Pulse Width Modulation also know as PWM is a method for getting analog results with a digital method. A digital method is used to create a square wave which means when the wave is high the signal is on and when its low the signal is off. Since it is a digital signal the simulated voltage can be changed by changing the time the signal spends on versus the time the signal spends off. The time that the signal is on is called **pulse width**. This method is useful when a component can benefit of changeable power such as LEDs and motor speeds.

Figure.1. shows PWM in a pictorial representation. The green lines are a regular period. The period is the inverse of the PWM frequency.

For example, if there was a PWM frequency of 500 Hz, the green lines would measure 2 ms each.

Duty cycle in figure.1. is the ratio the signal spends high and low measured in time this creates an average constant value. 0% duty cycle means that the digital signal produced is constantly low. A 100% duty cycle means that the digital signal produced is constantly high.

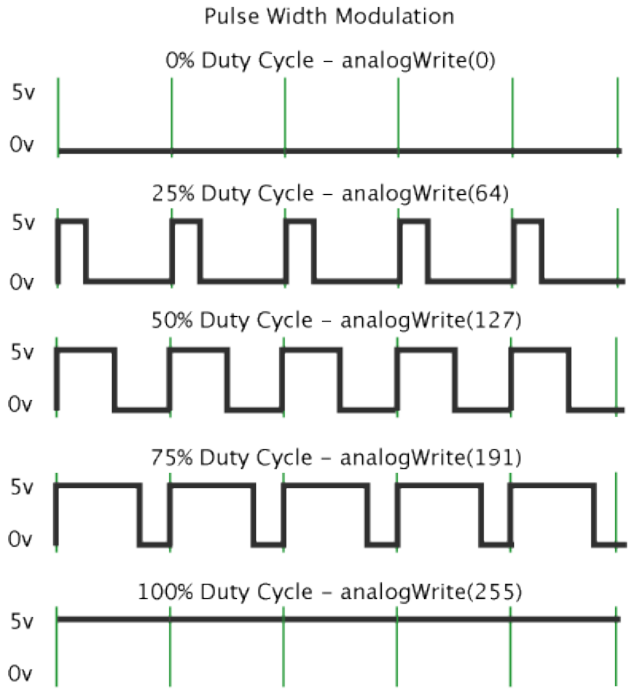

Figure.1. Pulse Width Modulation

Formula to calculate Duty Cycle in percentage: $Duty\ Cycle = \frac{Pulse\ Width}{Period} \times 100.$

Advantages of PWM:

- At high frequencies, the average output produced is stable, precise and constant.
- Ideal for transistors.

Disadvantages of PWM:

- Less reliable when producing waveforms with lower frequencies. This may produce outputs with noise.

References

[1]"https://www.arduino.cc/en/Tutorial/Foundations/PWM", https://www.arduino.cc/en/Tutorial/Foundations/PWM, 2020. [Online]. Available: https://www.arduino.cc/en/Tutorial/Foundations/PWM. [Accessed: 06- Nov- 2020].

[2]"Pulse Width Modulation - learn.sparkfun.com", Learn.sparkfun.com, 2020. [Online]. Available: https://learn.sparkfun.com/tutorials/pulse-width-modulation/all. [Accessed: 06- Nov- 2020].

[3]2020. [Online]. Available: https://www.electronics-tutorials.ws/blog/pulse-width-modulation.html. [Accessed: 06- Nov- 2020].

[4]J. Heath, "PWM: Pulse Width Modulation: What is it and how does it work?", Analog IC Tips, 2020. [Online]. Available: https://www.analogictips.com/pulse-width-modulation-pwm/. [Accessed: 06- Nov- 2020].