No: Date: / /

Assingment 01

PPM - Pulse Position modulation

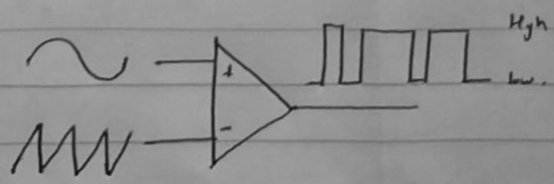
Pulse position modulation is a time domain analog modulation technique where the position of the pulse is within a pre defined time slot encodes the amplitude of the sampled signal. Unlike pulse width modulation which varies pulse duration or PAM which veres pulse height PPM preserves pulse amplitude and width.
The PPm can be mathematically modeled as.

$$m(t) = A \sum_{n=-\infty}^{\infty} \Pi\left(\frac{t - nT_s - k_p s(nT_s)}{\tau}\right)$$

τ - Pulse width
A - amplitude
T_s - Sampling period.
k_p - modulation sensitivity
$s(nT_s)$ - Sampled value of the message signal

PWm - Pulse width modulation.

Pulse width modulation is a way of delivering energy through a succession of pulses rather than a continuously varying signal. By increasing or decreasing the pulse width it can be made proportional to the amplitude of the signal.
a simple comparator can be used ~~to turn~~ with a sawtooth signal to turn a signal into PWm signal.



Atlas

No: Date: / /

In general if the amplitude of the signal is larger the pulse width will be wider.

mathematical model

width τ $\quad \tau_n = \tau_0 + k_w m(nT_s)$ $\quad \tau_0$ - unmodulated pulse width.

k_w - sensitivity constant

$m(nT_s)$ - amplitude of message signal at nT_s

Time domain signal

$$S_{pwm}(t) = \sum_{n=-\infty}^{\infty} A \cdot \pi\left(\frac{t - nT_s}{\tau_n}\right) \qquad A \text{ is a constant}$$

average value $\quad S_{avg}(t) = \frac{1}{T_s}\int_0^{T_s} S_{pwm}(t)\,dt$

$$= \frac{1}{T_s}(A \cdot \tau_n)$$

$$S_{avg}(t) = \frac{A}{T_s}\tau_0 + \frac{A k_w m(t)}{T_s}$$

↑ DC offset ↑ scaled signal

Applications

PPM - used in optical communication systems

PWM - motor control systems.