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Speed and Direction Control of DC Geared Motor Using WiFi Module

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***Abstract* - This study covers the design and implementation of a remote brush direct-current (DC) motor speed control platform that is WiFi-based.[1] The NODE MCU, battery, dummy, chassis, and motor driver circuit(L293D) are the parts that make up the platform. The main processor, NODE MCU, is configured with Linux to provide remote control and speed feedback of the motor within a WiFi environment.[2] This article then uses socket technology to realize the processor's communication with the remote client.[3] The encoder and speed meter record the geared DC speed, which is measured by the speed sensor. This article provides a detailed description of the development process of the networked control platform. The platform's feasibility is verified through experimentation using the findings.**

Keywords: Speed Control, Direction Control, DC Geared Motor, WiFi Module.

I. INTRODUCTION

A geared DC motor is made up of a stator that is made up of polyphase armature windings and a rotor that is shaped like a permanent magnet.[1]It is different from a traditional de motor in that it has brushes and uses electricity for commutation, feeding the stator windings through an electronic drive. There are essentially two construction methods for geared DC motors: one is to place the windings outside the core and the rotor outside the core. The rotor magnets in the former configuration function as an insulator, slowing down the motor's rate of heat dissipation and allowing it to run at low current. Usually, it is utilized in fans.[2]The motor in the latter configuration dissipates more heat, resulting in an increase in torque. Due to advancements in materials and design, the Geared DC Motor's cost has decreased since its introduction. The Geared DC Motor is a widely used component in many unique applications due to its lower cost and other advantages over the Brush DC Motor.[3]The trolley is propelled from one location to another by two geared motors.

Basic Principle

Direct current is used to generate mechanical work via a DC motor. As per Lorentz Law, "the current carrying conductor placed in a magnetic and electric field experience a force," it functions based on this premise.[1]It's the Lorentz force, that is the interplay between magnetic fields is the foundation of a compound wound DC motor's operation.[2]Two windings make up the motor: a series winding that is linked in series with the armature and a shunt winding that runs parallel to it.[2]

II. SYSTEM CONSTRUCTION

2.1 Arduino Nano

Developed by Arduino.cc and first published in 2008, the Arduino Nano is an open-source microcontroller board that can be used with a breadboard. It is based on the Microchip ATmega328P microcontroller (MCU).[4] It has a smaller form factor but provides the same specifications and connections as the Arduino Uno board.[5] The Arduino Nano has thirty male I/O headers in a layout similar to a DIP-30. These headers can be programmed using the online and offline Arduino Software integrated development environment (IDE), which is available for all Arduino boards. A type-B mini-USB connection is used to power board by a 9V battery.[6]

2.2 Battery

A general-purpose series battery intended for widespread use in high-tech applications is the CSB GP-1272 F1.Alarm systems, UPS systems, power systems, medical devices, and more are all excellent uses for this battery. The CSB GP series has a unique methodology to deliver better performance than its rivals.

2.3 Node MCU

There are open source prototyping board designs available for the NodeMCU firmware."Node" and "MCU" (micro-controller unit) are combined to form the term

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"NodeMCU".[1]The firmware itself is referred to as "NodeMCU" strictly speaking, not the related development kits.[2] The designs for the prototyping board and firmware are also available for free. The scripting language Lua is used by the firmware. The firmware was developed using the Espressif Non-OS SDK for ESP8266 and is based on the eLua project.[3] It makes use of numerous open source projects, including SPIFFS and lua-cjson. Owing to limited resources, customers must choose the modules that are pertinent to their project and create a firmware that meets their requirements. Additionally, support for the 32-bit ESP32 has been included.[4] A circuit board acting as a dual in-line package (DIP) that combines a USB controller with a smaller surface-mounted board holding the MCU and antenna is the usual prototyping gear.[5] The DIP format selection makes breadboard prototyping simple. Originally, the design was based on the ESP-12 module of the ESP8266, a widely used Internet of Things (IoT) Wi-Fi SoC combined with a Tensilica Xtensa LX106 core.[6]

2.4 DC Geared Motor

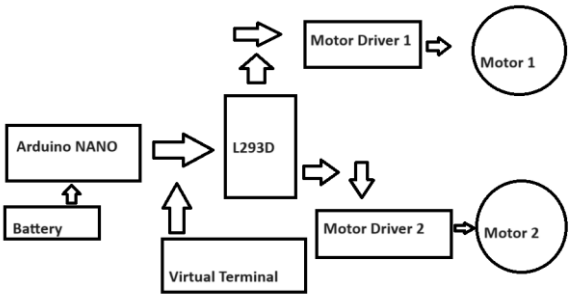
A DC gear motor is a compact DC motor and gearbox combined into one unit. It is sometimes referred to as a speed reduction motor or a DC geared motor.[1] Direct current power is used by it. The majority of the time, a gearbox is added to a motor in order to restrict its shaft speed and enhance its torque output.[2] DC gear motors are widely used in small and medium-sized motoring applications, ranging from robotics to vehicles, due to their versatile range of capabilities. You need to create a magnetic field in order to build a DC motor.[3] A magnet is used to create the magnetic field. It may be electromagnet or permanent magnet.

2.5 L293D Motor Driver

For the purpose of rotating a wheel or carrying out a certain task, even the most basic robot needs a motor. Motors demand more current than a microcontroller pin can normally produce, so you'll need a switch of some kind that can take in a tiny current, amplify it, and produce a larger current which feeds the motor even more.[1] A person referred to as a motor driver completes this full procedure. That process is made easy using the L293D Motor Driver IC, which has been used in a lot of applications with ease.[2]

The most popular driver for bidirectional motor driving applications is the L293D H-bridge driver. The DC motor may run in either direction thanks to this L293D IC.A set of two DC motors can be controlled concurrently in any direction by the 16-pin integrated circuit L293D.[3] It indicates that two DC motors can be controlled by a single L293D IC. Since it contains two H-Bridge Circuits. Small and silent large motors can also be driven by the L293D.[4] An H-bridge motor control circuit can be created in a number of methods, including by utilizing L293D/L298, relays, and transistors. Let's first review the definition of an H-Bridge circuit before getting more specific.[3]

III. BLOCK DIAGRAM

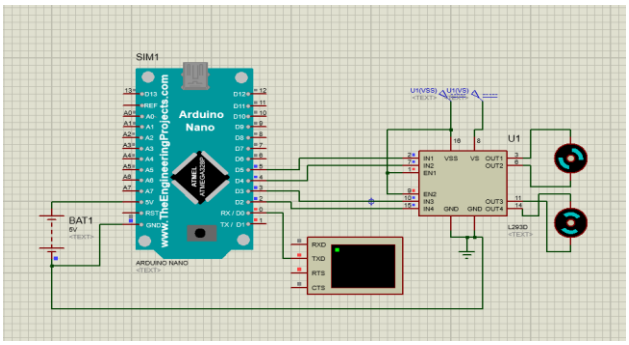


IV. HOW IT WORKS

Programming an Arduino NANO to regulate the DC geared motor's operation is the goal of the project "Speed and Direction control of DC geared motor using wifi module.[1] The Arduino NANO is linked to the pins of the motor sensors. For controlling purposes, the L293D motor driver is placed in the middle of the circuit and connected to the Arduino. Remote buttons will regulate the direction and speed of the motor.[2] The wifi module is used to connect to the remote's interface. This is how we can adjust the direction and speed of a DC geared motor.

V. RESULT

In this process of wireless power transmission, the receiver coil is situated in the down side of the vehicle, and electricity is supplied from the primary coil to the secondary coil (electromagnetic induction). The technology achieves the technique of wireless charging station.



VI. ADVANTAGES

i) Better speed versus torque characteristics

We see that the torque of DC motor decreases linearly with increasing speeds. The torque and the motor speed are

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inversely correlated. The speed torque curve is drawn starting from the Y axis, where torque is greatest and speed is zero.

ii) Can be remotely controlled

An organization's accounting and record-keeping are under the controller's purview.

iii) High dynamic response

The response of the trolley is high as compared to other controlling methods.

iv) Long operating life due to a lack of electrical and friction losses

Compact DC gear motors are renowned for their longevity and effectiveness. The gears' minimal wear and friction design ensures smooth operation and increased longevity. Their longevity and functionality can be further improved with routine maintenance including cleaning and lubrication.

VII. CONCLUSION

This study focuses on the design of the networked control brush. The Arduino NANO is a WiFi-enabled speed platform for DC motors that can accept control commands and run the system. And analyze the network's conditions by using the brush DC motor's speed as a study subject. This document provides the exact designs of the programs and concepts from the software and hardware, respectively. The results of the experiment show that the brush DC motor under networked control can satisfy network control requirements and has a respectable speed platform. This networked control platform will be used for future analysis and study on the more relevant network control trials.

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With great pride, we present our project, "Speed and Direction control of DC geared motor using wifi module. With the completion of this significant research, our academic career has reached a critical turning point that would not have been possible without the guidance and support of our mentor, Dr. Anupama Singh. We are very grateful for her outstanding advice and assistance during the report's production. We were able to effectively complete the project because of Dr. Anupama Singh's dedication, patience, and passion, which provided us with guidance and clarity. We really appreciate all of the staff members' assistance and cooperation. We also sincerely thank Dr. V.N. Pawar, the principal, and Dr. S. R. Deore, the head of the electrical department, for their encouragement and support.

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