

Last week

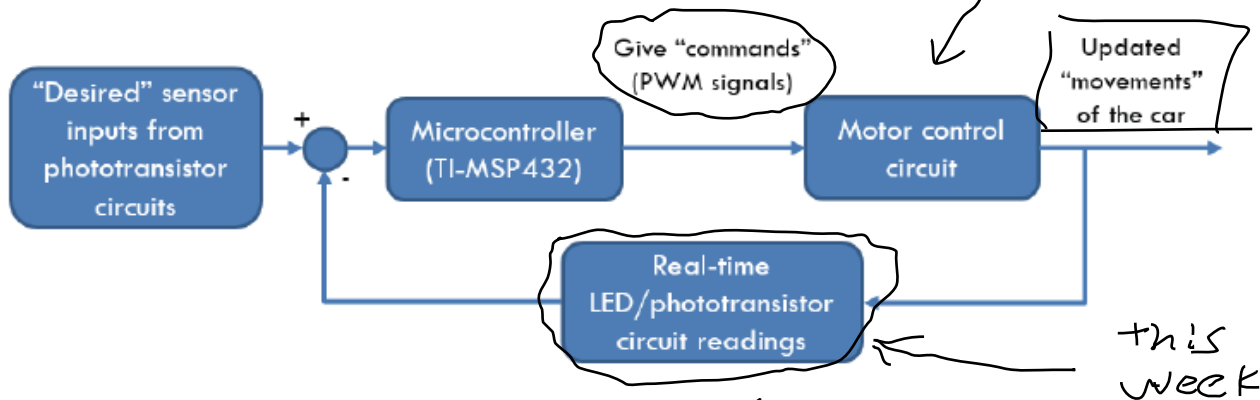
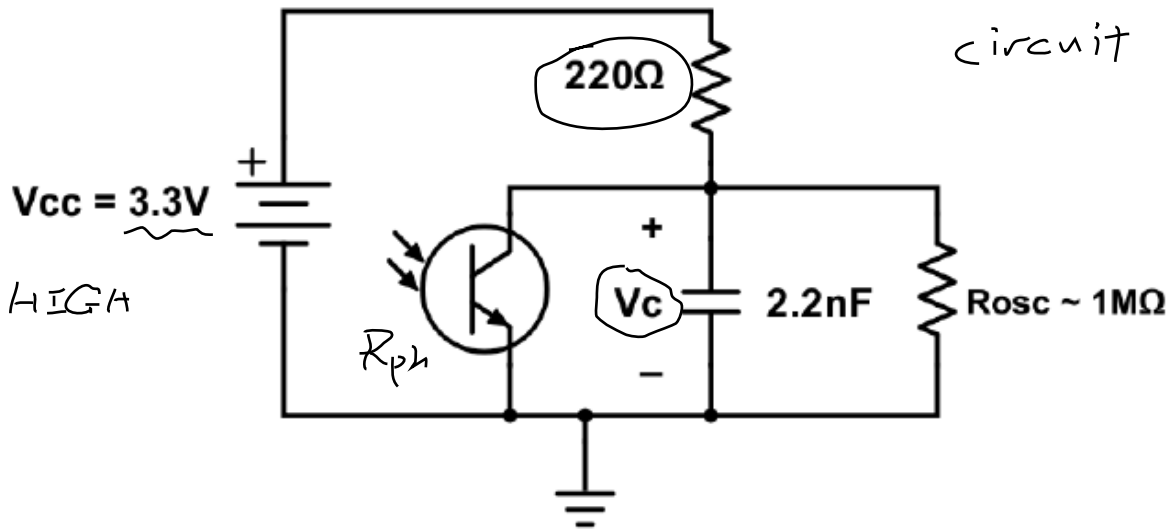


FIGURE 3-1: High level understanding of the ECE3 class project

Working Mechanism of the phototransistor circuitry:

Charging: $0 \rightarrow 3.3V$

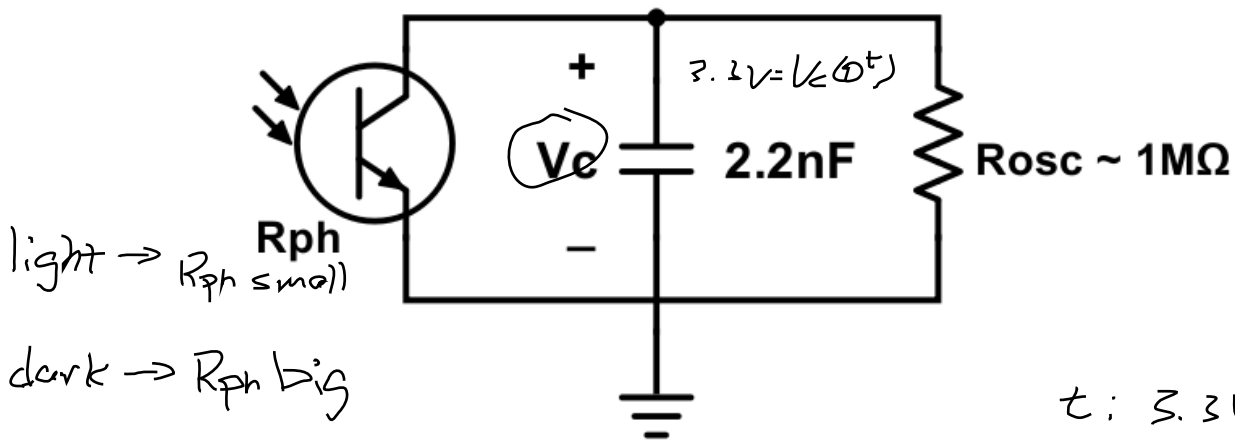
1st order RC circuit



$$\tau_c = C(R_{220} // R_{ph} // R_{1M}) \approx 220\Omega \times C$$

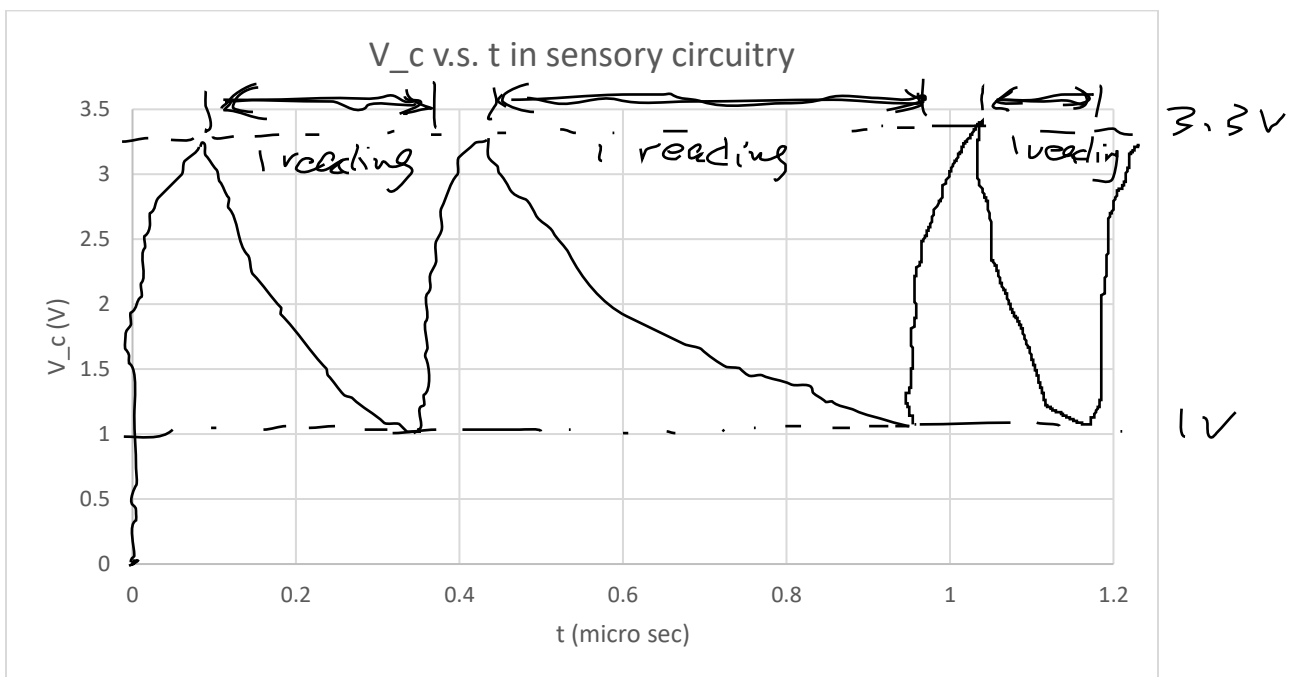
very short time ($\sim 0.4 \mu s$)

Discharging: $3.3V \rightarrow 0V$



$t: 3.3V - 1V$

$$\tau_c = C(R_{ph} // R_{1M}) \approx R_{ph} \times C$$



Total time needed to wait for each read?

when sensor see black
 ($\sim 2ms$ per reading)

3 hour project
 worst case
 scenario

Sampling rate
 ($\sim 150 \text{ samples/s}$)

completely white

In our project setting: We read the discharging time from 3.3V to 1V as the sensory input data

(0.2500)

time

completely black

White surface:

each dot:



turn on

R_{ph} low



$R_{ph} \cdot C$ low



$t: 3.3V - 1V$ short

R_{ph} high

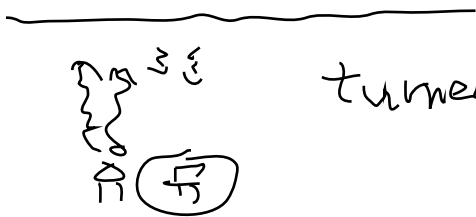


$R_{ph} \cdot C$ high



$t: 3.3V - 1V$ long

Black surface:

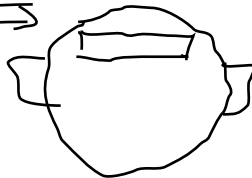
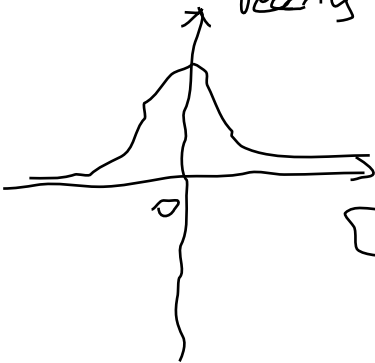


turned off

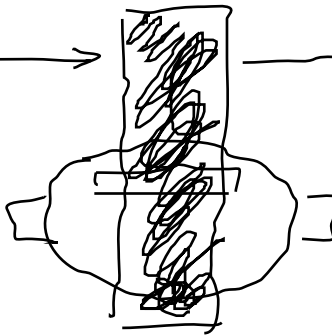
Sensory data fusion:

8 sensors \rightarrow 1 number \uparrow

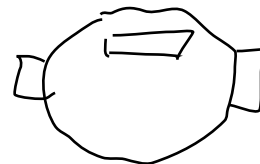
sensor reading



white



black

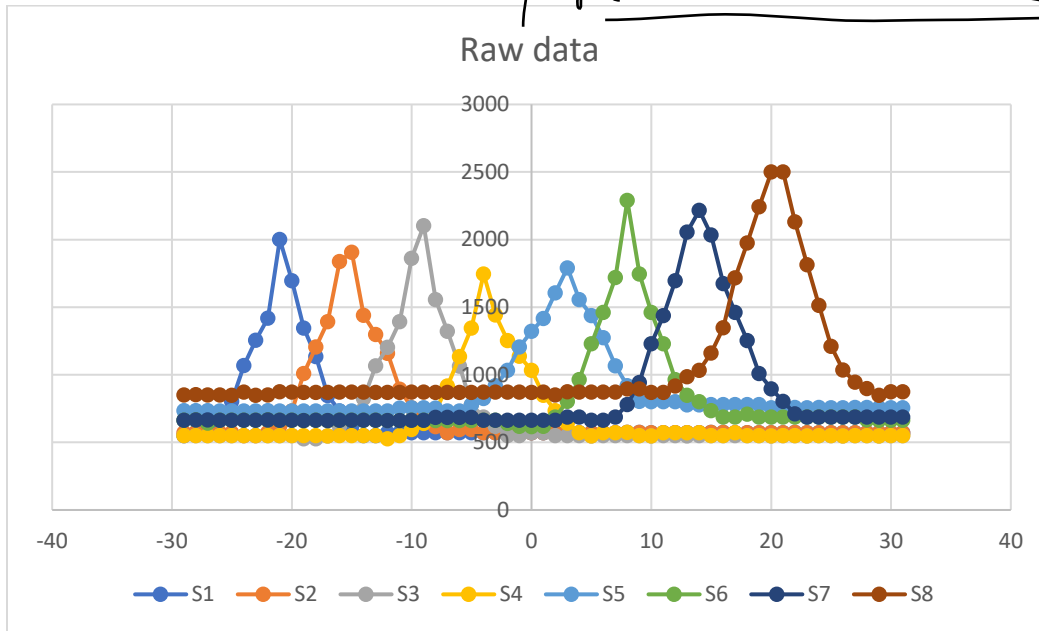


white

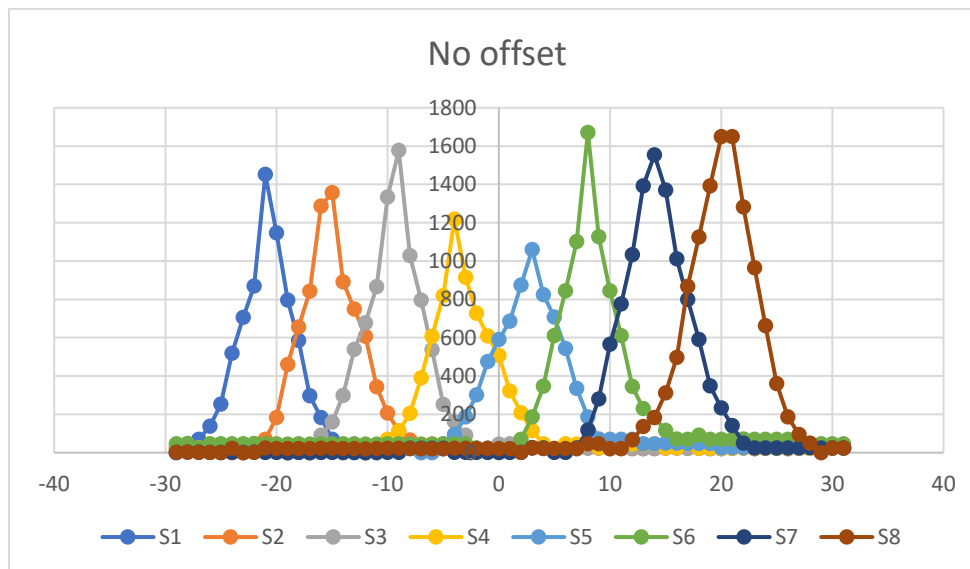
Raw data:

① offset_k: δ_{num}

② range: δ_{num}



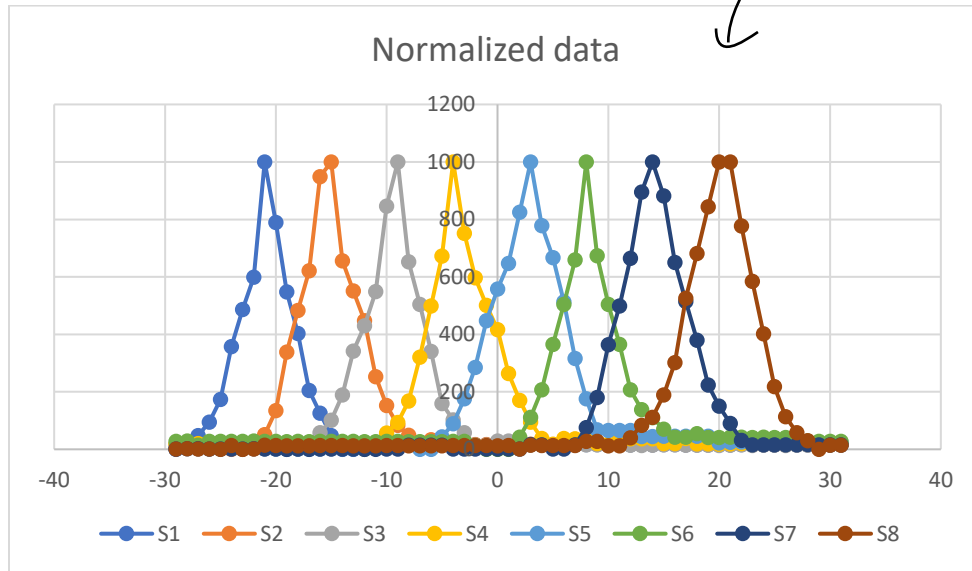
Kill the offsets:



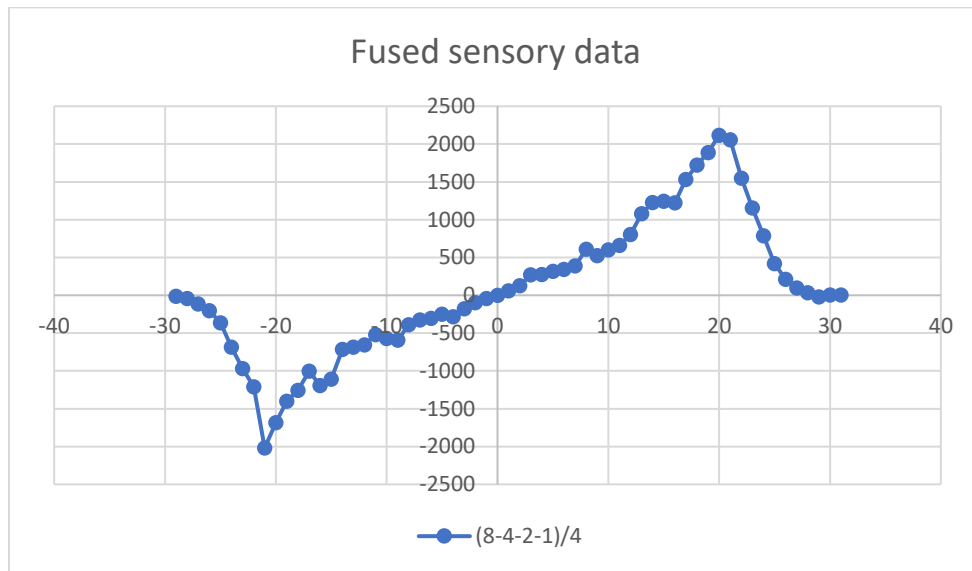
Normalize through scaling:

$D = 1000$

(3+
Suggestion



Sensor fusion: (skip)



"Pseudocode" of our project:

- { ① Control Motors
- { ② Read from sensors

```
void setup () {  
    pinMode - --
```

```
    ECE3_Init();  
    :
```

```
}
```

```
void loop() {
```

① Read Raw Data from 8 sensors
→ 8 numbers from 0-2500

② Hard code the data calibration
kill offset

scale
→ 8 numbers 0 - 1000 2nd
(clean data) suggestion

③ Change motor speed
according to sensor inputs

```
}
```

