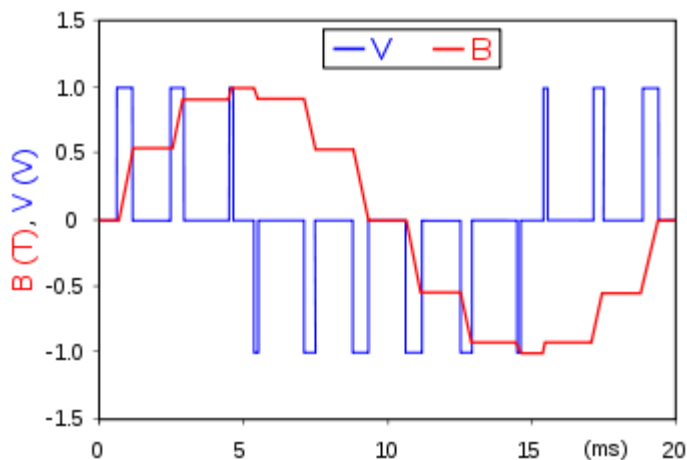# Description of PWM

Pulse Width Modulation is a crucial technique to control many analogue devices using digital signals. It can be used for controlling the speed of a motor, adjusting the brightness of a LED, directing the servo motor and many other applications **[1]**.

It is based on the idea of the duty cycle of a digital signal. Duty cycle is the ratio between the duration the signal stays high and the whole period of the signal. When the width of the signal which is the time the signal spends on the on status is changed, the duty cycle of that signal will be changed accordingly.

The other factor of PWM is the frequency of a signal. Since most digital signals have high frequency (i.e. being so fast), the process of switching the status of the signal form high to low and vice versa is not noticed by the human eye. Instead, it is seen as an average voltage which is like analogue signal. Therefore, when a signal has a duty cycle of 50% and the High voltage is 12 V for example, it is seen as a steady 6 V.

PWM can be thought of as a way to fake the analogue signal by adjusting the duty cycle. The average voltage can be calculated as the duty cycle multiplied by the high-level voltage. The below image shows how the digital signal can simulate an analogue one using PWM.

PWM is more efficient method comparing to the use of potentiometer to define the voltage. This is due to minimizing the power loss **[2]**.

[3]

References:

[1]   https://learn.sparkfun.com/tutorials/pulse-width-modulation/all

[2]   https://www.techopedia.com/definition/9034/pulse-width-modulation-pwm

[3]   https://en.wikipedia.org/wiki/Pulse-width_modulation