric motorcycle. Because the battery pack uses a DC voltage, the charger needs to turn 220V AC voltage into DC voltage. The total voltage of the battery pack is 48V~72V, this DC voltage part is converted into three-phase voltage to supply the motor as the power source.



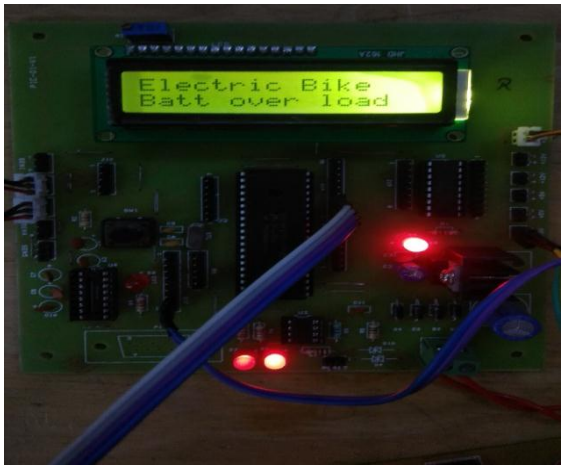
The DC voltage part through the 200W DC / DC power modules turns into 12V DC voltage which supplies the power of turning signal / headlight. 12V DC voltage through LM2576-XX Series DC / DC chip bucks into 5V DC voltage, supplying the power of 2000mah lithium battery backup power. In the system design, if the lithium battery is fully charged, 5V power supply does not supply power to the lithium battery, which cuts off this part of the circuit. 5V power supply under the influence of low-dropout voltage regulator LM1117-3.3, forming into 3.3V power supply and supplying power to the processor STM32. When the battery pack is stolen, the power of the electric motorcycle system is cut off, at this time 2000mah lithium battery begins to supply power to the front main control processor, so GPS / GPRS / GSM module is able to continue to operate and inform the owners that his motorcycle is stolen and provides motorcycle location information to mobile terminal and computer terminal.

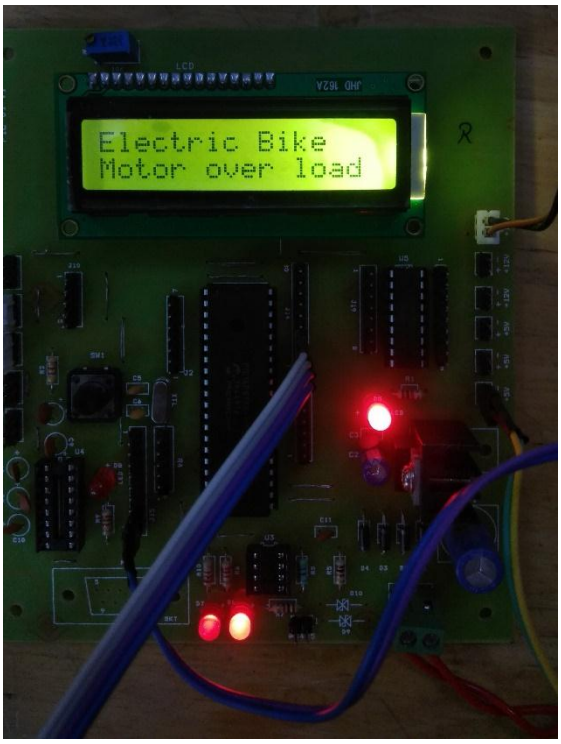


The battery temperature is also shown on the display. Where the temperature signal read form temperature sensor attached in the battery. So, the analog signal is read by micro controller and convert into digital signal. Range of battery voltage is measured and calculated to display in percentage. Battery and Motor temperature are monitor by the micro controller. When both are exceed there rated limit, the micro controller display the alert message and sent the message to mobile through GSM. If any accident is detected by vibration sensor in vehicle. If accident occurs, the location of the vehicle and message sent to the mobile.Also emergency number is display on the LCD to contact. Where the temperature of the battery limit is can be adjust by manual and similar motor temperature also adjust.



The speed of the vehicle is measured every full rotation of wheel is counted to calculate the distance of vehicle moved and to calculate the speed of the vehicle in hours, measuring the timing taken from every single rotation of vehicle and calculated into km/hr. In display there are two distance travelled in kilometer by vehicle, one is fixed cannot reset and another can be reset. Where the modes of vehicle is shown on the display, at which mode the vehicle is running. If the vehicle is running at low speed mode, then on the display it shows 'ECO'. If the vehicle is running at high speed mode, then on the display it shows 'SPORT'.





V. DIFFERENCESBETWEEN PROPOSED AND EXISTING SYSTEM

Most of motorcycles, people are using, are generally manually controlled motorcycles but they have some electronic security features/facilities attached to it. Several researches have improved the automobile technology to an extent and made the motorcycles more efficient though the researches could not provide enough security featured products to save the motorcycle and the rider from accidents. Some security feature are already introduced to the market.

This proposed system is going to use several sensors and WPAN communication technology which will connect the helmet with the motorcycle and make them able to transmit data each-other. The sensors will make the more efficient, user friendly and most importantly secured. This project is going to propose a well synchronized security system. This system is not introduced in the market till now. If this security system is merged with the modern electric/hybrid motorcycle technology, it will be an extraordinary idea for the upcoming two wheeler technology.

VI. CONCLUSION

All the hardware elements will be put together and will also accumulate the result onwards. Then in order to ameliorate the all over reliability of the approached security system of electric motorcycle different results

will be analyzed. Motorcycles are the most widely chosen vehicles all over the world. The electric motorcycles enrich and provide an exceptional creative mode of the transport system and efficiently solve many problems which people are concerned about for example, constantly decreasing the level of natural fuel and increasing the level of pollution. These are the main reasons why the young generation is preferring these motorcycles. The stated security system of electric motorcycle in this present project will uplift self-confidence of the rider by giving a lot of security features and if the rider confronts any accident his present location will be delivered to the accidental rescue team and his family automatically. By using of SMS the rider will be able to operate (i.e. to start or to stop) the motorcycle. And motorcycle will be capable to stay away from any type of accidents automatically. These before said features will make the motorcycle very user friendly. So it is quite evident that the invention of the electric motorcycle is indeed an exceptional evolution.

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