Illuminate NEBRASKA
POWERED BY NEBRASKA PUBLIC POWER DISTRICT

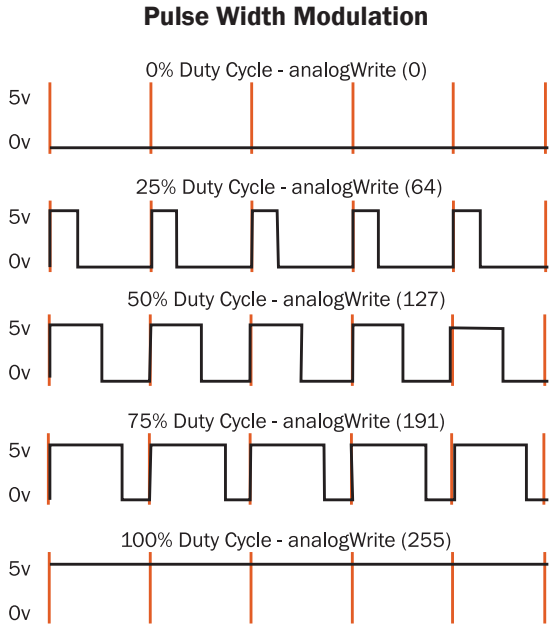
MOTION

PULSE WIDTH MODULATION (PWM)/MOTOR CONTROL

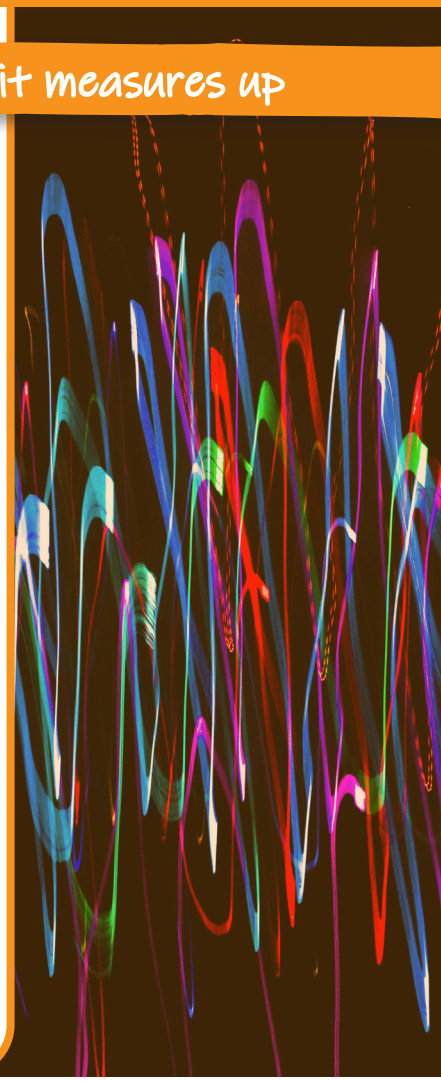
CONCEPT PWM (Pulse Width Modulation) is a technique used to control the speed of a motor or the intensity of an electronic device. In PWM, a signal with a fixed frequency is generated, and the duty cycle of the signal is varied to achieve the desired control. The duty cycle is the percentage of time the signal is high in a given time period. By adjusting the duty cycle, the average power delivered to the motor or electronic device can be controlled, and thus its speed or intensity can be varied. PWM is commonly used in motor control applications to achieve precise control over the speed of the motor, and it is widely employed in a range of electronic devices, including power supplies, LED lighting, and audio amplifiers. PWM offers several advantages over traditional analog control methods, such as improved efficiency, higher precision and greater flexibility.

BACKGROUND

PWM dates back to the early 20th century, when the first electric motors were developed. At that time, motor control was primarily achieved through mechanical means, such as varying the voltage applied to the motor or adjusting the mechanical load on the motor shaft. In the 1960s, the development of solid-state electronics led to the introduction of electronic motor control, which enabled more precise and efficient control of motors. PWM technology was first developed in the 1970s and quickly became the preferred method for motor control due to its high efficiency, low cost, and simplicity. With the continued advancements in microcontrollers and power electronics, PWM has become even more sophisticated and widely used in a variety of applications, including robotics, automation, and renewable energy systems.



Make sure it measures up



EXAMPLES

PULSE WIDTH MODULATOR (PWM): This is the primary component that generates the PWM signal. It can be an integrated circuit or a standalone module that provides the necessary circuitry to generate the PWM signal.

MICROCONTROLLER OR MICROPROCESSOR: The microcontroller or microprocessor provides the necessary processing power to generate the PWM signal and control the motor. It is responsible for monitoring the input signals and generating the PWM output.

MOTOR DRIVER: The motor driver is a specialized electronic circuit that translates the PWM signal into a voltage/current signal that can be used to drive the motor. It provides the necessary amplification and power conditioning to drive the motor.

POWER SUPPLY: A stable and reliable power supply is necessary for the motor to function properly. The power supply should be capable of providing the required voltage and current to the motor driver and the motor.

MOTOR: The motor is the device being controlled by the PWM signal. The motor can be of different types, including DC motor, AC motor, stepper motor, etc.

APPLICATION

PWM/Motor controls are built into the electronic speed controllers (ESCs) used in radio-controlled (RC) hobby vehicles. In RC cars, airplanes and drones, the ESCs use PWM technology to control the speed of the motor and the direction of rotation. The ESC receives a signal from the remote control unit, which adjusts the duty cycle and frequency of the PWM signal sent to the motor, allowing for precise control of the vehicle's speed and direction.

In this application, PWM/Motor control technology allows RC hobbyists to enjoy a more realistic and immersive experience, as they can control their vehicles' speed and movement with precision and accuracy. Additionally, PWM/Motor control technology allows hobbyists to optimize the performance of their vehicles, improving speed, maneuverability and energy efficiency.