The ~~Antibac~~Buggy

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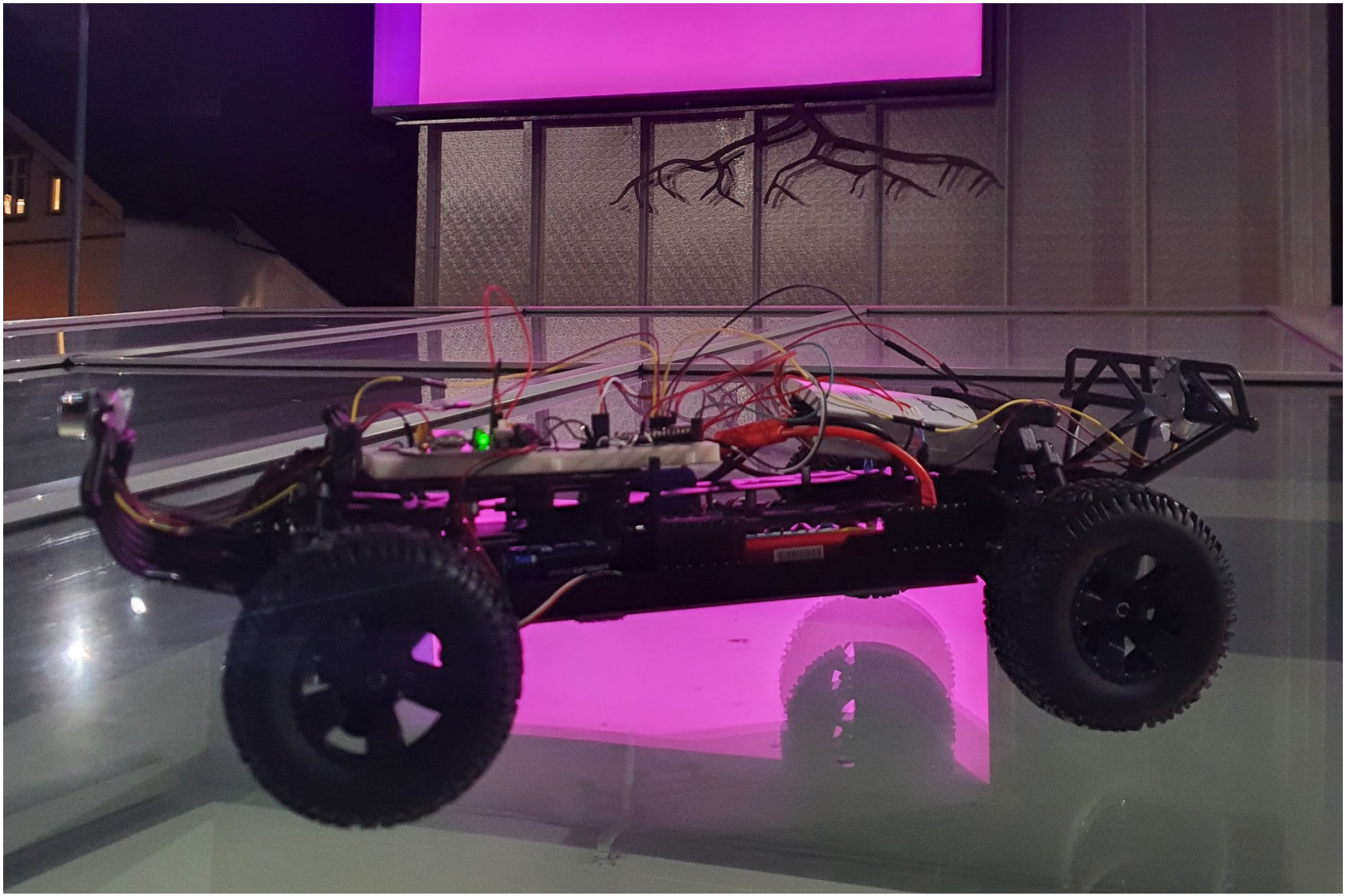
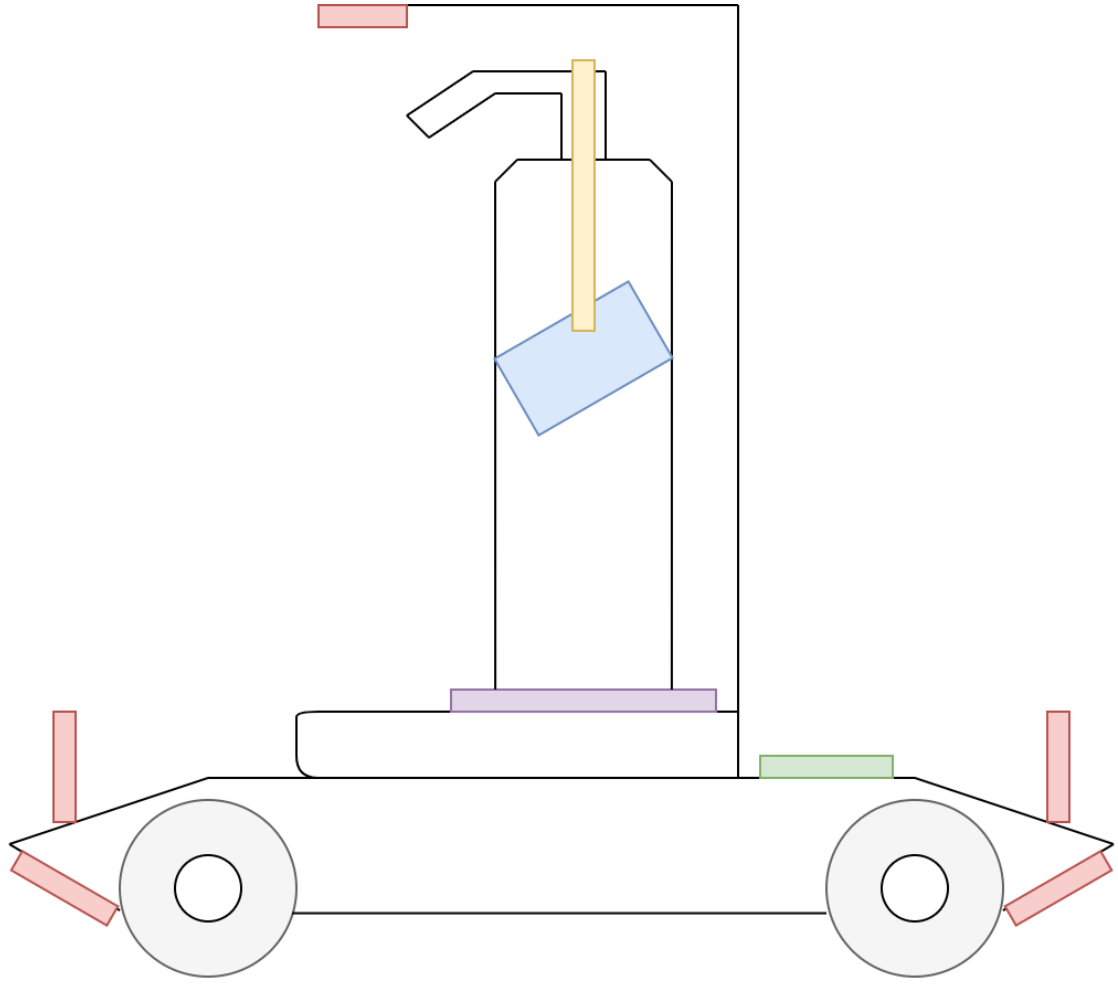
USN

Autumn 2020

Showcase



Initial Concept



Arduino NANO 33 BLE SENSE

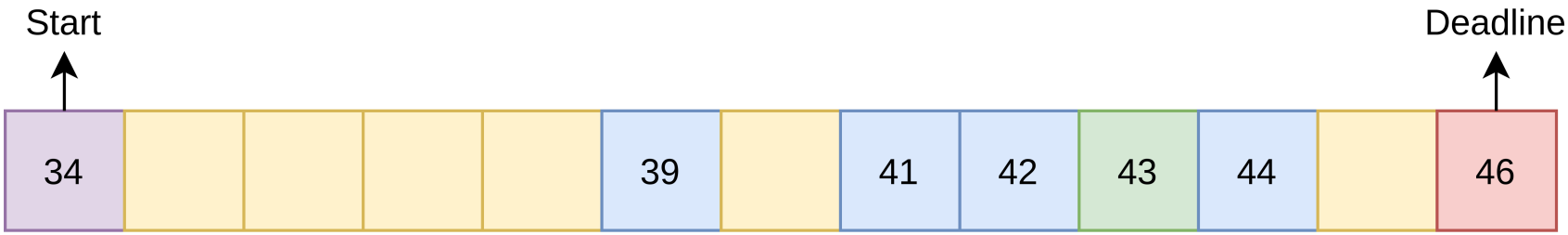
Pressure Plate

Rubber Band

Proximity Sensor

Servo Motor

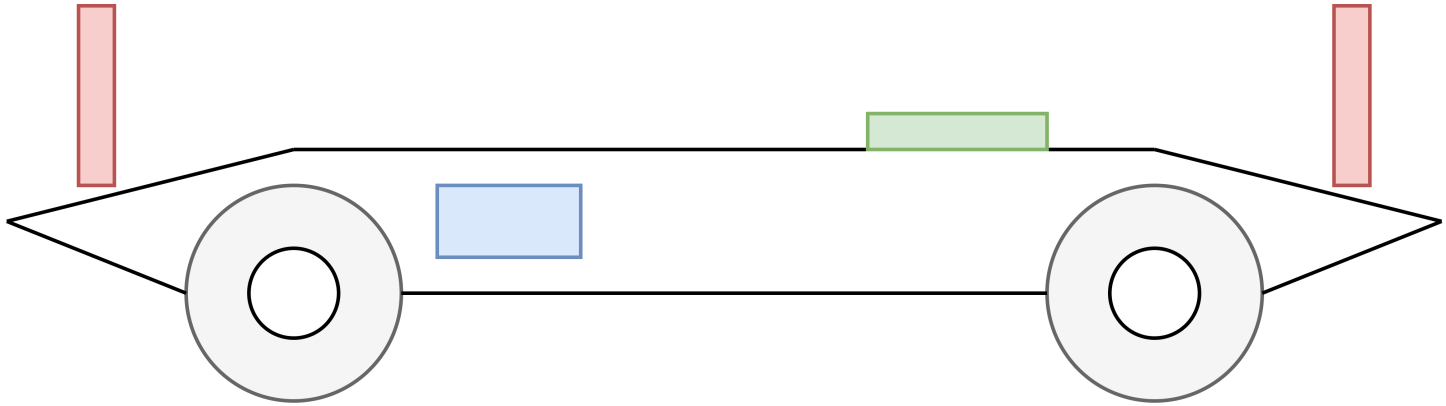
Timeline

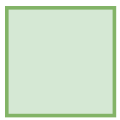


39	We received the Arduino.
41	We received the Segger J-Link debugger.
42	First successful flash.
43	We tested the code on the car, and are satisfied.

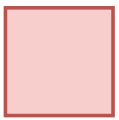
44	We measured task cycles and finished the report and presentation.

Final Design





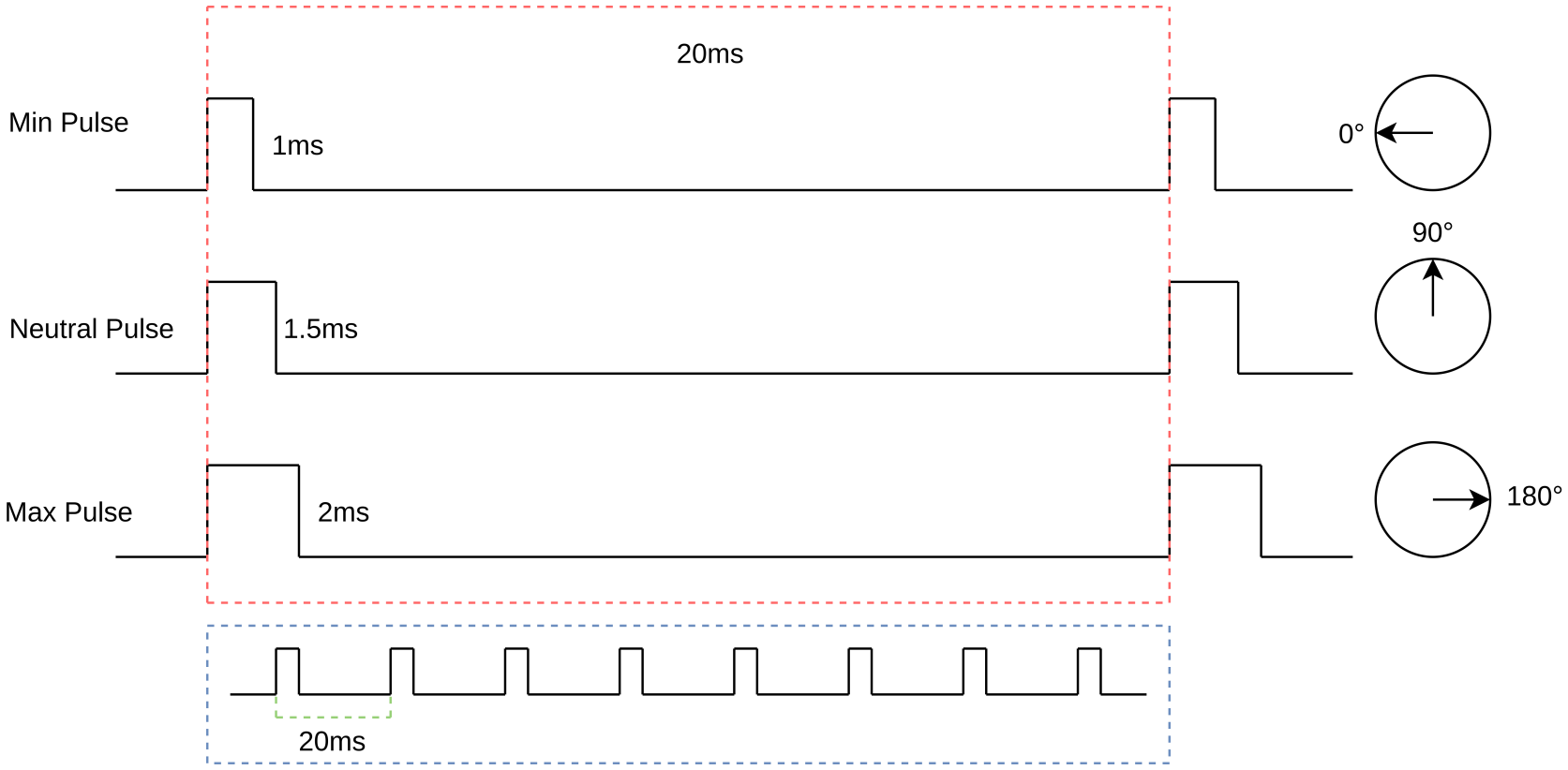
Arduino NANO 33 BLE SENSE



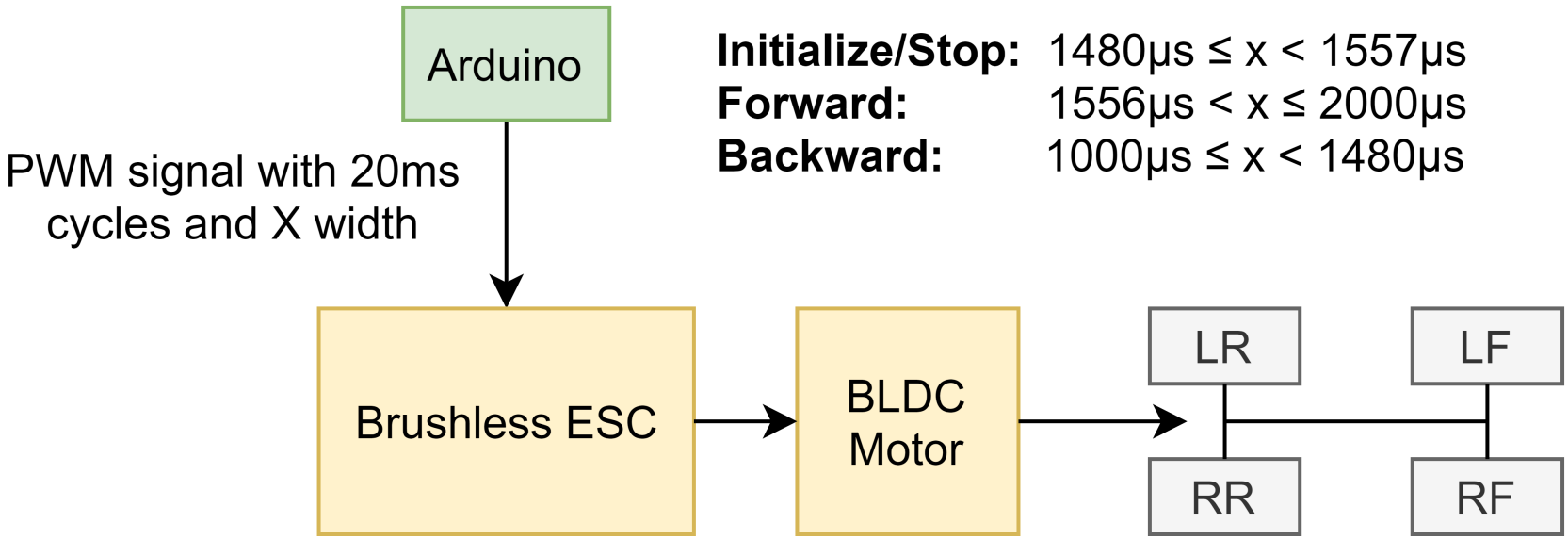
Proximity Sensor

Brushless Motor ESC

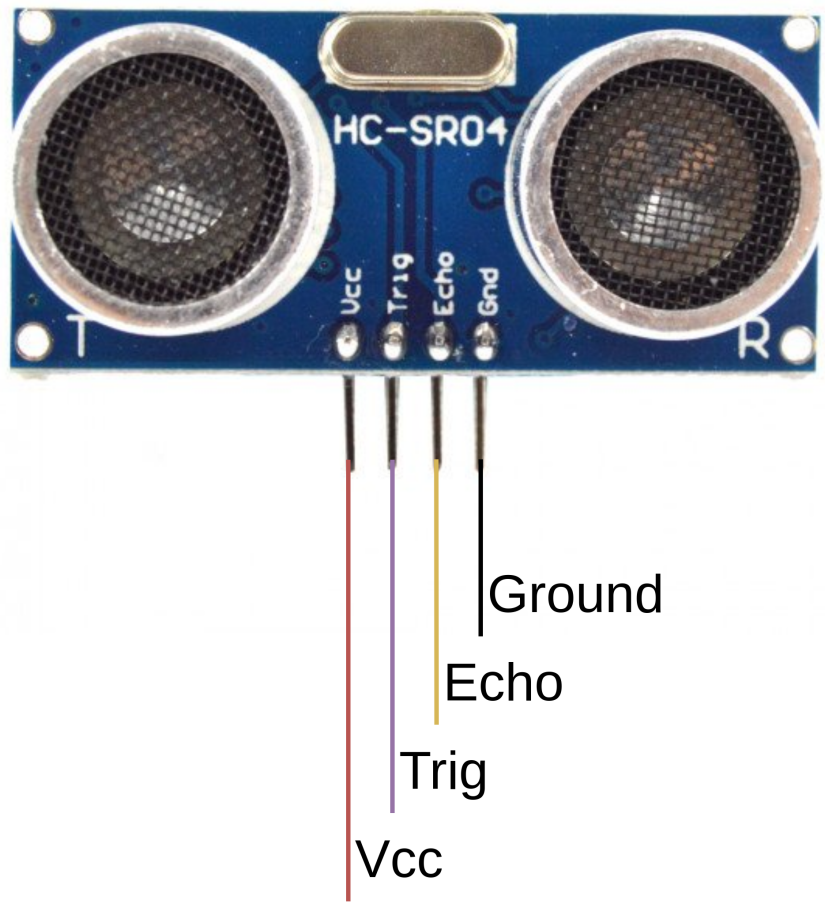
Servo


20ms
Min Pulse
1ms
0°
90°
Neutral Pulse
1.5ms
Max Pulse
2ms
180°
20ms

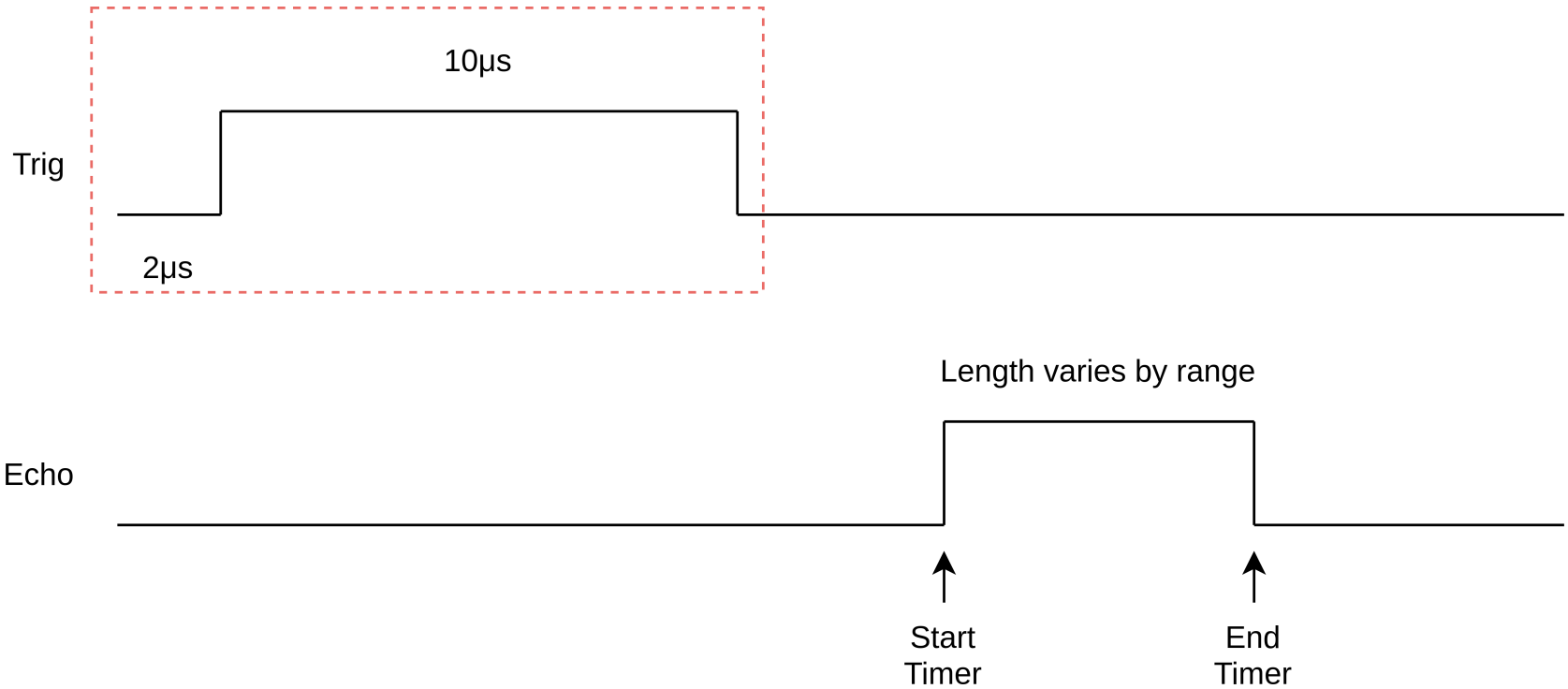
Brushless Motor ESC



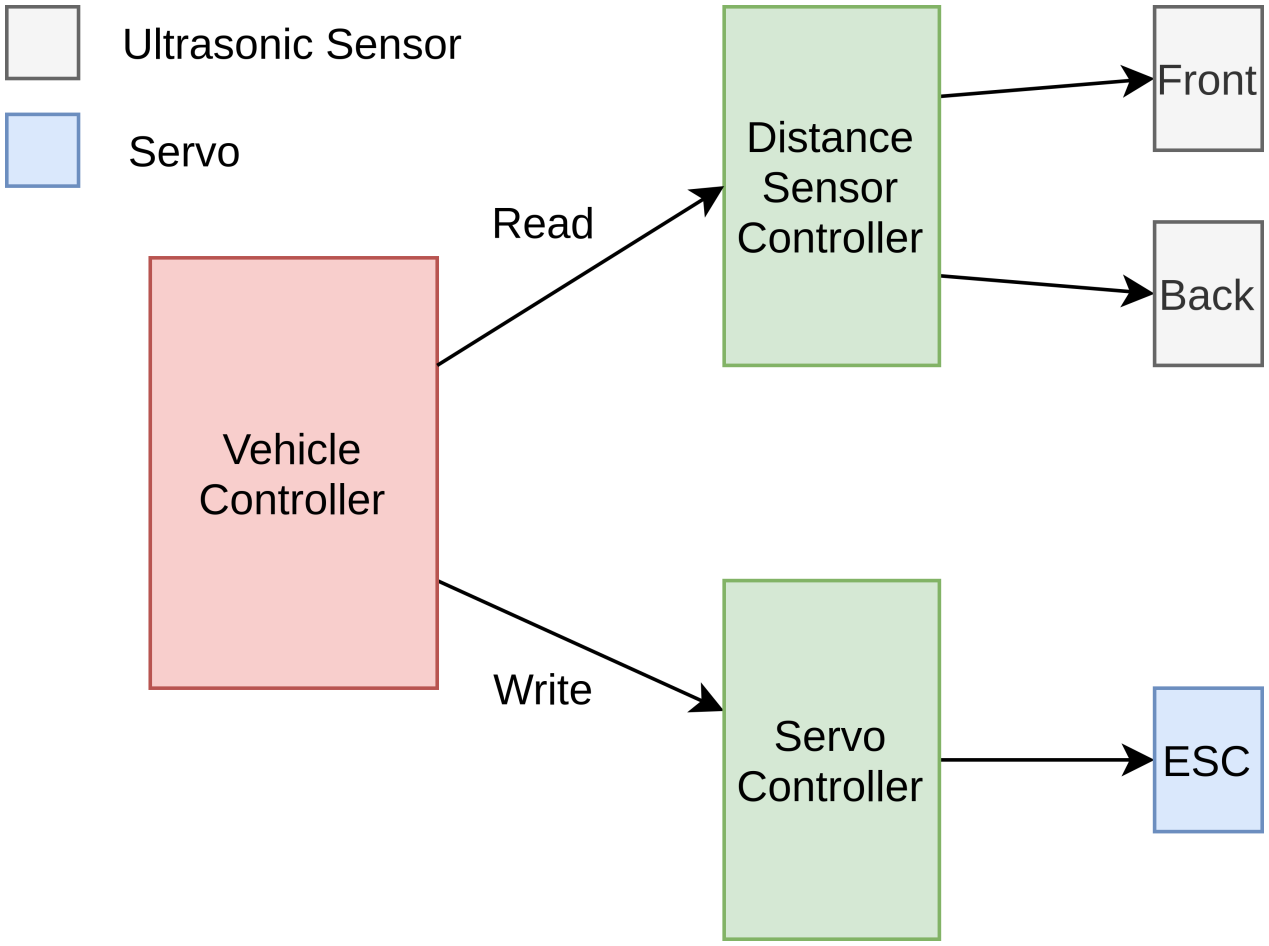
Distance Sensor



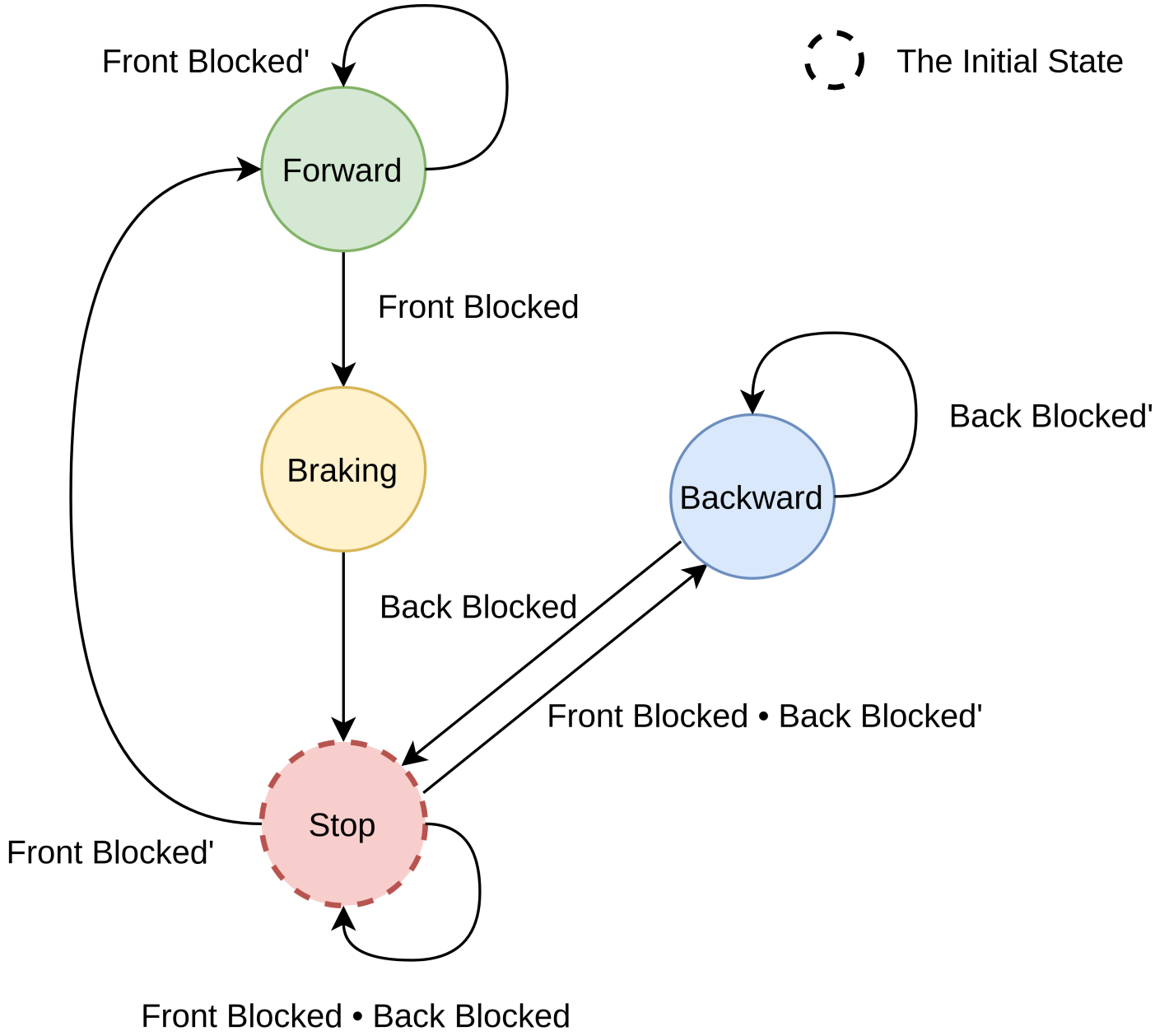
Distance Sensor



System Architecture



Vehicle Controller



Scheduling with utilization test

Task	Period(T)	Comp. time(C)	Priority(P)	Util(U)
Engine	20ms	4094ns	4	0.0002
Compute	16ms	844ns	3	0.000052
Sensors	16ms	11600190ns	2	0.72
Lights	200ms	13438ns	1	0.000067
Main	N/A	16ns	0	0

The utilization factor for this system is

$$U_{Sum} = 72.0319\%$$

which is lower than the limit of 74.1% for five tasks.

Scheduling with response time analysis

$$R_i = C_i + \sum_{j \epsilon hp(i)} \left\lceil \frac{R_i}{T_j} \right\rceil C_j$$

Task	Period(T)	Comp. time(C)	Priority(P)	Response Time(R)
Engine	20ms	4094ns	4	4094ns
Compute	16ms	844ns	3	4938ns
Sensors	16ms	11600190ns	2	11605128ns
Lights	200ms	13438ns	1	11618566ns
Main	N/A	16ns	0	N/A

Demonstration

Live Demo

Questions

Any questions?

The End

Thank you for your attention. :)
You can find our Ada_Drivers_Library fork and the source code over at https://github.com/stykk-gruppen