SAN DIEGO STATE UNIVERSITY

DIGITAL MOTOR CONTROLLER

Sponsored by: Professor B. Dorr

2021

RUN DMC

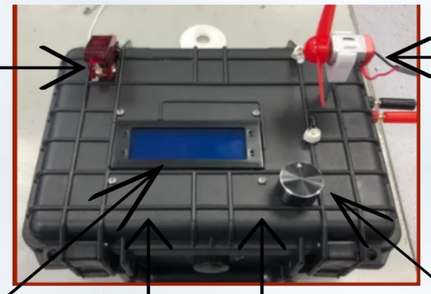
PROJECT OVERVIEW

Motor Control is a challenge for many people taking on their first projects. Our team has designed a digital motor controller that will allow a user to set the speed of a low voltage brushed DC motor and then the controller will maintain that speed even when the motor meets resistance. Think of it like cruise control for a small motor. Our team built this controller as an example for future students to follow when they decide to use motors in their own projects.

The proposed device is a Digital Motor Controller (DMC). The DMC is designed to maintain a set RPM of a low voltage Brushed DC motor (BDC) under various load conditions. The DMC consists of a plastic case which contains a battery, PCB, and screw down terminals. The screw down terminals will be used to connect the DMC to a low voltage BDC.

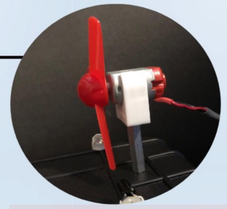
On the lid of the DMC there is a power switch, control knob, and LCD. The motor itself is mounted to a motor carriage that is separate from the DMC. The motor carriage holds the motor in place during operation and also holds the infrared emitter and receiver in place.

OUR DMC



SWITCH
Turns the motor on and off

Motor & Propeller
A BDC motor that is connected with 6-8V and can hit 6300 rpm



LCD
Displays the RPM, Setpoint, and error of the motor

Infrared LED Sensor
The sensor will show the current RPM of the motor forming a closed feedback loop

Button
Button is used for set initial set point for Feed back loop

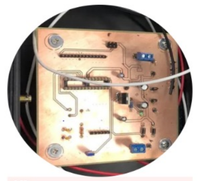
CONTROL KNOBB
Make the actual motor RPM match the setpoint RPM

Microcontroller (ATmega328p)
Generates Pulse Width Modulation (PWM) to control motor RPM

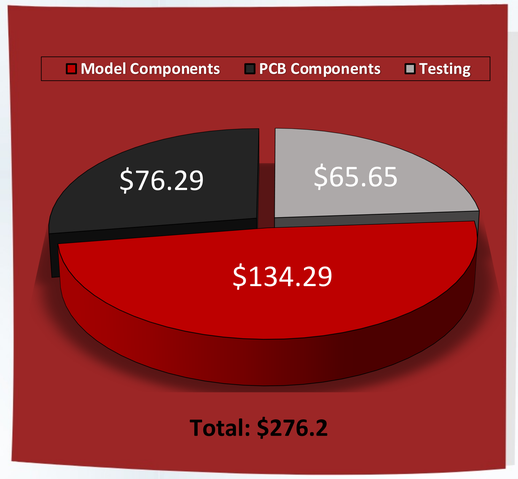
ATmega328p

Interior Components

PCB
ConnectS all the component together



Budget



Design Process changes

Problems & Solutions

7 Segment -> Lcd

Lcd is much easier to use, efficient for reading results and could display more information. Also, allow us using less I/O pins.

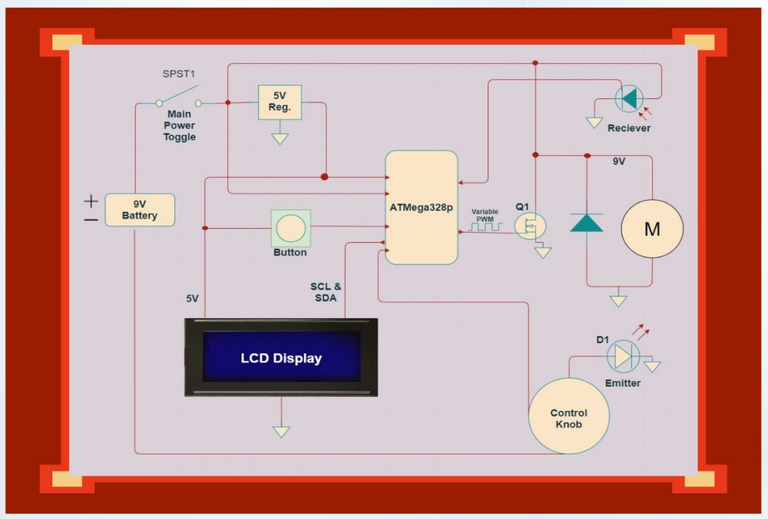
AC -> BDC

Originally, the team had planned to use a brushless AC motor but our sponsor requested we change the design to accommodate a Brushed DC motor. This gave the team a much more simple design requirement as well as significantly reducing projected costs.

555 Timer -> ATmega328p

Using ATmega328p to generate PWM and process feedback loop is helpful by adding voltage regulators and a crystal oscillator.

Block Diagram



Team

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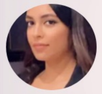

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