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Power Saving System for Electric Vehicles

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ABSTRACT: Electric Car is one of the indispensable element in fighting the climate change and air pollutions. But the limitations in the development of the electric vehicle like limited number of charging stations, and limited storage capacity of batteries, and lack of proper infrastructure still restricts the users to buy the electric cars. In the process of clearing the hurdles, we developed the power saving system to act as a backup system in electric vehicles when battery power reaches below the minimum level. This will help the user to cover maximum distance possible with the remaining battery power. The battery power level given by the programs and sensors in the car will be fed to the BMISC (a microcontroller board based on ATmega328P). This microcontroller will control the different Electronic control units in the car so that the remaining power is completely used for the purpose of driving alone.

KEYWORDS: ATmega328p, L293 Motor Driver, Electric Vehicles.

I. INTRODUCTION

The Range of electric vehicles has been considered a major barrier in acceptance of electric mobility due to electric vehicles having a significantly shorter range than conventional vehicles. The range of electric vehicles influences not only the design of the vehicle but also driving style and operational factors. The main design factor is battery capacity. Climatic conditions has significant impact to the electric vehicle range. The range is decreasing with extremely low or high temperatures. Technical condition of the vehicle is also important especially accurate tyre pressure and speed. The range also affects using of comfort features such as air condition or heating.

The driving style has significant influence to the electric vehicle range. Although electric vehicle and vehicle with internal combustion engine may appear to be identical, drivers must adjust their driving habits to fit the different mode of driving required by the electric vehicle. One of the possibilities of how to help the user to increase the driving range with the condition of low battery state of charge is a system which automatically helps the driver to travel more distance by using the remaining battery as efficient as possible.

II. RELATED WORK

Electric Vehicle Attitudes And Purchase Intention: A Flemish Case Study

This paper focuses on the user and his perception about electric vehicle. It also analyzes the customer opinion on driving the electric car in A living lab, this forms the ideal environment to question test users about their perception after a 10 weeks EV testing trial. From this type of arrangements the respondents had a moderate positive attitude towards electric mobility. They confirm that the low cost per kilometer, environmental friendliness and home charging are important advantages. This also states that consumers with a more positive attitude experience the environmental character as a bigger advantage. The limited electric range still remains the main disadvantage for users, followed by the high purchase price. Consumers with a more positive attitude attached more importance to the higher purchase price. The willingness to purchase an EV is in some way related to someone's attitude: the more positive, the sooner one is willing to purchase an EV.

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Analysis Of Parameters Influencing Electric Vehicle Range

In This Paper, Range is considered as a key parameter of electric vehicles. Increasing electric vehicles range is important for acceptance of electro mobility. Battery capacity is the main parameter influencing electric vehicles range. In order to batteries are the most expensive part of electric vehicle is it suitable to focus on others parameters such a weight, aerodynamic drag coefficient or correct size of motor. Range is not influencing only by the designs parameters such as battery capacity but also important is driver influence. Simulations were created in order to determine how these are influencing those factors range. For better accuracy was used real driving cycles.

III.PROPOSED SOLUTION

Introduction

The modern electric vehicles has only systems that warns the driver about potential battery drain out condition. The proposed system will override the controls of the other embedded components in the car other than the driving systems enabling a longer distance.

Description

In this project, we are using a Multi Integration On Single Chip (MISC) which consists of ATmega 328p. A 12V Transformer is connected to the MISC. This will be stepped up and down to demonstrate the battery draining condition in car. Whenever the transformer is stepped down (assuming the battery power is low) the power saving system will automatically turn off all other systems and allow the battery power only for driving and if user wants to go for a long journey he can use this system by simply using a manual switch.

IV.POWER SAVING SYSTEM

Working principle

Electric vehicles have a significantly shorter range compared to the conventional vehicles with the internal combustion engine. Hence, it is important to use the remaining battery power as efficient as possible. Thus the range must be somehow improved.

The proposed power saving system for electric vehicle will help in increasing vehicle range at the time of critical battery power level,

The microcontroller controls the functions of AC(CPU fan), motors, lights(led lights), music systems(buzzer), dashboard(lcd display), and speed of the motor when the battery power reaches low level.

The system can be activated even when there is sufficient amount of charge manually by using a switch if the user is in need of more travelling range with less battery power consumption.

This system reduces the speed of the motor to the optimum speed by using the L293 Motor driver. Thus the speed will be reduced to optimum speed and

The lights if on will be switched to low beam or dim light and all the other systems will be completely turned off by the system.

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Block Diagram

The power saving system consists of (BMISC) a ATmega328p microcontroller, L293D Driver,

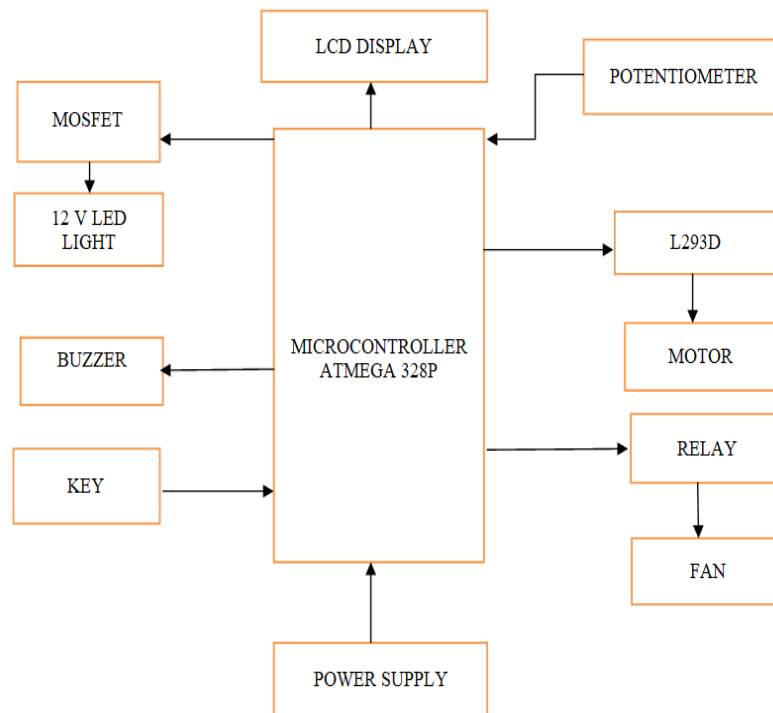


Fig 1: Block Diagram of Power Saving System.

V. HARDWARE DESCRIPTION SYSTEM

Microcontroller

The microcontroller used in this project is BMISC(A ATmega328P based microcontroller)

- The operating voltage is 5V
- The recommended input voltage is 7-12V
- There are 14 digital input/output pins (6 PWM outputs)
- There are 6 analog inputs
- 16 MHZ Quartz crystal
- USB Connection
- Power jack for input power supply
- ICSP header and a reset button
- Flash memory of 32 KB (ATMEGA328P) of which 0.5KB used by boot loader
- SRAM of 2KB (ATMEGA328P)
- EEPROM of 1KB (ATMEGA328P)
- Clock speed of 16MHZ

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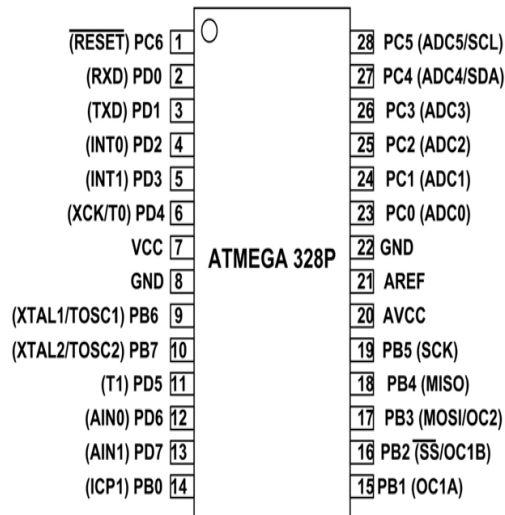


Fig 2: Pinout of ATmega328p

ATMEGA328 has 1KB Electrically Erasable Programmable Read Only Memory (EEPROM). This property shows if the electric supply supplied to the micro-controller is removed, even then it can store the data and can provide results after providing it with the electric supply. Moreover, ATMEGA-328 has 2KB Static Random Access Memory (SRAM). ATMEGA 328 has several different features which make it the most popular device in today's market. These features consist of advanced RISC architecture, good performance, low power consumption, real timer counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software security, throughput up to 20 MIPS etc. ATmega-328 is mostly used in Arduino

L293 Motor Driver

The L293 driver is mainly used for controlling the speed of the motor

- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- Internal ESD Protection
- Output Current 1 A Per Channel (600 mA for L293D)
- Peak Output Current 2 A Per Channel (1.2 A for L293D)

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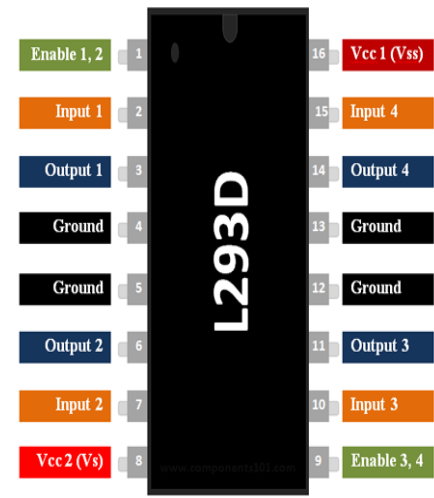


Fig 3: Pinout of L293D

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor integrated circuit(IC).The l293d can drive small and quiet big motors as well.

Overview Of Motor System

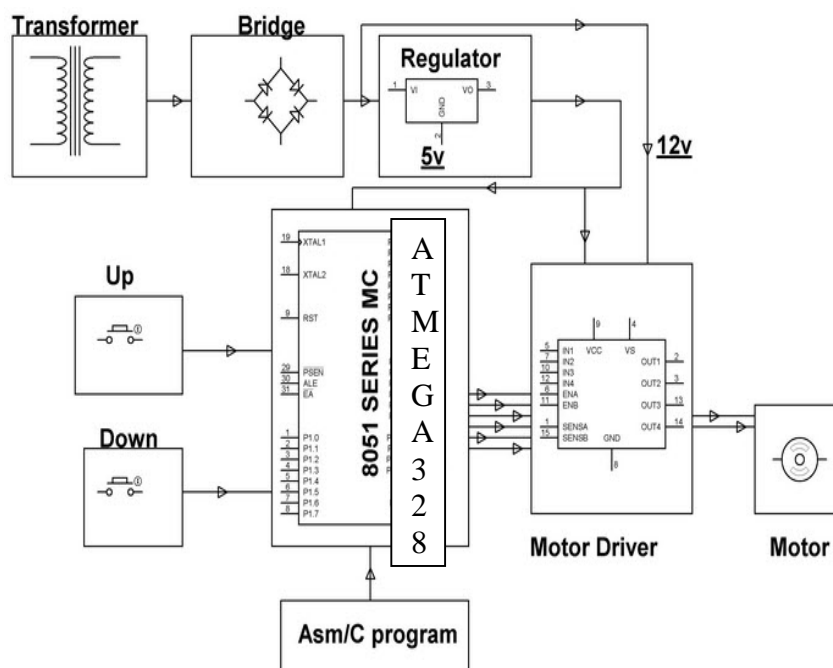


Fig 4: Circuit diagram for the motor control

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VI. SOFTWARE DESCRIPTION

Arduino IDE

- Arduino IDE is an open source software that is mainly used for writing and compiling the code into the MISC Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, MISC and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given MISC Module.
- This environment supports both C and C++ languages.

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the MISC and Genuino hardware to upload programs and communicate with them.

VII. EXPERIMENTAL RESULT

The Power Saving System developed has been experimentally proven to work satisfactorily by connecting components such as lights, motors, fans and display with microcontroller. This System successfully controlled the desired components automatically by turning off of non essential systems and by reducing the speed of the motor.

VIII. CONCLUSION

Using the power saving system as a base, this system can be implemented in various type of electric vehicles including electric bikes, hybrid vehicles, electric trucks, and even for conventional fuel based vehicles for both decreasing the difficulties faced by the vehicle users when the respective fuel (battery power or fuel) is critically low and increasing the electric vehicle users. These will subsequently help in fighting the pollution and climate change in a faster rate.

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