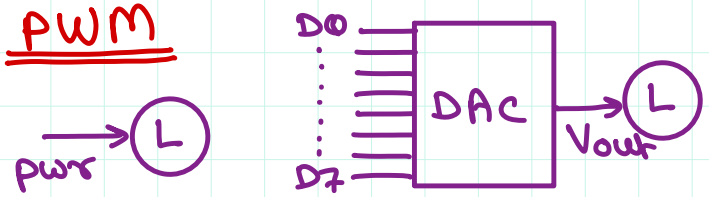
Advanced Micro-controllers - ARM

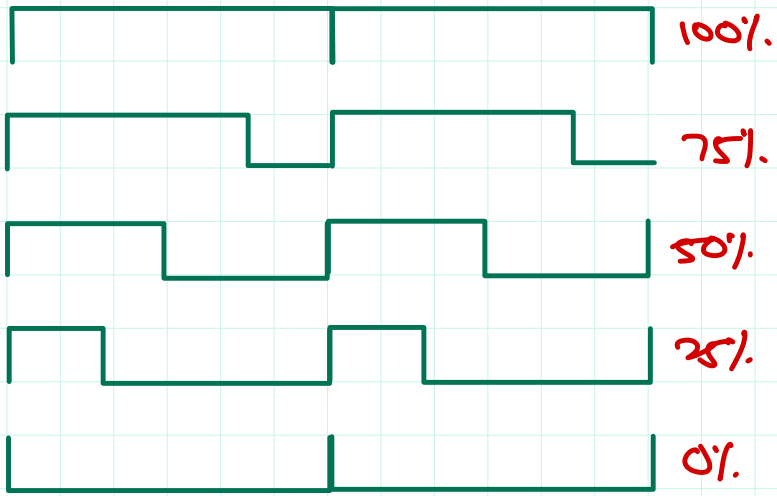
DESD @ Sunbeam Infotech

PWM



e.g. LED glow proportional to power delivered.

e.g. DC motor speed is proportional to power delivered.



clock period = 10sec. (0.1 Hz)

clock period = 1 sec. (1Hz)

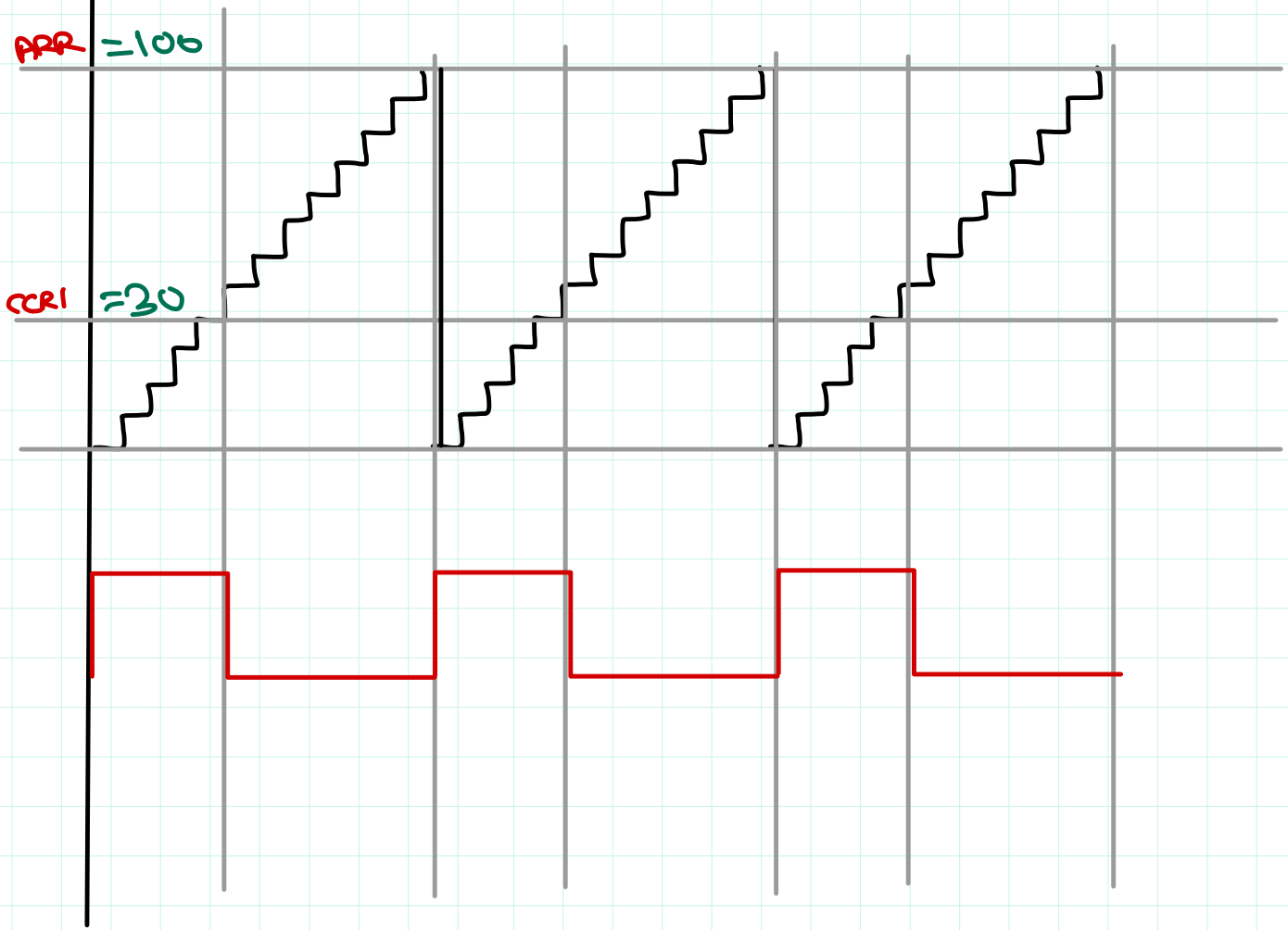
clock period = 100µs (10 kHz)

Ideal PWM freq
10 kHz to 100KHz.

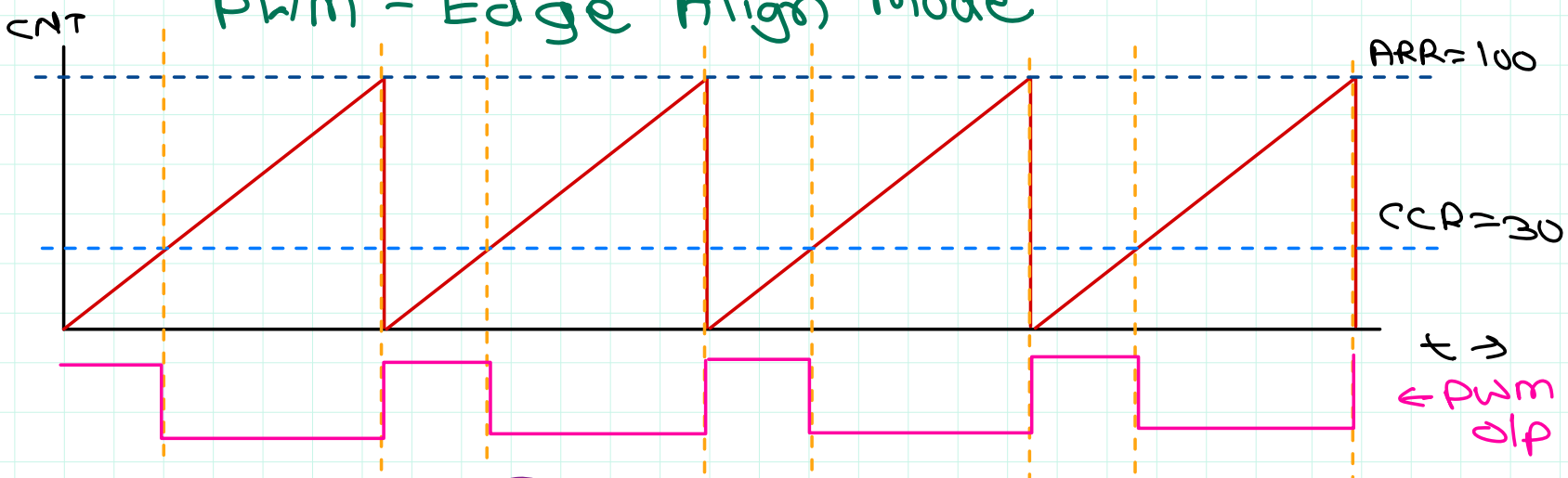
output freq = 10 KHz. out clock period = 0.1ms

FPCLK = 16 mHz , PRESCALAR = 16

$$CNT = \frac{FPCLK}{1000} \times \frac{ms}{PR} = \frac{16000000}{1000} \times \frac{0.1}{16} = 100$$



PWM - Edge Align mode



$$Fpwm = \frac{FPCLK}{PR \times ARR}$$

$$\text{Duty cycle} = \frac{CCR}{ARR}$$

$$T = \frac{PR}{FPCLK} \times CNT \times 1000$$

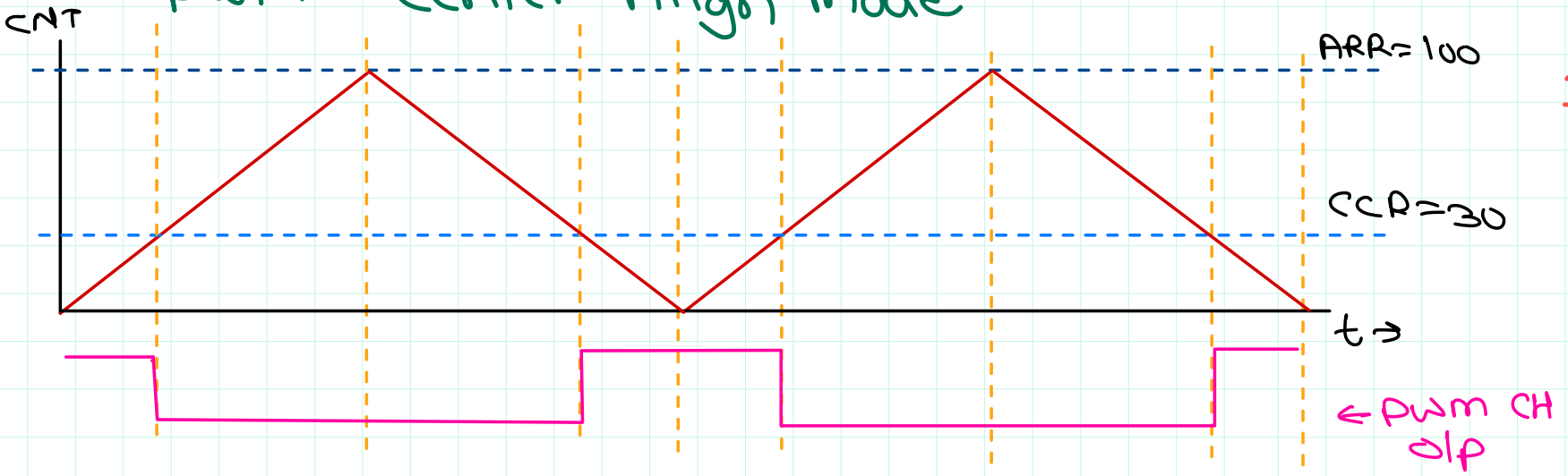
$$= \frac{16}{16000000} \times 100 \times 1000$$

$$= 0.1\,ms$$

ARR

PWM Freq = 10 KHz

PWM - Center Align Mode



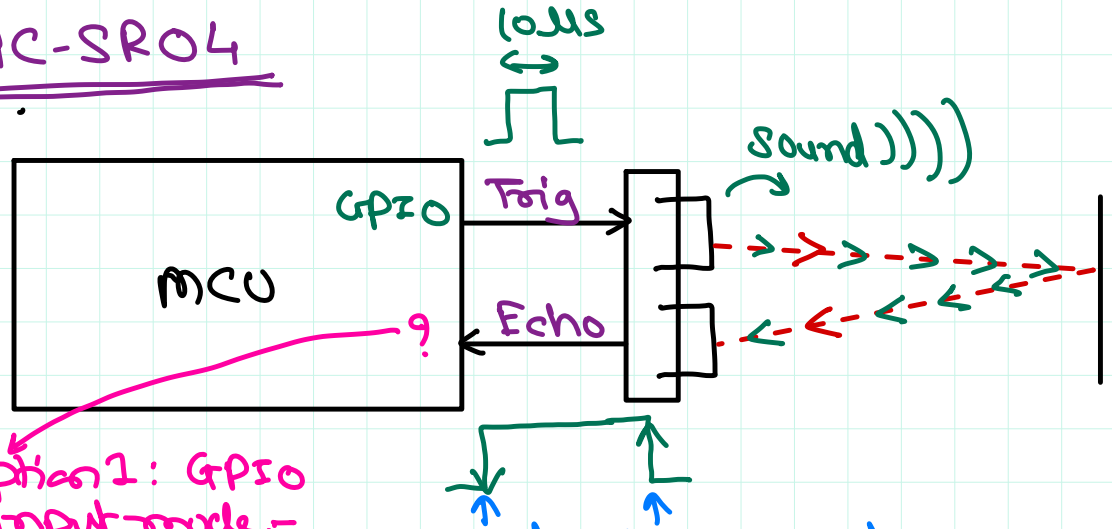
$$Fpwm = \frac{FPCLK}{PR \times ARR \times 2}$$

$$\text{Duty cycle} = \frac{2CCR}{2ARR} = \frac{CCR}{ARR}$$

$$T = 2 \times 0.1\,ms = 0.2\,ms$$

PWM Freq = 5 KHz

HC-SR04



Option1: GPIO input mode - poll / intr - measure time using timer.
- when sound echo receives (falling edge)
- when sound wave sent (rising edge)

Option2: Input Capture
- → connect to echo pin
- → handle input capture intr handler.
  - ✓ rising edge → store captured cntr (CCR) → var1 → 1000
  - ✓ falling edge → store captured cntr (CCR) → var2 → 1050

var2 - var1 = diff cnt.

$$time = \frac{PR}{FPCLK} \times cnt \times 1000 \text{ ms}$$

$$= \frac{16}{16000000} \times 50 \text{ sec}$$

$$time = \frac{1}{20000} sec =$$

Consider sound speed = 340 m/s

distance = speed x time

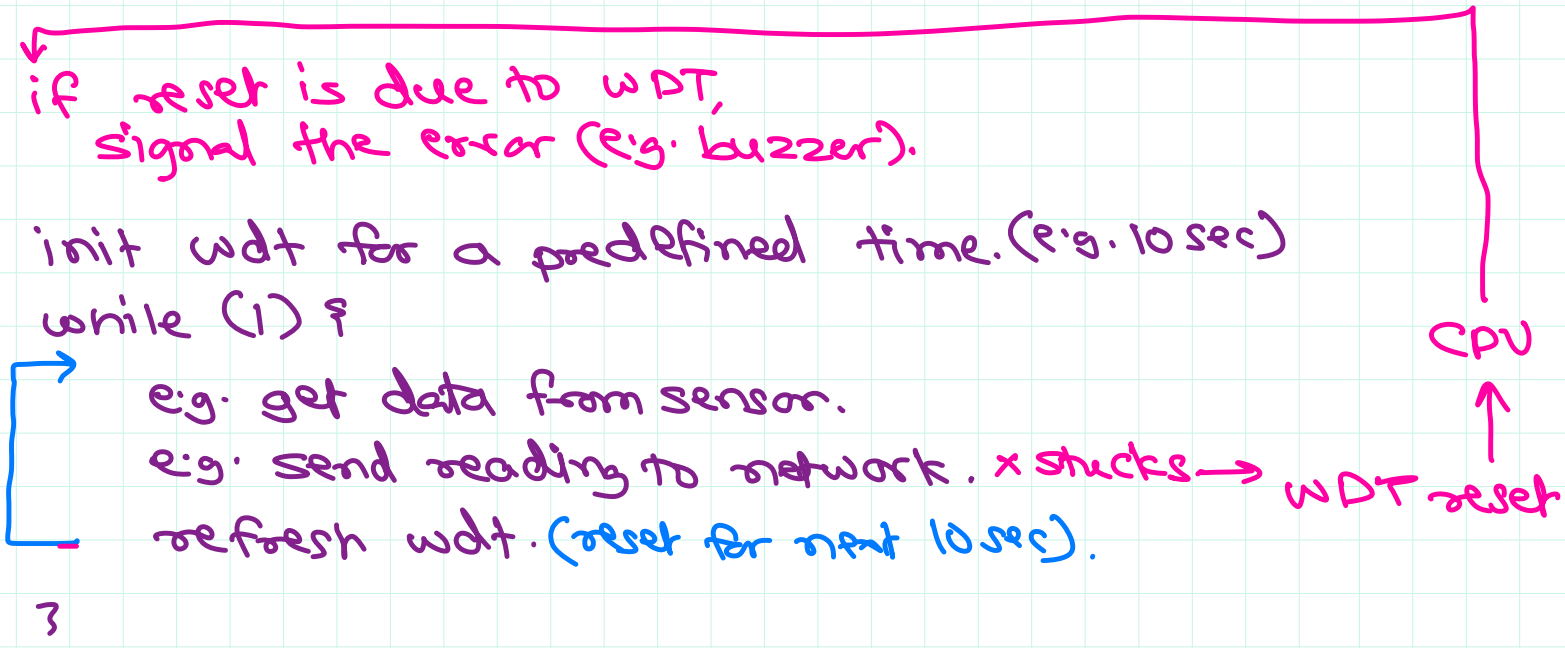
$$= 340 \times \frac{1}{20000}$$

$$= 17 \text{ mm}$$

dist from obstacle

$$= \frac{dist}{2} = \frac{17}{2} =$$

watchdog timer



Thank You!

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