Motor Controller Final Report

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# Basic Principles

## PWM

PWM (Pulse Width Modulation) is a widely adopted method to control the output power by changing the duty cycle of the output signal of the circuit, which can be easily implemented with digital controllers. In this project, we use PWM to control the speed of a DC motor.

One of the most commonly understood example is its application on low-end LED monitors. For traditional non-LED backlight, the most common way to change brightness is increasing or decreasing the input voltage of the backlight source. However, the color temperature of LED will deviate if the input voltage is different from its working voltage, which is not acceptable for displaying purposes. Therefore, LED manufactures come up with using PWM to control the brightness since it is a cost-friendly approach that can maintain the color accuracy of LED monitors.

The problem of PWM's application on LED monitor is the flickering that can be observed at low frequencies, which can lead to eye fatigue that is even more serious than what an old-style CRT screen could trigger. Thus, high-end LED monitors are usually equipped with complicated circuits that simulates the analog way to change brightness.

But in this project, as well as in many other cases, PWM is an excellent controlling method. For a DC motor, if we just simply apply the analog way to control its speed, we will have a lower power at low voltages, which means a lower torque for motor. With PWM, the output is always at the maximum power. In real life, we expect a high torque at low speed, and this is what PWM can help us to achieve.

What's more, PWM can be easily implemented with digital components, which means we can realize the control with widely-available digital solutions like Arduino. In this project, we use 8052 microcontroller to implement it.

## Reset Circuit



<http://www.edaboard.com/thread14477.html>

<https://www.youtube.com/watch?v=Qgr-3vOr6xs>

# Components

## Stepper Motor 28BYJ-48

For many industrial applications like CNC machine, or 3-D printer for plastic material, the precision of movement is crucial.

## 8052

In this

## Transistor Array ULN2003A

### Darlington Pair



### Note on Usage

If the driving current from one port is not enough, we can use parallel connection to match the current requirement.