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E-BIKE SPEED CONTROLLER SYSTEM USING ARDUINO & WIFI MODULE

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ELECTRICAL AND ELECTRONICS ENGINEERING

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Abstract:

The Era of the eco-friendly technologies is emerging rapidly; bicycles are the most dependent modes of transportation. The environmental factors and the increase in fuel price make it clear that it is far better to use a bicycle over a motor vehicle for travelling. The idea proposed in this paper is to control the speed of the E-vehicle either manually and web based. In this we are using Arduino micro controller to control the speed of the vehicle based on the speed controller circuit. Here a simple geared type Dc motor represents the vehicle.The vehicle should be operating in two modes. The first one is normal mode and speed adjust mode .Here we are using Blynk as a web application that is open source and easy to design. Through the integration of advanced technologies and efficient control mechanisms, it contributes to the overall performance, reliability, and enjoyment of electric-bikes.

Index Terms: *Arduino ,speed controller, NODEMCU,LED Indicator, DC Motor LCD.*

I.INTRODUCTION

Since centuries the use of bicycle had been common for man as a useful mode of transport. As the future advancements in technology took place the need for more sophisticated, comfortable option which required less efforts and consumed less time. In this context the solution is also to upgrade a normal bicycle into an electric one.

This electric bike motor speed controller can be used on bicycles in general. The project's primary objective is to control the electric motor's speed by measuring the variation in the throttle's manually generated input.

The major advantage of using electric bikes is that is has zero carbon emission that is

no carbon footprint and hence promotes the Indian vision of Carbon free by 2070 and even the global aim to go carbon free and thus overall reducing pollution caused drastically. Along with being environment friendly this is also pocket friendly which makes it one of the most effective choices to be made in dense populated cities, huge college campuses, parks etc.

This can be used in conjunction with normal cycling, where the rider can choose to propagate in battery mode if they are exhausted. the vehicle will have a battery, making it an electric vehicle. The continuous monitoring, controlling and displaying of the speed the rider to plan and enjoy his ride in a better way.

II.LITERATURE REVIEW

Mehrdad Asadi, Mahmood Fathy ,Hamidreza Mahini , Amir Masoud Rahmani, "A systematic literature evaluate of car velocity assistance in sensible transportation system", extent 15,Issue 8.

In this study , the authors have targeted on presenting a review of ordinary speed harmonization methods based totally on variable speed limit (VSL) and ramp metering (RM) techniques. The authors examined the literature considering speed harmonization algorithms , mechanism and the consequences of emerging technologies. They pointed out the shortage of velocity harmonization for dynamics visitors go with the flow and lack of applying emerging technological know-how in their study.[1]

Hsu, SuHau., Hsu, D. W., Fu, L. C., & Hsu, Y. P. (2004, June). Novel integrated management system design of electric motorcycles. In American Control Conference, 2004.Proceedings of the 2004.IEEE.

Su-Hau et al (2004) directed their attention towards optimizing the utilization of battery energy and put forth a comprehensive management system for the electric motor with a strong emphasis on energy efficiency..[3]

Huang, K. David.,&Tzeng, Sheng Chung. (2004). A new parallel-type hybrid electric-vehicle. Applied Energy, 79(1), 51-64.

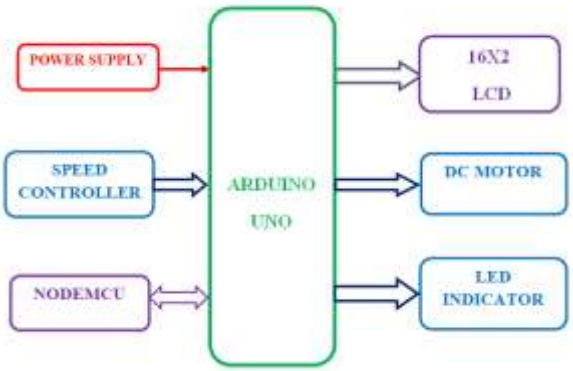
A novel parallel-type hybrid-electric power system, comprising an engine's energy distribution and a torque-integrated mechanism, was introduced by David and Sheng-Chung in 2004. This system specifically included an engine, a motor/alternator, a CVT device, PCM, and a 3-helical gear set.[4]

III.PROPOSED SYSTEM

The proposed E-Bike Speed Controller System Using Arduino & Wifi Module is to provide a cost-effective and efficient solution

for air individual transportation. The system integrates the following components.

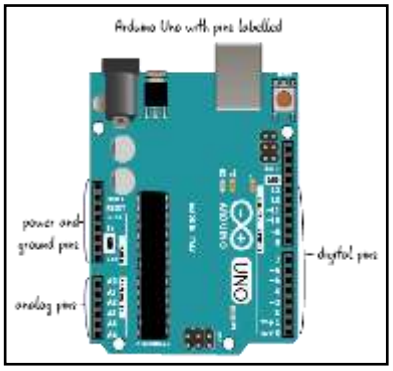
System Architecture:



In this we are using Arduino micro controller to control the speed of the vehicle based on the speed controller circuit. Here a simple geared type Dc motor represents the vehicle. The controller always takes readings from the speed controller circuit then control the vehicle depends on predefined instructions. The vehicle should be operating in two modes. The first one is normal mode which the speed of the vehicle controlled manually with the reference of speed controller circuit. The second one is speed adjust mode which the maximum speed of the vehicle adjusted in the Dash board of web application. Here we are using Blynk as a web application that is open source and easy to design. The status of allocated speed to the vehicle displayed in 16x2 LCD with Led's indication.

A. Arduino Uno:

The Arduino Uno is an open-source microcontroller board based on the ATmega328P microcontroller. It serves as the central processing unit, collecting data from various sensors, processing it, and transmitting it to the cloud platform. The Arduino Uno provides a flexible and easy-to-use development environment, making it suitable for prototyping .



B. NODEMCU:

NodeMCU is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Expressive Systems, contains the crucial elements of a computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds. The firmware uses the Lua scripting language.

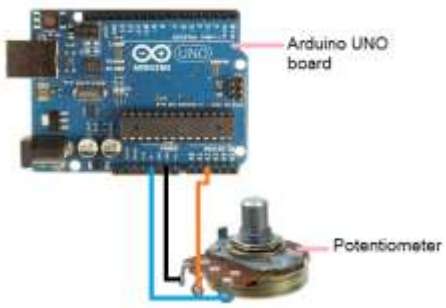
The firmware is based on the Lua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many opensource projects, such as SPIFFS. Due to resource

constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

C. Potentiometer:

A potentiometer is a simple mechanical device that comes in many different forms. It provides a variable amount of resistance that changes as you manipulate it. By passing voltage through a potentiometer into an analog input on your Arduino, it is possible to measure the amount of resistance of the potentiometer as an analog value.

The typical potentiometer will have 3 pins, two power supply pins (+5V and GND), and one pin that connects to an analog input pin on your Arduino to read the value output. Any time you're using analogRead(), where the center of pot pin (wiper) of the pot goes into the analog input of the arduino, and one side of pot to +5 and the other to (-), (the pot wired as a voltage divider).

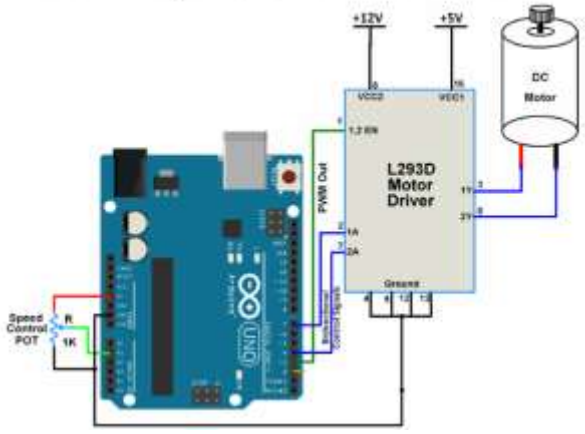


D. DC MOTOR:

DC motor converts electrical energy in the form of Direct Current into mechanical energy in the form of rotational motion of the motor shaft. The DC motor speed can be controlled by applying varying DC voltage; whereas the direction of rotation of the motor can be changed by reversing the direction of current through it.

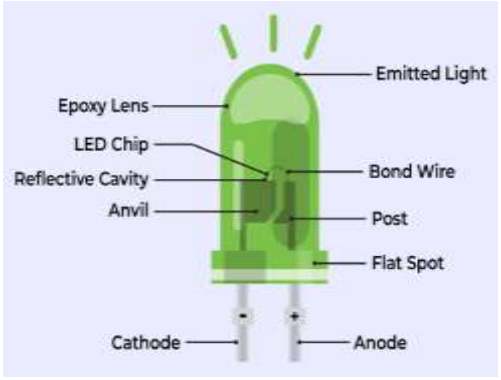
For applying varying voltage, we can make use of PWM technique.For reversing the current, we can make use of H-Bridge circuit or motor driver ICs that employ the H-Bridge technique.For more information about DC motors and how to use them, H-Bridge circuit configurations, and PWM technique, refer the topic DC Motors in the sensors and modules section.

Connection Diagram of DC Motor with Arduino



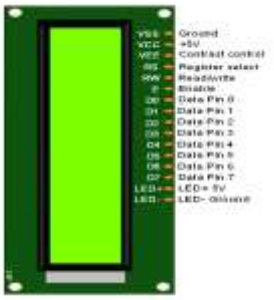
E. LED INDICATOR:

The LEDs (Light Emitting Diodes) are becoming increasingly popular among a wide range of people. When a voltage is given to a PN Junction Diode, electrons, and holes recombine in the PN Junction and release energy in the form of light (Photons). An LED's electrical sign is comparable to that of a PN Junction Diode. When free electrons in the conduction band recombine with holes in the valence band in forward bias, energy is released in the form of light.



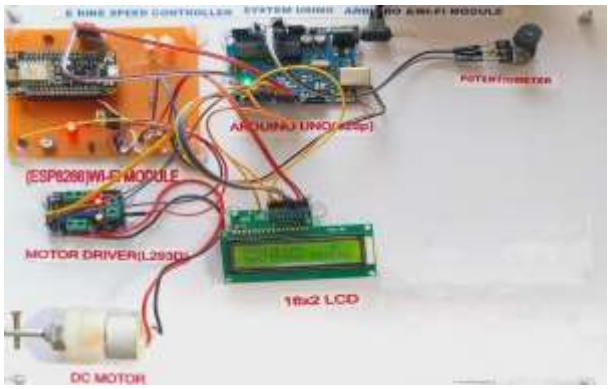
F. 16x2 Liquid Crystal Display (LCD):

The 16x2 Liquid Crystal Display (LCD) provides a user-friendly interface for displaying real-time data collected from various sensors, such as pollutant concentrations, temperature, humidity, and location information. This on-site monitoring capability allows for immediate data analysis and interpretation, enabling rapid response and decision-making by on-site personnel or local stakeholders.



IV.SYSTEM SETUP AND OUTPUT

The real time view of the E-Bike Speed Controller System Using Arduino & Wifi Module is shown below.



Functionality:

In this we are using Arduino micro controller to control the speed of the vehicle based on the speed controller circuit. Here a simple geared type Dc motor represents the vehicle. The controller always takes readings from the speed controller circuit then control the vehicle depends on predefined instructions. The vehicle should be operating in two modes. The first one is normal mode which the speed of the vehicle controlled manually with the reference of speed controller circuit. The second one is speed adjust mode which the

maximum speed of the vehicle adjusted in the Dash board of web application. Here we are using Blynk as a web application that is open source and easy to design. The status of allocated speed to the vehicle displayed in 16x2 LCD with Led's indication.

V.CONCLUSION

Riding experiences have been transformed by the Arduino micro controller-based e-bike speed control system. It achieved accurate speed control, guaranteeing effectiveness and safety. The sturdy of the Arduino architecture of the system optimized braking and acceleration, ensuring seamless speed changes over a variety of terrains. It greatly improved control, stability, and user safety. Additionally, the efficiency of the NODEMCU increased safety of rider without updating the firmware. By offering a better, more user-centric experience with improved control and performance, these accomplishments completely changed the e-biking landscape and took a big step toward intelligent, sustainable urban mobility.

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