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APPLICATION OF PULSE WIDTH MODULATION (PWM) IN ELECTRONICS

There was a turning point in the history of electronics using PWM or pulse wide modulation. What was needed was good control of engine power and speed. This led to the creation of a new way of transmitting electrical signals. This is how PWM was born – a recipe that changed the way the electrical engineering and technology controlled things.

Pulse width modulation or PWM – used to vary smoothly the power to the load coming from the power source. For example, to control the speed of the motor shaft rotation; to change smoothly the brightness of lighting or backlighting. A separate wide area of PWM application is switching power supplies and autonomous inverters.

The principle of operation of a PWM signal is to send regular pulses at certain time intervals with a varying duty cycle (percentage of “on” time).

Depending on the duty cycle, more or less energy is supplied to the controlled device affecting its speed or position in the automated system. By increasing or decreasing certain parameters such as frequency, amplitude and pulse width, these parameters can be adjusted to suit any application requirements and provide precise control of the device output without changing the voltage level. Pulse width modulation is an important and widely used method of controlling output power in various applications. It can be implemented using digital or analogue control systems. In the digital version, signals are generated using software algorithms that determine the width of the pulses; whereas in analogue PWM, signals are generated by hardware components such as transistors and capacitors that create the desired pulse width without the need for programming. Both methods have their advantages and disadvantages, but when implemented correctly, both provide reliable, low-distortion performance.

Here are some examples of devices that use PWM:

1. **Power Supplies (SMPS - Switched-Mode Power Supplies):** Power supplies that provide a stable voltage or current often use PWM to regulate output parameters. This allows the voltage to be increased or decreased with high efficiency, minimizing energy loss.

2. **DC-AC Inverters:** Inverters that convert direct current (DC) to alternating current (AC) can also use PWM. This helps create high frequency pulses which are then filtered and converted into a sine wave output signal.

3. **DC-DC Converters:** Devices designed to change the level of DC voltage may include PWM to control the output voltage or current. This allows for efficient power control and stable output.

Charger Controllers: Battery chargers can use PWM to regulate charge current and voltage, which is important for charging batteries efficiently and safely.

Pulse Width Modulation (PWM) has become a fundamental element in modern electronics due to its efficiency, flexibility and wide range of applications. PWM allows you to effectively manage power consumption, adjust device parameters and provide precise power control.