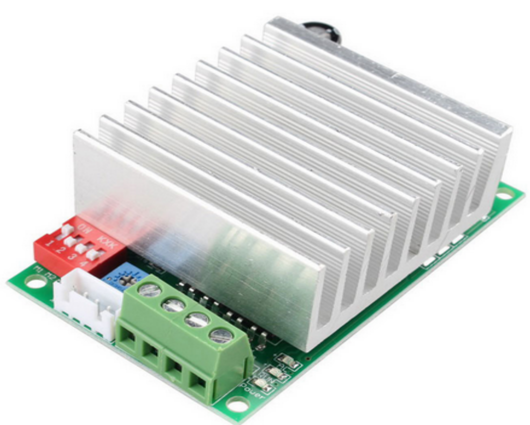
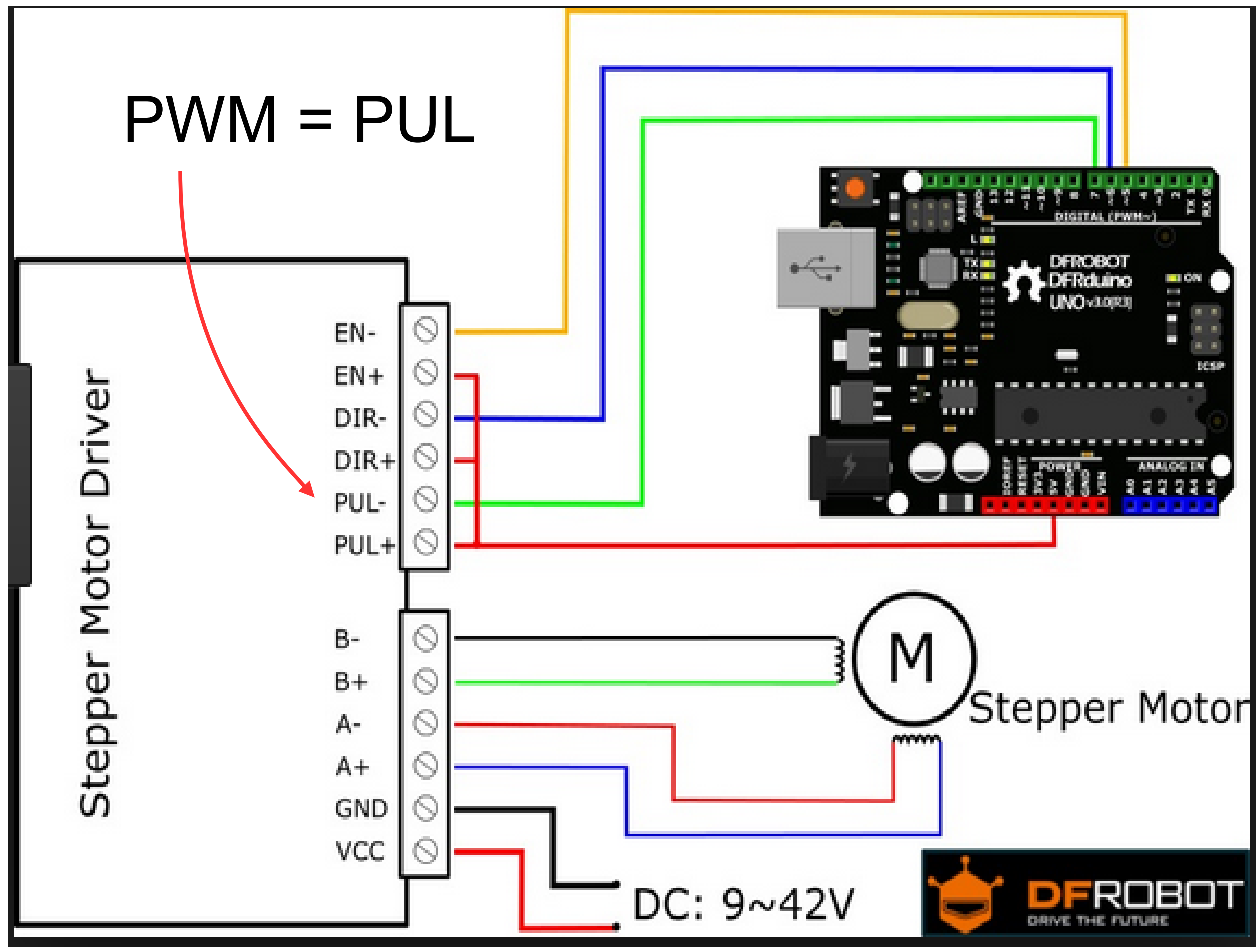
TB6600 4.5A CNC Single-Axis For LDR-40B

Stepper Motor Controller 1

15 USD

https://www.amazon.com/gp/product/B01DIK5IRI/ref=oh_aui_detailpage_o02_s00?ie=UTF8&psc=1



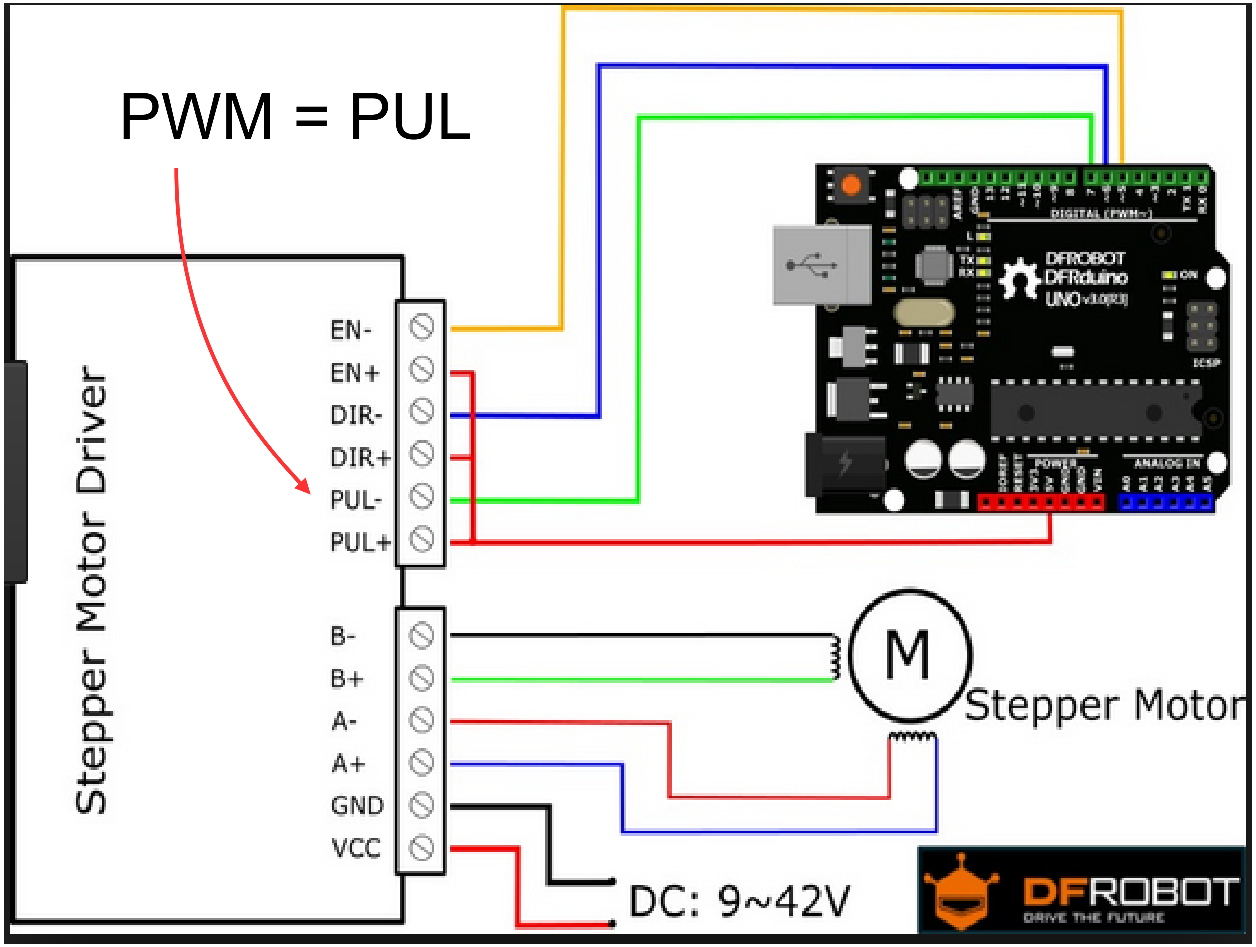


TB6600 4.5A CNC Single-Axis

Stepper Motor Controller 2

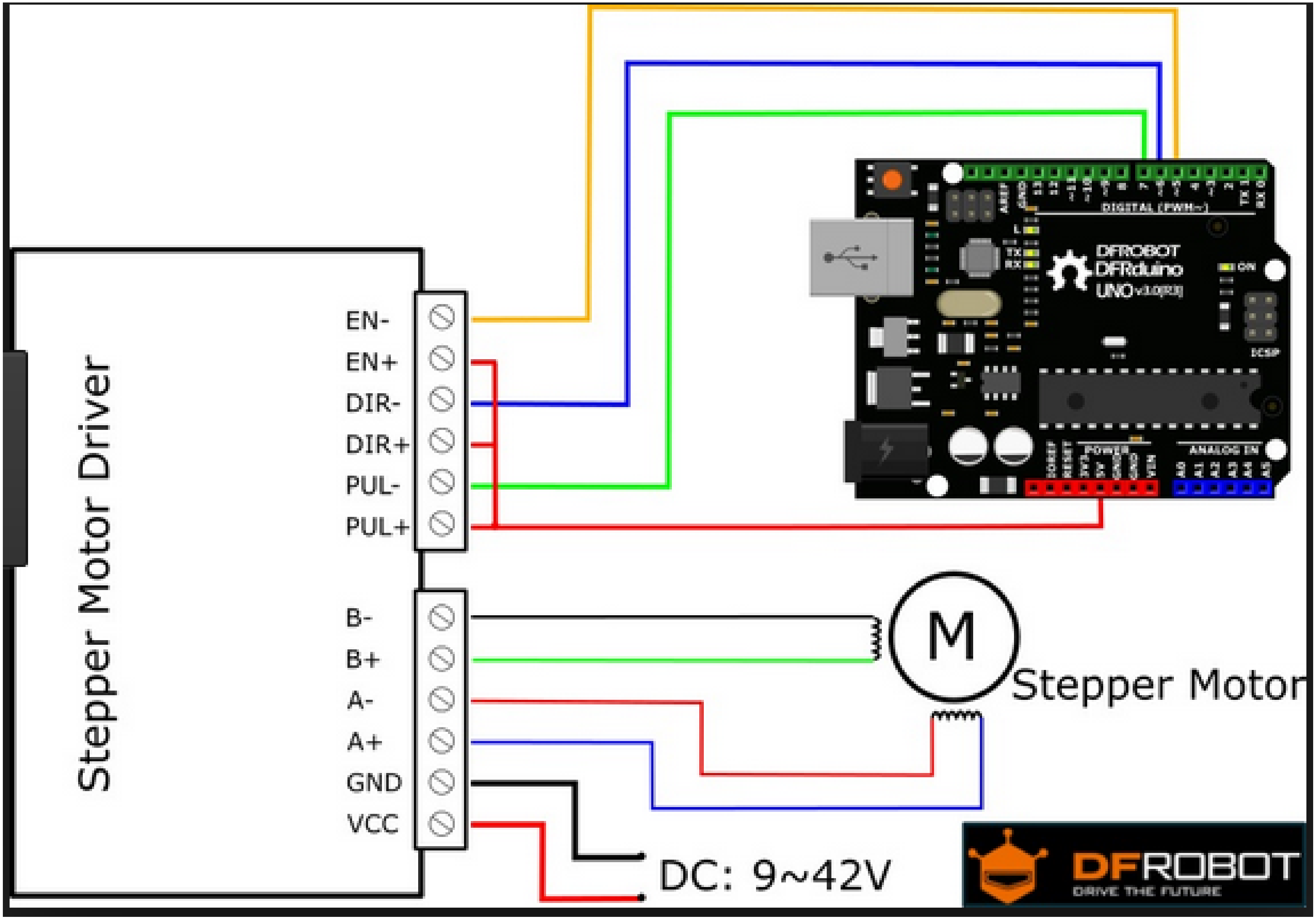
https://www.amazon.com/gp/product/B01DIK5IRI/ref=oh_aui_detailpage_o02_s00?ie=UTF8&psc=1

15 USD



TB6600 4.5A CNC Single-Axis

Wiring Diagrams



TB6600 4.5A CNC Single-Axis

Arduino Sample Code

https://www.dfrobot.com/wiki/index.php/TB6600_Stepper_Motor_Driver_SKU:_DRI0043

```
int PUL=7; //define Pulse pin
int DIR=6; //define Direction pin
int ENA=5; //define Enable Pin
void setup() {
  pinMode (PUL, OUTPUT);
  pinMode (DIR, OUTPUT);
  pinMode (ENA, OUTPUT);
}
void loop() {
  for (int i=0; i<6400; i++)    //Forward
5000 steps
  {
    digitalWrite(DIR,LOW);
    digitalWrite(ENA,HIGH);
    digitalWrite(PUL,HIGH);
    delayMicroseconds(50);
    digitalWrite(PUL,LOW);
    delayMicroseconds(50);
  }
  for (int i=0; i<6400; i++)   //Backward
5000 steps
  {
    digitalWrite(DIR,HIGH);
    digitalWrite(ENA,HIGH);
    digitalWrite(PUL,HIGH);
    delayMicroseconds(50);
    digitalWrite(PUL,LOW);
    delayMicroseconds(50);
  }
}
```

April 25 18 WHLMOT Wheel

April 25, 2018 HL.ZX.

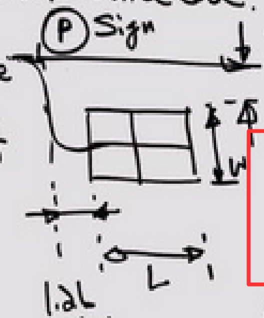
1) 1.5T Motor Drive.
Schedule 3-Party meeting.
9:00 Am (CHN) — 6:00 P.M.

2). FLK4000 — Instrument Enclosure/Frame.
Before The End of the Week (April 28)

3) Run Experiment, 1 Km/Day ≃ 300 Km
ON New Track (H.Z.)

4) LPC1769 Source Code.

4.1 One pulse of PWM = Displacement of the wheel.



Travel Distance per pulse

1° $\frac{360}{200}\left(=\frac{2\pi}{200}\right)$ For Full Step full revolution. ...(1)

2° $\frac{2\pi}{200}\cdot\frac{1}{mST}$ (mST: microstep, $mST=\frac{1}{4}\sim\frac{1}{8}$) ...(2)

3° $\frac{2\pi}{200}\cdot\frac{1}{mST}\cdot\frac{1}{RR}$ (RR: Reduction Ratio, 28:1) ...(3)

4° $R\cdot\alpha=$
$R\cdot\frac{2\pi}{200}\cdot\frac{1}{mST}\cdot\frac{1}{R.R}$ ...(4)

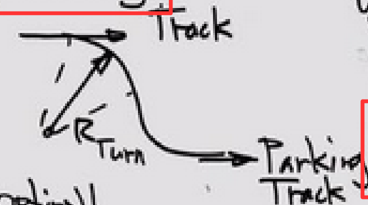
Angular Displacement per pulse

5° Experimental Verification.
1000 pulses (15% Duty Cycle ON AGV4000)

Displacement Distance for 1000 pulses.

$\frac{Dist}{1000}\overset{?}{=}R\cdot\frac{2\pi}{200}\cdot\frac{1}{mST}\cdot\frac{1}{RR}$ ...(5)

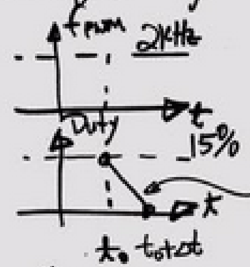
4.2 Turning



Option 1

1° Forward motion can be isolated from Analysis. (AGV Stationary). 2°

5. Soft Start/Stop. (S^3-Algorithm)



t_0: "Stop" Received { Emergency Stop { "Hot", f=0 PWR ON; "Cold", PWR off; Normal Stop "S^3"

Eqn (5) for "S^3" Stop

$\frac{x-x_2}{x_2-x_1}=\frac{y-y_2}{y_2-y_1}$, $\frac{t-(t_0+\Delta t)}{(t_0+\Delta t)-t_0}=\frac{Duty-Duty_2}{Duty_2-Duty_1}$

$y=f(x)$, $Duty(t)=f(t)$

$Duty_2+\frac{Duty_2-Duty_1}{(t_0+\Delta t)-t_0}(t-(t_0+\Delta t))=Duty$

$Duty=\frac{Duty_2-Duty_1}{\Delta t}(t-t_0-\Delta t)+Duty_2$ ...(5)

April 26 18 WHLMOT Testing

April 26 2018 ZHL.ZX.

1) Testing WHLMOT Control Equation.

N	Dist. (Physical)	Eqn Prediction
1) N_1 1×10^6 pulse		
2) $1.5N_1$		
3) $2.0N_1$		

$\times 15$.

Note! 1° S^3 Algorithm.
2° 2 wheels in same motion.
3° One wheel stationary, One wheel moving only.

Apr. 26

Experiment design

$$\frac{360}{200} = 1.8^\circ$$

$$\frac{1}{MST}\cdot\frac{1}{RR} = \frac{1}{8}\cdot\frac{1}{35} = \frac{1}{280}$$

$$Dis/_{pulse} = \frac{1.8^\circ}{360^\circ}\cdot 2\pi r\cdot\frac{1}{280}\cdot 15\%$$

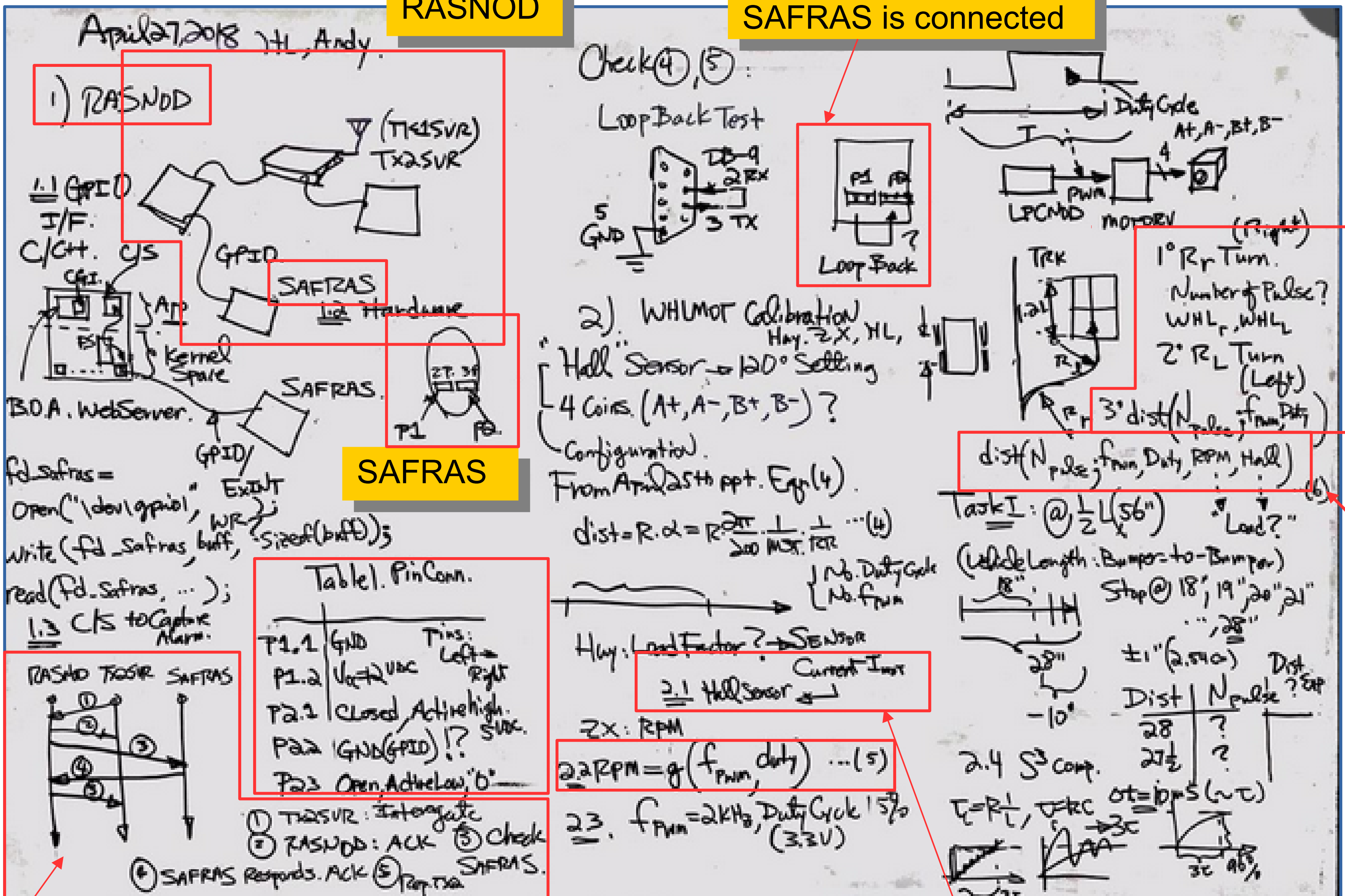
Duty cycle

$$= 3.42\times10^{-6}\ m/_{pulse}$$

Physical testing:

$$\approx 3.68\times10^{-8}\ m/_{Pulse}$$

April 27 18 WHLMOT Testing



April 30 18 WHLMOT Testing

Not using this equation, going back to April 25 eqn(4)

1 million pulses = 38 mm ??? use eqn (4), April 25, to verify

April 30, 2018 HL, Z.X.

1) Parking: Table (April 27)

1.1 #define MILDIS 38 // mm.
#define MILMST 1000000 // MST = 1/8

1.2 Formula To Compute No. of Pulse, Given Distance. x

$f_{No}(x) = (x + Const) / SSlop * MILMST$

where x : distance in mm. ...(1)

SSlop (Speed slop) =

Dist

No. of pulse

Slop

Δy

$\Delta x = 1$

From April 25, Eq (4), For One Pulse,

$dist = R \cdot \alpha = R \frac{2\pi}{200} \cdot \frac{1}{MST} \cdot \frac{1}{RR}$; ?

To find Slop, $\Delta dist / No. of Pulse = SSlop$.

= Eq (4) (April 25)

dist = SSlop * No. of Pulse ...(1)

No. of Pulse = dist / SSlop. ± Δ No. of Pulse

Constant

Experiment: Eqn (1)

Dist	No. of Pulse	Exp. Dist
:	:	:

$\Delta Dist_{Error} \triangleq Dist - Dist_{Exp}$ ...(2)

No. of Pulse = Eqn (1)

Z.X: Based On April 26 Data

First 6.5 mil Not Run/motion NB

use (No. of Pulse - 6.5 million) ...(3)

Dist	No. of Pulse Eqn(1)	Exp. Dist.	Extra No. of Pulse Eqn (3)	Final Dist.
:	:	:	:	:

6.88 million ?

CONDITIONS:

t_0 t_1 t_2 t_3 t

AGVStraightForward(); 6.9 * MILMST
AGVStop();

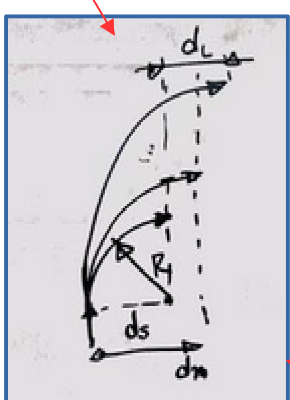
t_0 : Command Issued;
t_1 : Actual WHL Start running
t_2 : $[t_0, t_1]$
t_3 : Actual Stop; $t_3 \approx t_2$

...(4)

$No. of Pulse = \frac{dist}{SSlop * 8826} + 6.9 MILMST$.

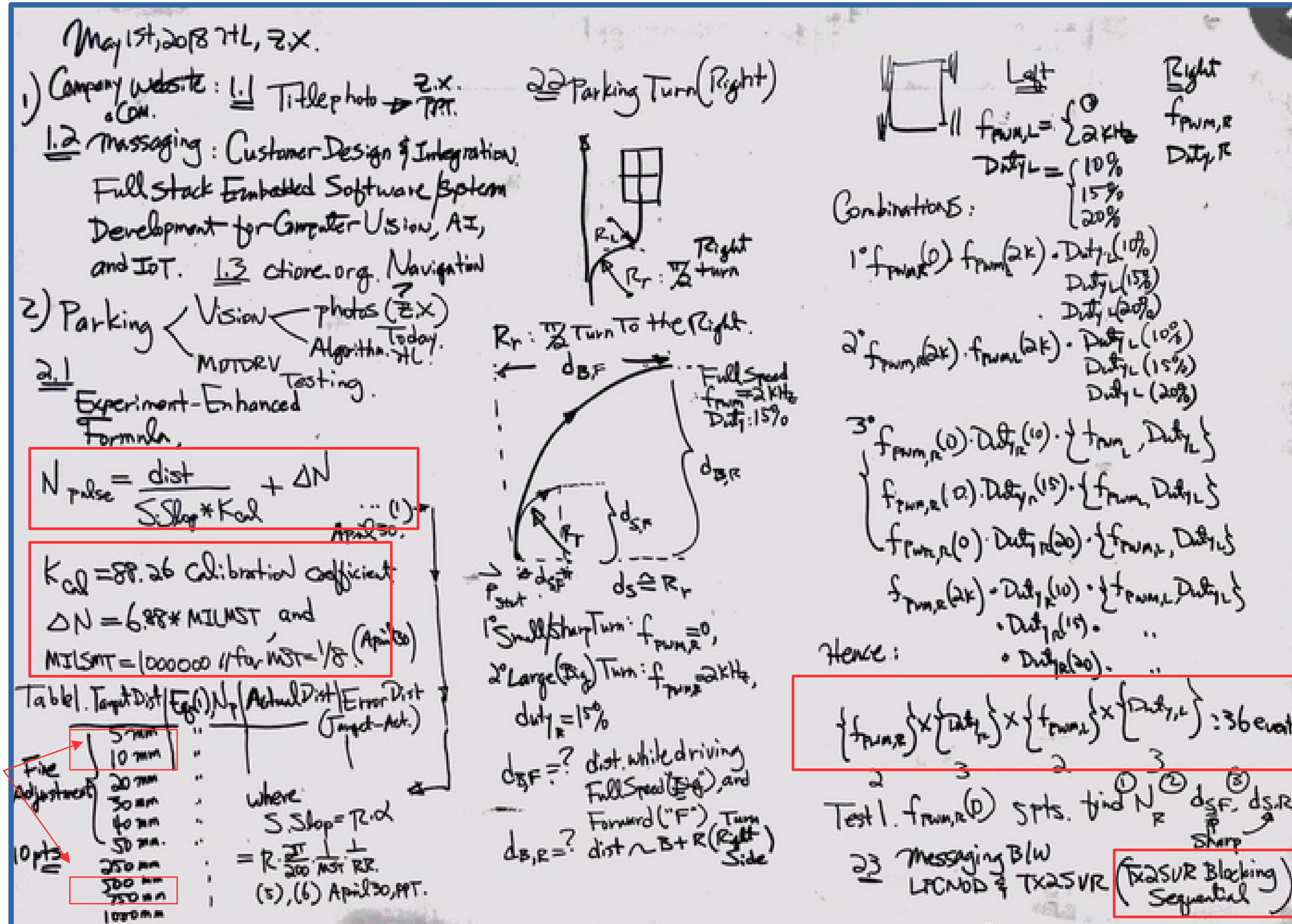
$S.Slop = R \cdot \alpha$ ...(5); $\alpha = \frac{2\pi}{200} \cdot \frac{1}{MST} \cdot \frac{1}{RR}$ ...(6)

Fastest speed leads to Large Turn, stationary leads to Smallest Turn, Speed in between leads to M Turn



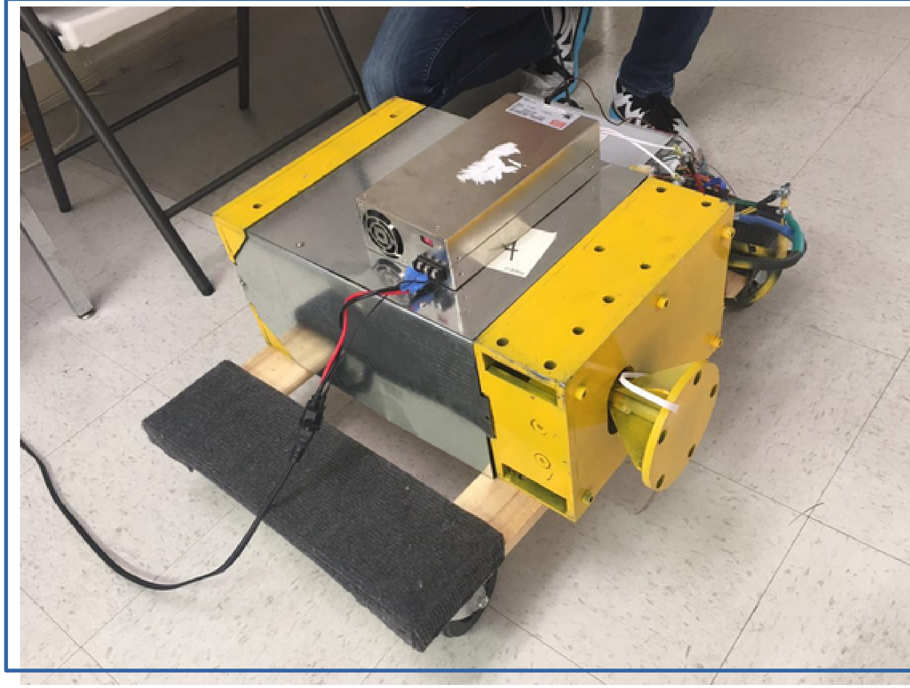
Theoretical plus experimental lead to this formula, use this formula to build all motion control actions

May 1 WHLMOT Testing

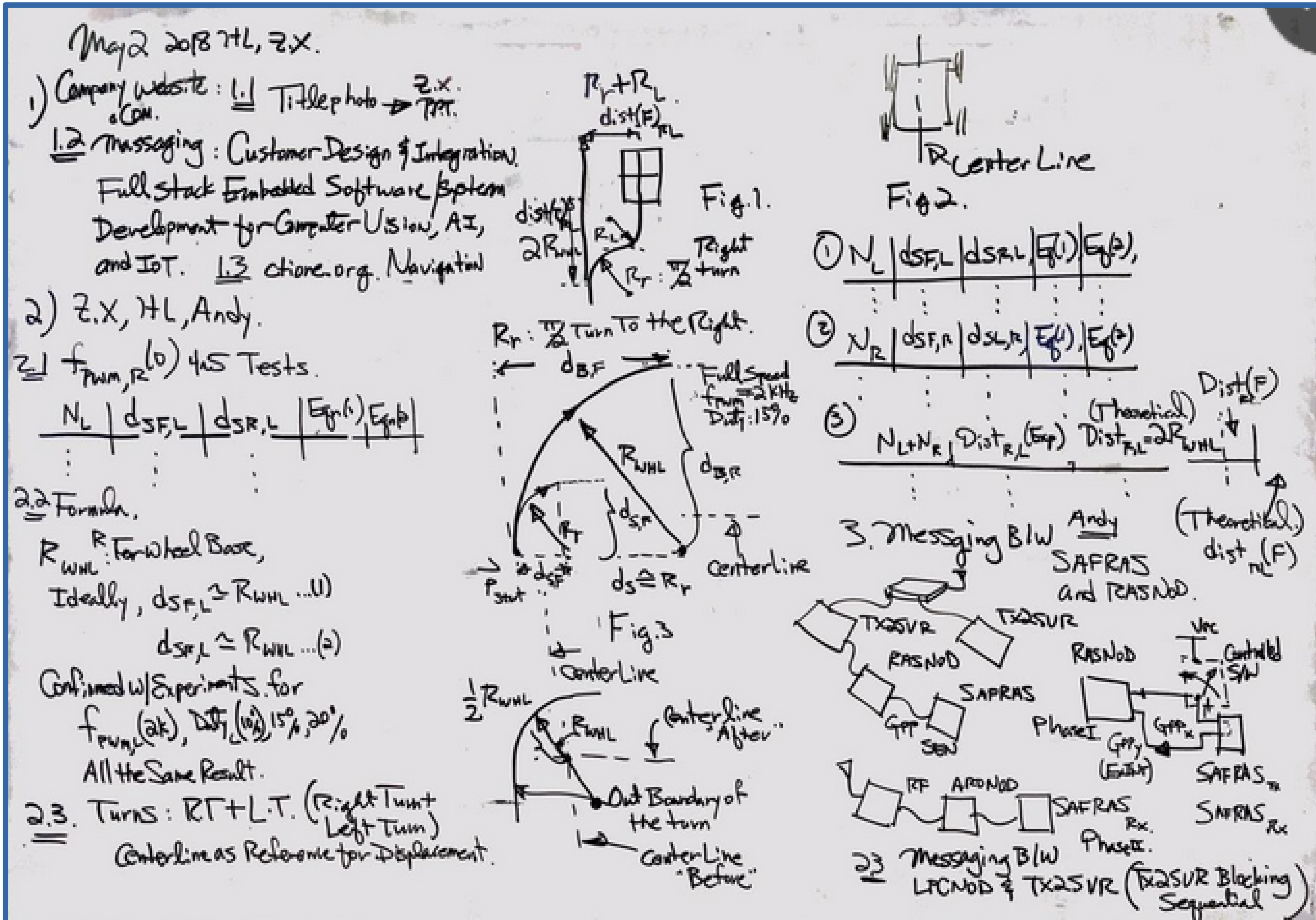


???

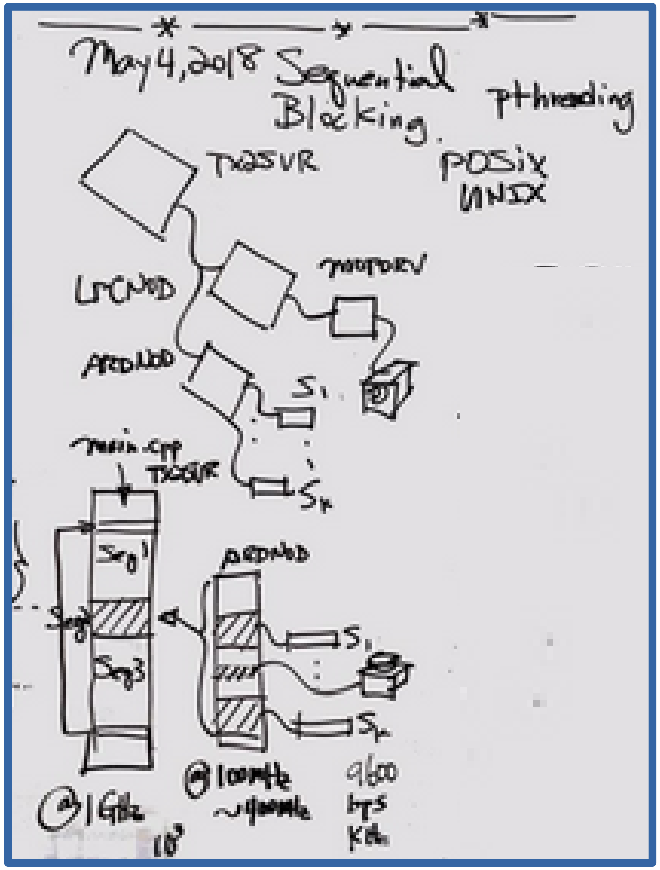
Motor Control



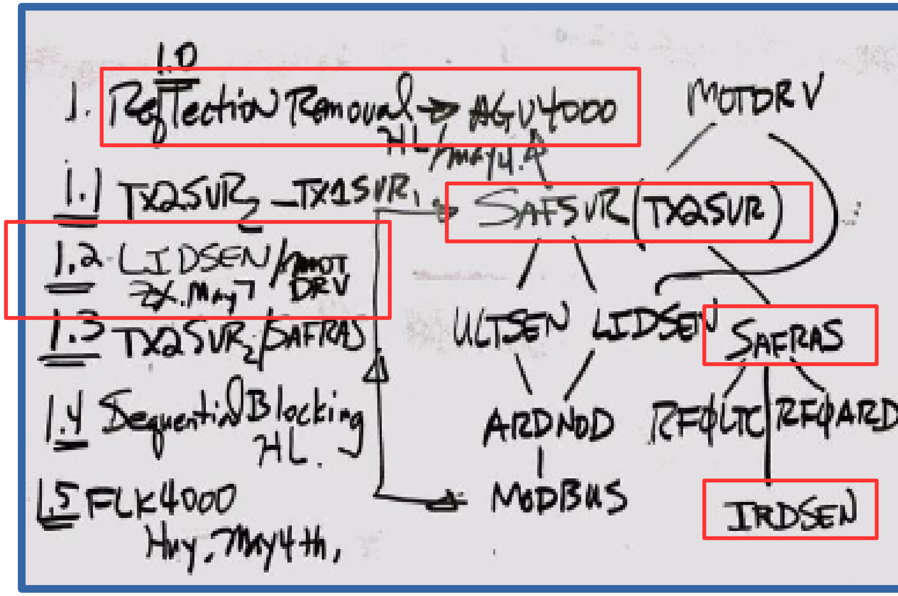
May 2 Turning Tests

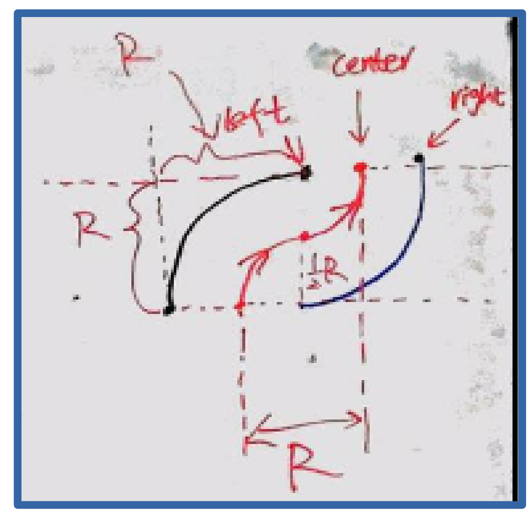


May 4 Sequential Blocking, FLK4000



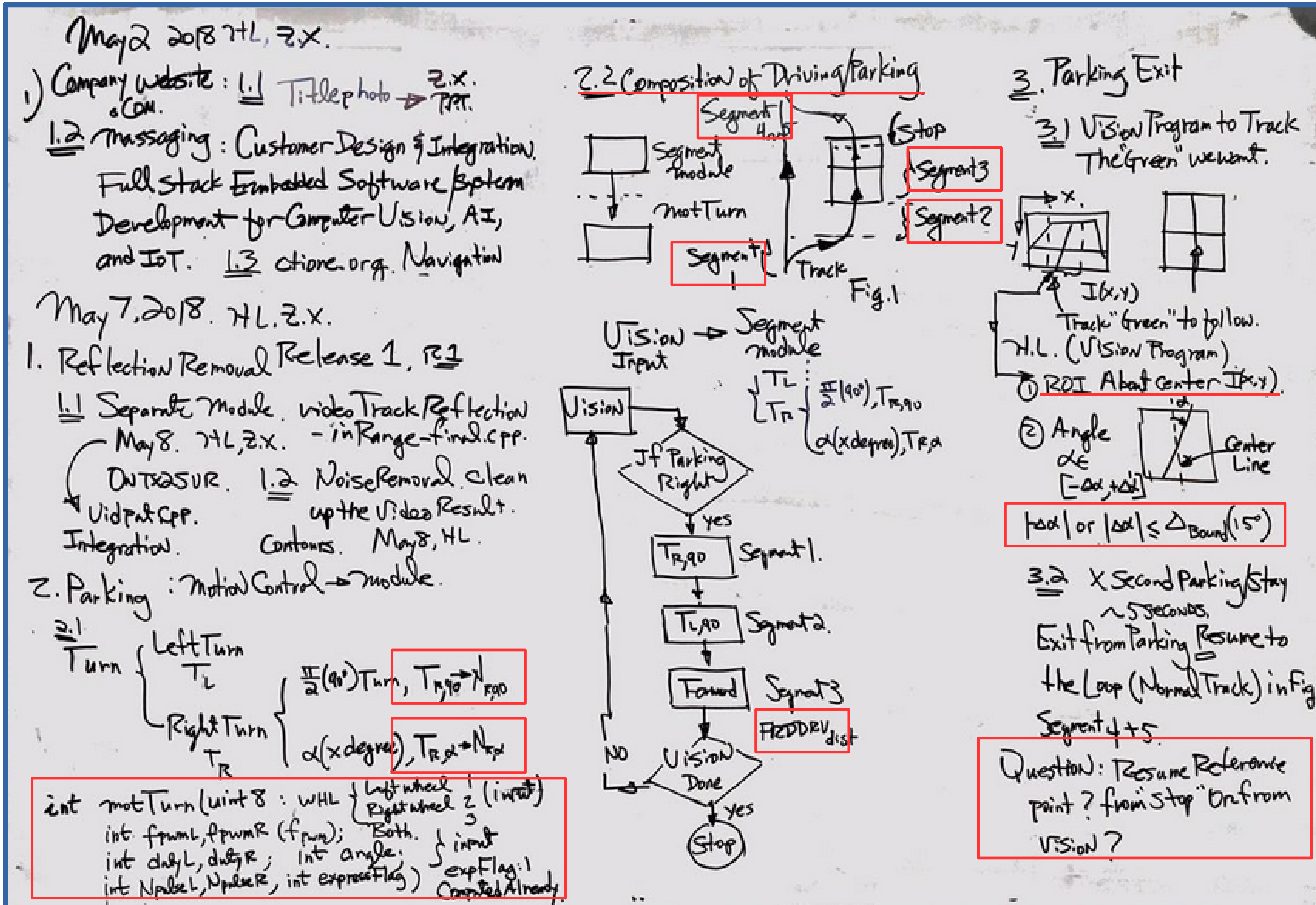
Solve sequential blocking: 1. interrupt; 2. pthreading





Conclusion: the tightest turn distance is R

May 7 Turning Arbitrary Angle



April 27 18 SAF