Dec.13 (Tue)

Step1. Home Position

Angle(LSM303.

Distance:

Step2. D.L. Scan Circularly the Destination, Point P_{ini}

Dec31 (Sat)

Phase I: Shortest Distance No Obstacles
SDNO

Phase II: Shortest Distance with Obstacles
SDWO

Algorithm I-100-SDNO: Vision Whole Circular Inspection.

Objective: To find Point $\vec{P_B}$, Destination Point

Current TLR Robot Position, $\vec{P_A}(x_n, y_n)$.

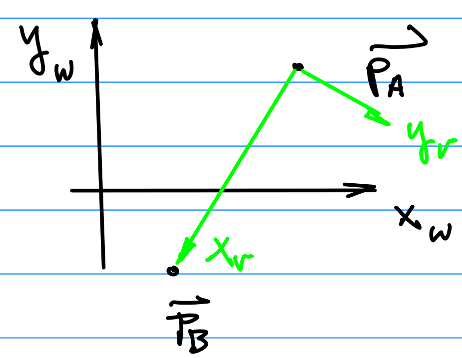


Fig.1.

X_w-Y_w-Z_w: World Coordinate System.

X_w-axis Direction: North Pole. Defined from LSM303's North Direction (0°C);

X_v-Y_v-Z_v: Vehicle Coordinate System.

X_v-axis: Front Drive Direction.

I-100-SDND Algorithm:

1. Received a Call to Identify $\vec{P}_B$.

2. Register the Current Orientation Angle θ. Defined by Positive X_w and Positive X_r, as in Fig. 2

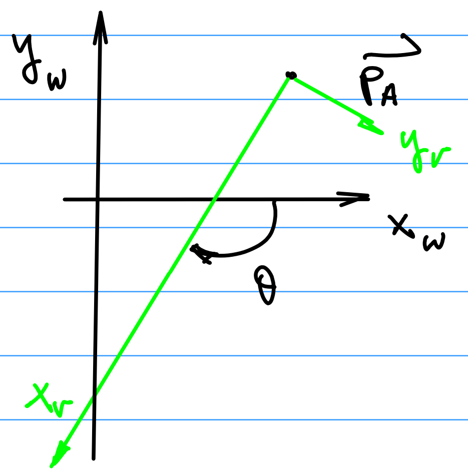


Fig. 2

$\theta \geq 0$: Counter Clockwise Direction

$\theta < 0$: Clockwise Direction

3. Read Proximity Sensor Array for Environment Awareness. If No Proximity Sensor OR NO Sensor Array, Then skip this step.

4. Capture Image $I(x, y; \theta(t_0))$

   $\theta(t_0)$ = Initial Orientation

5. Process $I(x, y; \theta(t_0))$ to find First 5 Largest Objects $O_i(t_0)$, $i = 1, 2, \ldots, 5$.

6. Determine By Parsing $O_i(t_0)$, if

   $O_i(t_0) = O_{Human}$ ... (1)

   if yes,

   Determine if

   $O_{Human} = O_{user}$ ... (2)

   By looking for

   $Face[O_{Human}] = Face[O_{user}]$ ... (2-1)

   $Cloth\_Color[O_{Human}] = Cloth\_Color[O_{user}]$ ... (2-2)

   $Feature\_K[O_{Human}] = Feature\_K[O_{user}]$ ... (2-3)

   if Eqn (2) True, then

   Define $O_{user} = \vec{P}_B(x_B, y_B)$ ... (3)

   if Eqn (2) False, then

   Rotate the Robot By $\Delta\theta$ Counter Clockwise, where

   $\Delta\theta = \pi/6$ $(30°)$ ... (4)

   Then, go to Step 3.

May 11 (Th), HL, YY.

To Make T.T. for Both Windows10 and 11.

Note: NVDA CUDA Toolkit includes: a. CUDA; b. GPU Drivers, and c. others

Customized Installation

① Clean Install Windows10 (with GPU Driver)

③ CUDA Toolkit 11.0 (Not Znabled)

④ Token test (Working)

⑤ Unstall GPU Driver to Test

⑦ Repeat ③ by Installing CUDA Toolkit 11.0

CUDA Tool Kit 11.0 for OpenCV Compilation

⑧ Token test successful

t

5/15

② Windows update (CUDA11.1)

Fig.1.

t

⑥ Windows Applied GPU Driver;

Fig.1

M.S. Auto Upgrade

Note2: Windows Installer

2004 —— Released in 2020

22H2

Note3: Windows Installer 2004 Install Nvidia CUDA+GPU Driver, and Allows users to install the older Version if they want.

(is Updated Windows10)

However,

Windows Installer 22H2 Install Nvidia CUDA+GPU Driver, But Only Allows users to install the newer Version if they want. OR otherwise the Complecated installation Process Not for general users.

CTI

May 15, HL, YY, SJ

CV|DO

Mnn No GPU Needed
A

→ Integration with CTI ONE Algorithm
B

→ Tokentest
C

1° A+B
2° Comm. Video Streaming
3° Simple UI

↓

FPS Rate Slower ~10 FPS

← To Speed up the FPS OpenCV GPU option

← Win10 Environment with Anaconda

1. Client Does Not have Anaconda
2. Our Release was Not Portable
D

→ fixed the issue 2, Make the Release Portable

→ Clean install Win10 for

Bug fixed. But No Release

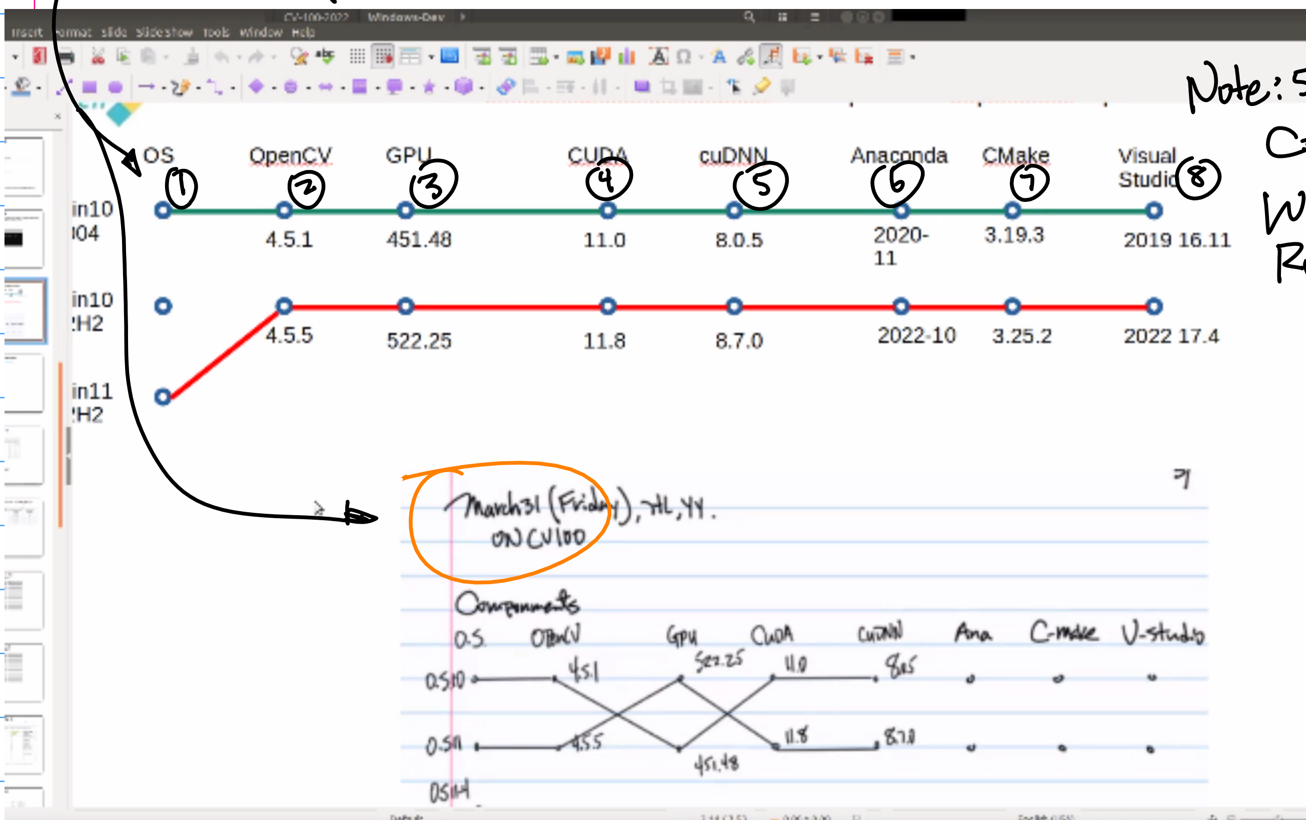
phase I

phase II: see Fig.1 PP.1

1° Generalize the working Version to cover all Windows10 machines;
2° .. .. To Cover all Windows11 machines.

"ZZHZ"

Note: The "Green" path is the final Implementation for PhaseI.



Note: 5/15
C# Side:
Windows Runtime.

Note: Further Discussion On Compatability

"DCH" Driver Compliance Required.

A
NVDA CUDA Compute Capability

B
OpenCV

Tokentest Windows10
CTIDNE Windows11 (22H2)

C
CUDA
CUDNN

D
CUDA

Note: Interview with 育欣

PCB Design meeting
Jun 21, Wednesday

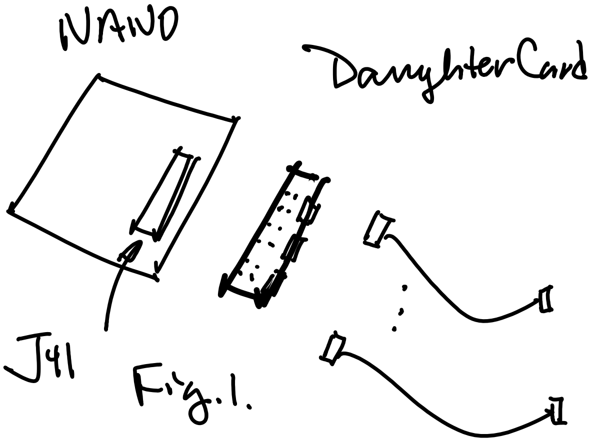
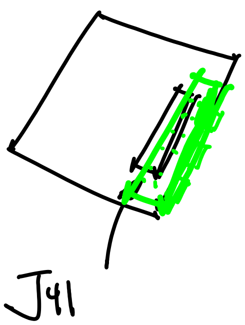
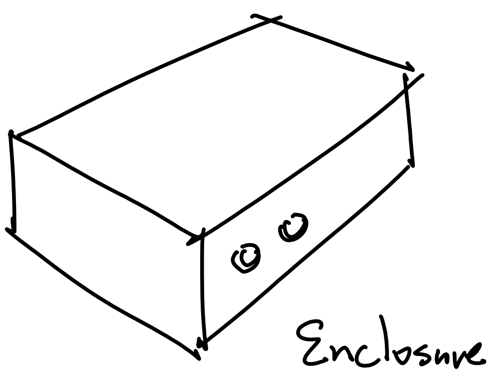


Fig.1.





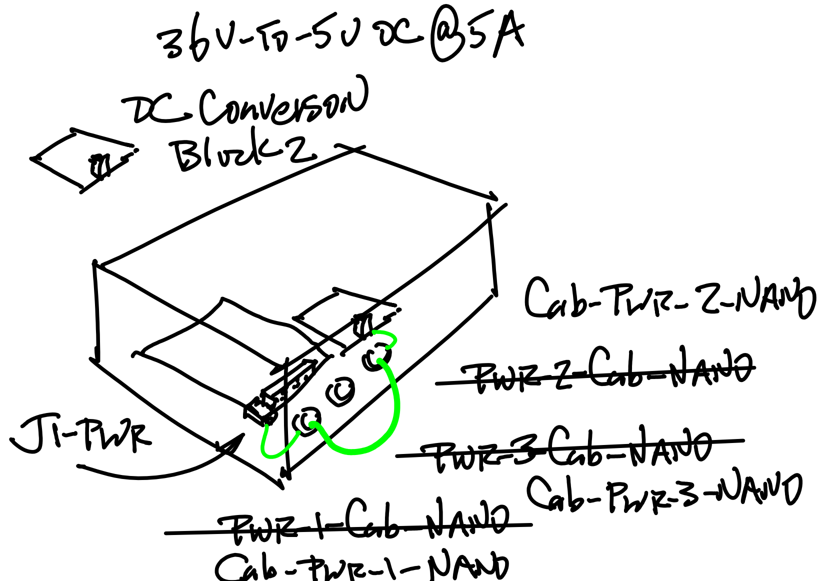
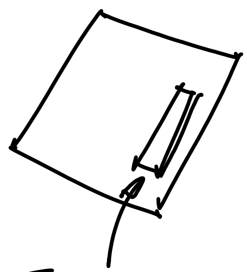


Fig.2. NAND PWR Connector for DC Supply.

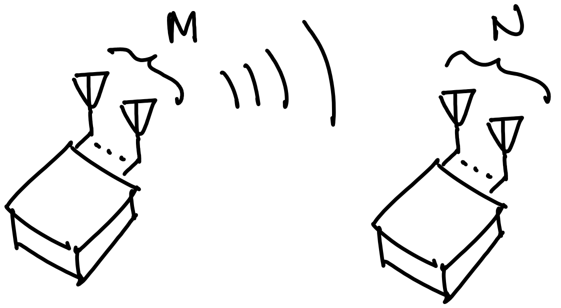
Cable Type:

Connector Type:

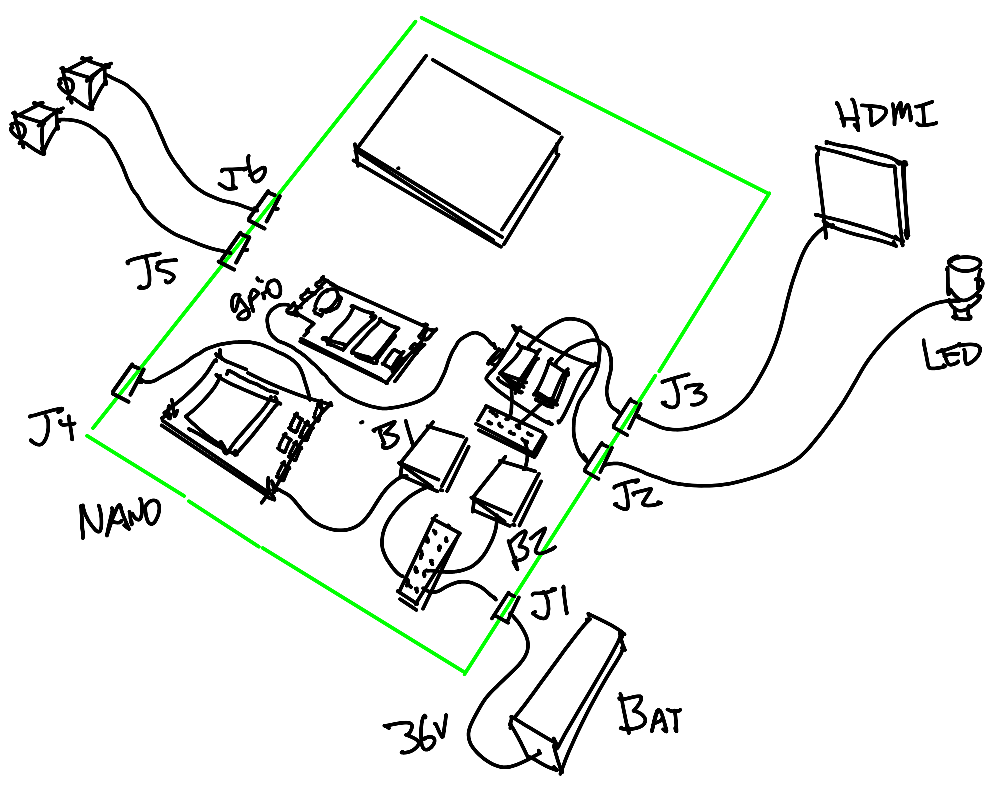
Jun 22nd, Intern Team
YY, HL. (YZ, NW, KQ)



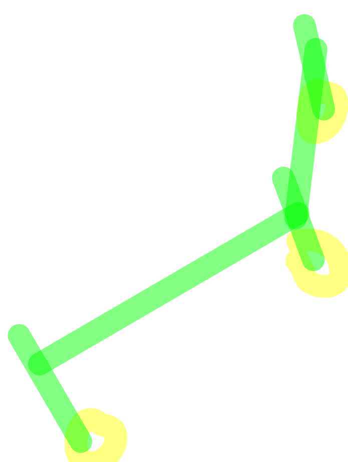
July26(Wed) HL, KQ(Keyang Qin)



J1 BAT TO PANEL Input
J2 12V Out Output to LED
B1 DC-DC 36-TO-5
B2 " 36-TO-12
J3 12VOUT Output to HDMI monitor
J4 Ethernet
J5/J6 USB CAM



July 28 Friday.



Quick Coupling / Quick Release

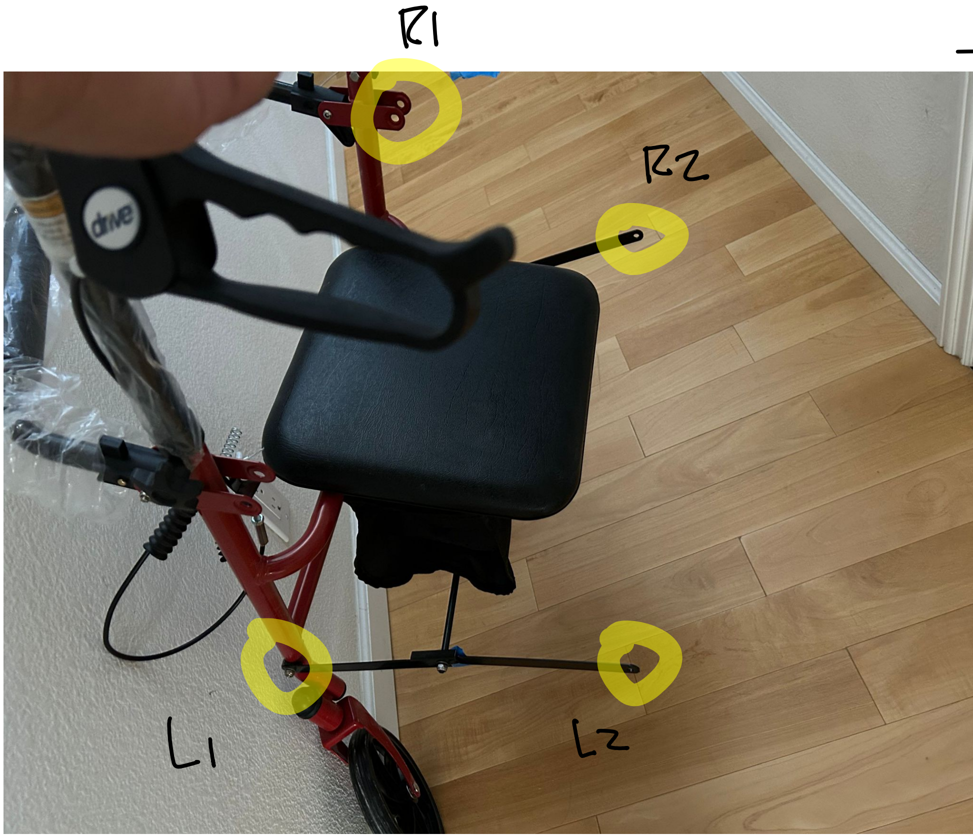


Fig. 1

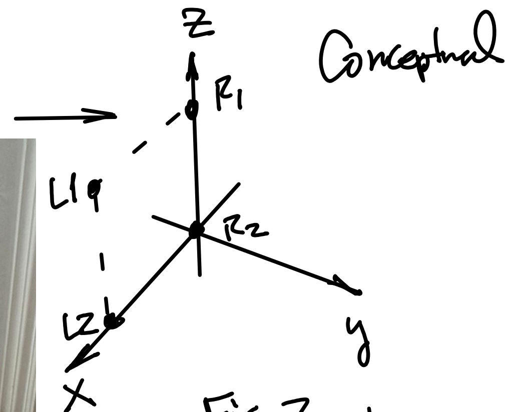


Fig. 2

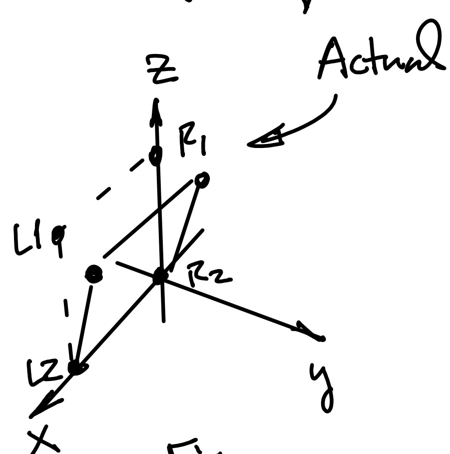


Fig. 3

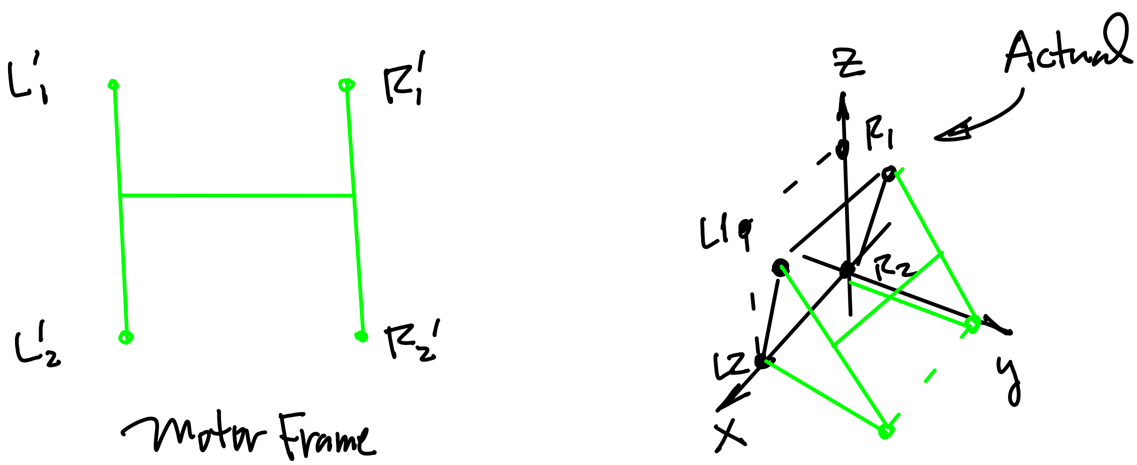
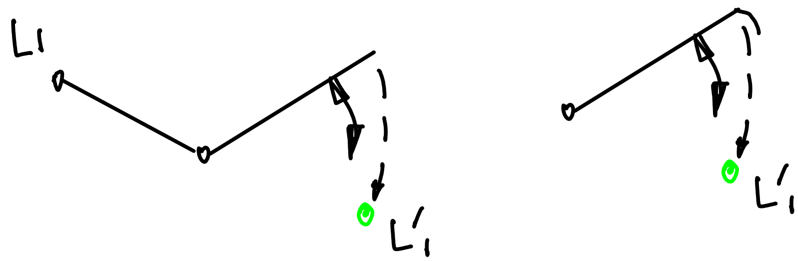


Fig. 4

Motor Frame has 4 matching Points, e.g., (Green) R1', R2', L1', L2' for the existing Frame's R_1, R_2, L_1, L_2

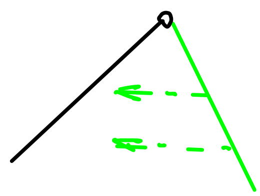
Matching L_1 to L_1'

See Pickup Truck Locking.



Matching R_1 to R_1'

Same Locking as in L_1-L_1'



July 31st (Monday): Design Foldable Walker,

1. Make R_1 & L_1 as a henge axis for the motor frame

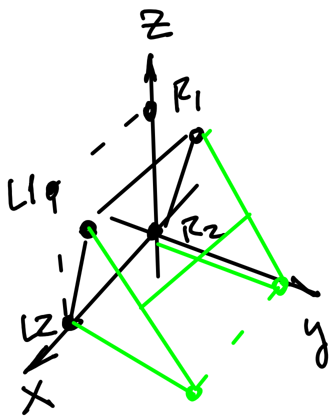


Fig. 1.

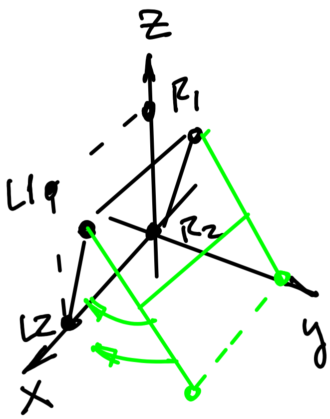


Fig. 2

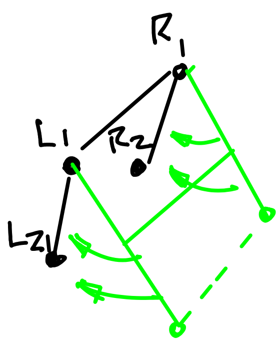
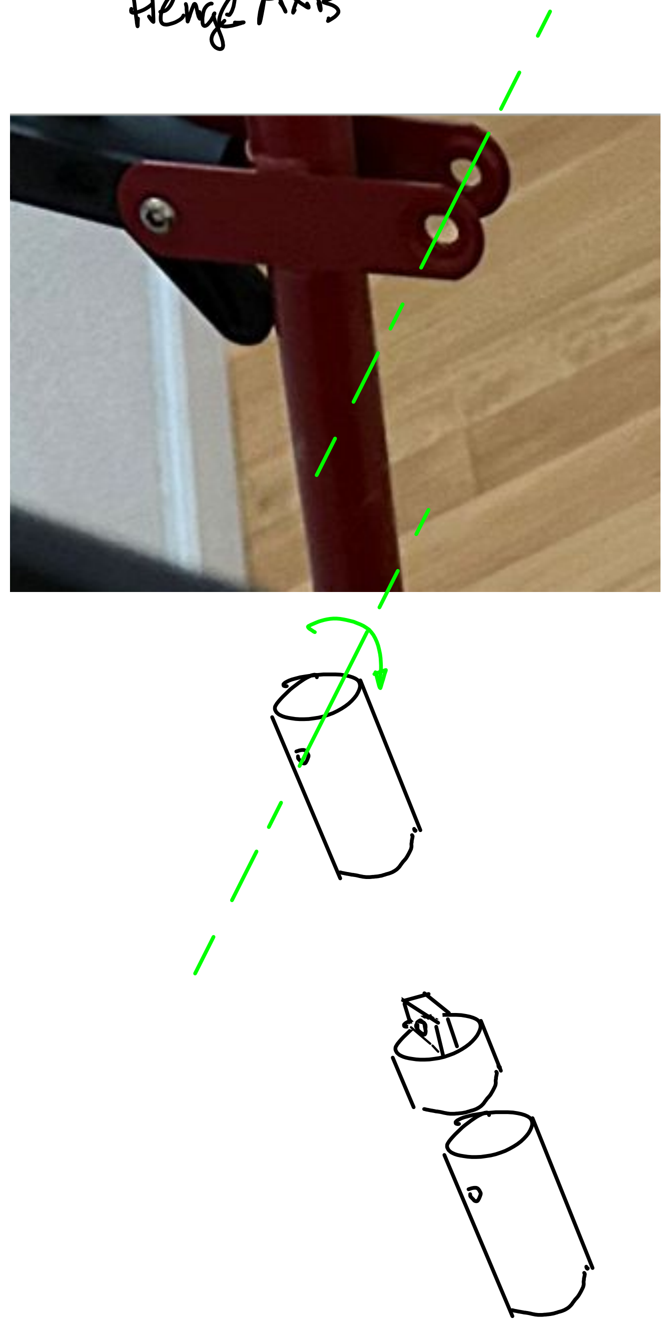
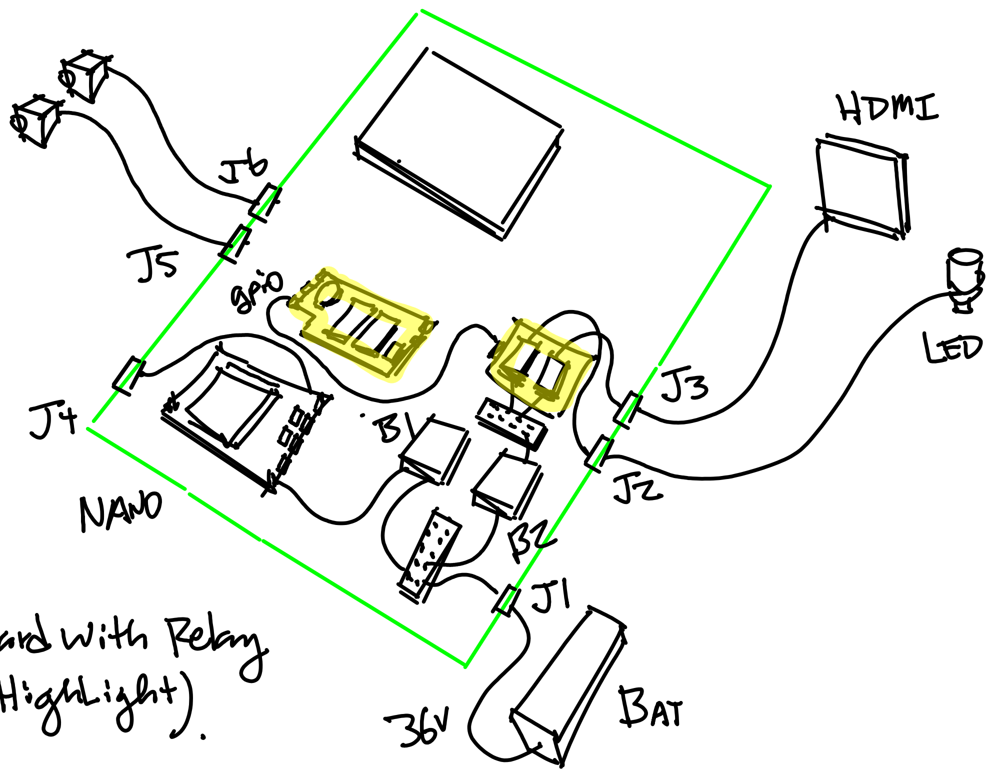


Fig. 3

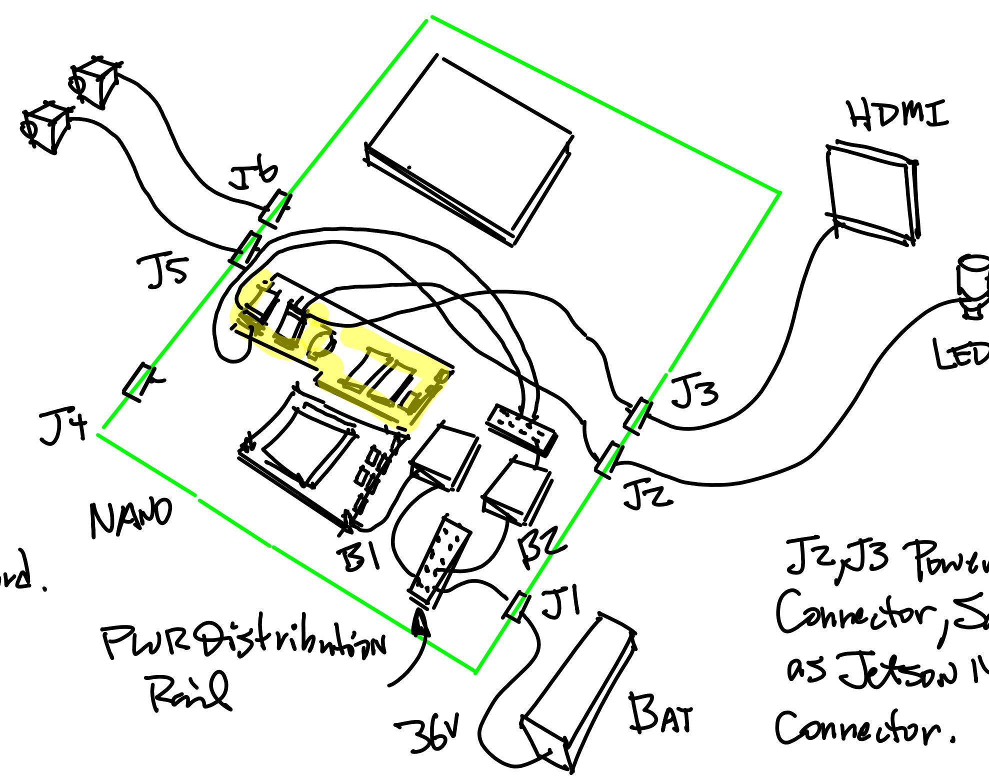
Henge Axis



PCB Design (HL, YZ)



Combining Existing IO Board with Relay Boards. (See Highlight).

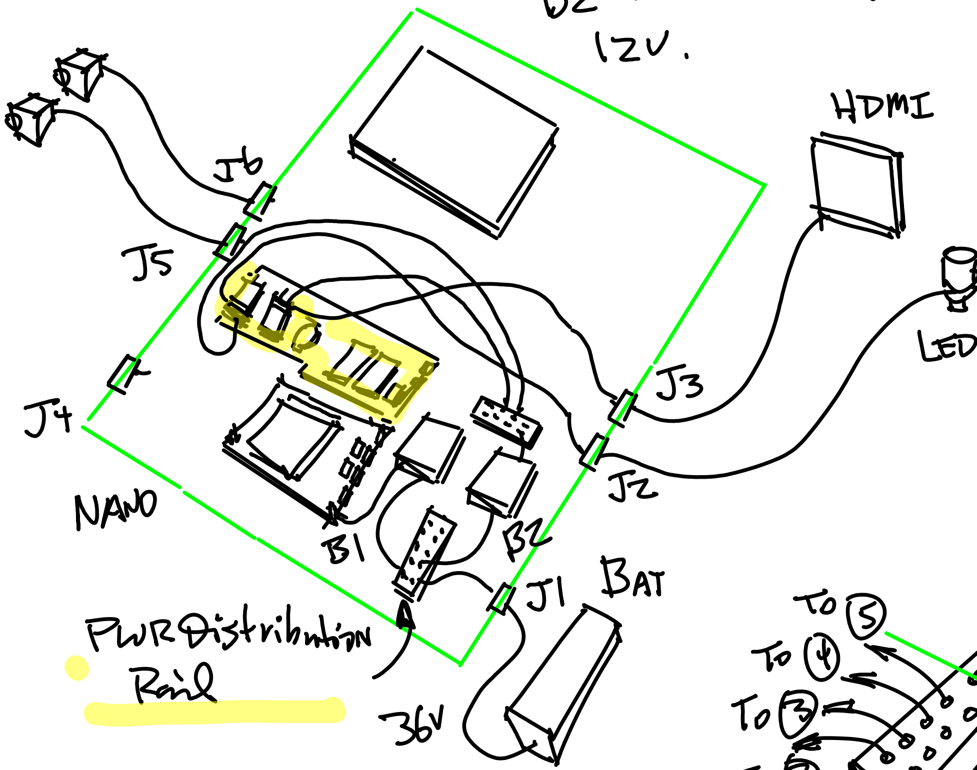


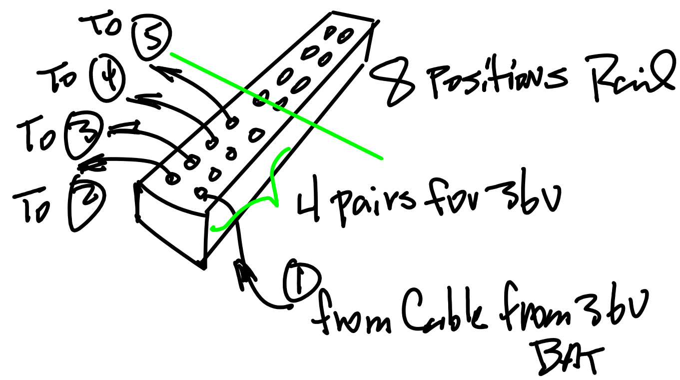
Upside Down for the 2nd Relay Board.

J2, J3 Power Connector, Same type as Jetson NANO PWR Connector.

Power Distribution Rail

B1 for Distribution of 36V.
B2 .. .. .. 12V.





Note: The Terminals Needed for B1 (36V).
See table 1

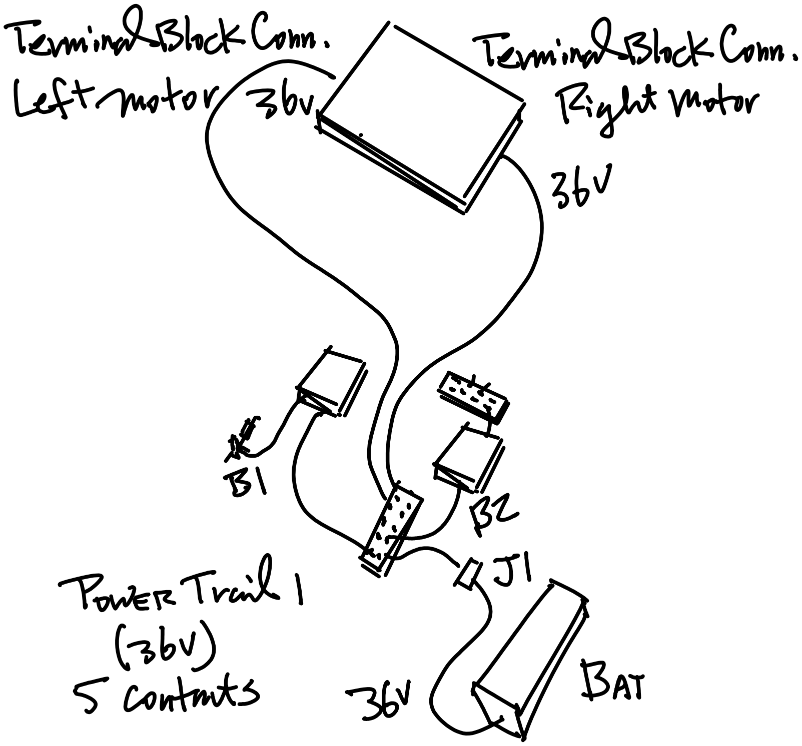
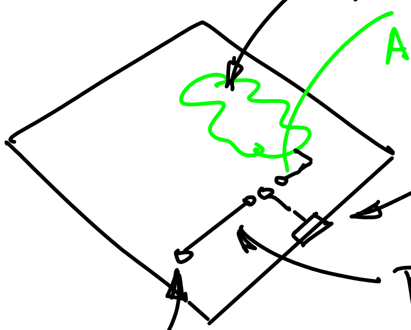


Table 1. Power Rail 1
(36V)
5 contacts

Contact No.	Description	Note
1.	BAT Input 36V	
2.	B1 (36-To-5V, 10A) To NANO	
3.	B2 (36-To-12, 3A) To HDMI/LED	
4-5	To motor Controller Right/Left Motor	

Power Supply: Existing PWR Rail(s)

Right Angle PWR Connector.



Power Connector.

Power Rail goes to 485 Boards, LSM303 etc.

POWR Pin from J41

GAP: Minimum. With Jumper Cap.

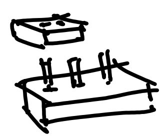


Table 2. Power Rail (12V) 3A
3 contacts

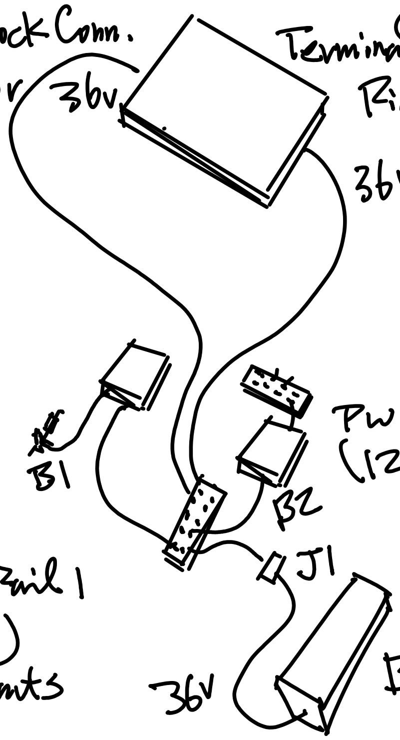
Contact No.	Description
2-1.	Out To Relay Board 1 HDMI
2-2.	Out To Relay Board 2, LED
2-3.	In from B2, 12V out, 3A

Table 3. Power Rail (5V) 10A
3 contacts

Contact No.	Description
3-1.	Out To Relay Board 1 HDMI
3-2.	Out To Relay Board 2, LED
3-3.	In from B2, 12V out, 3A

Terminal Block Conn. Left motor

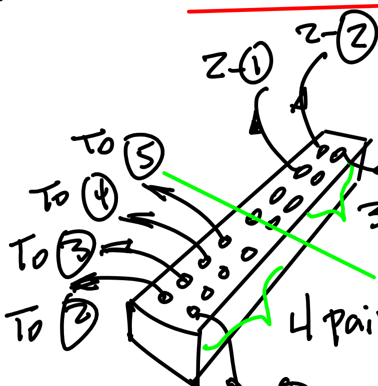
Terminal Block Conn. Right motor



PWR Rail 2 (12V, 3A)

Power Rail 1 (36V) 5 contacts

ReDesigned, Next 2 pages

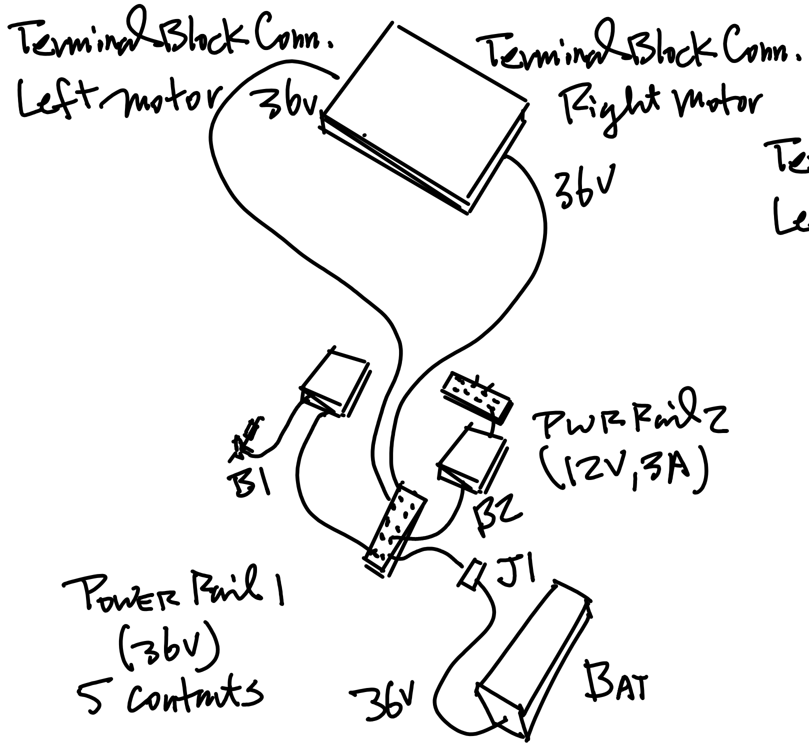


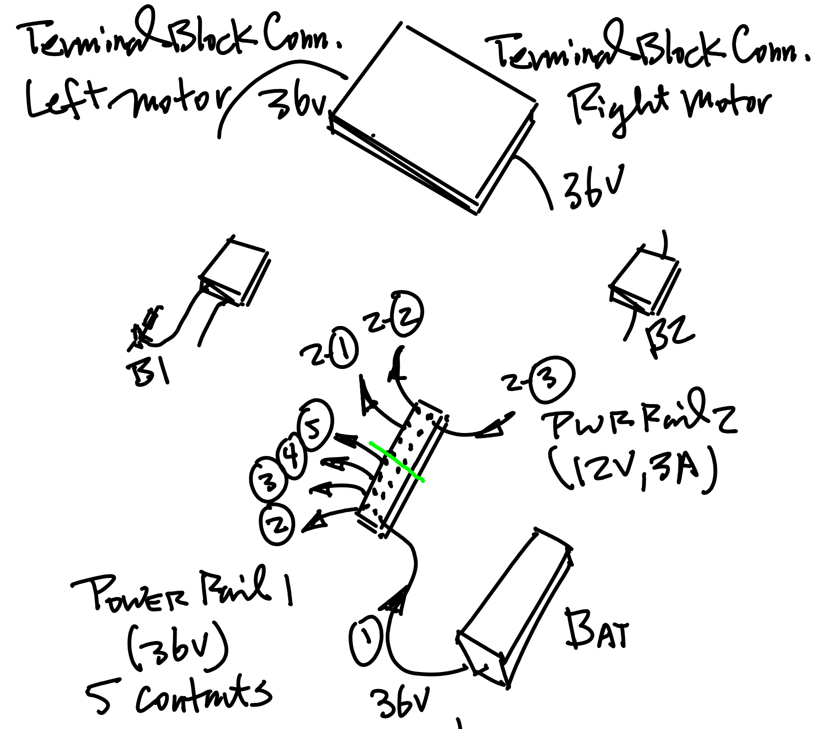
3 pairs for 12V, 1 pair as isolation.

4 pairs for 36V

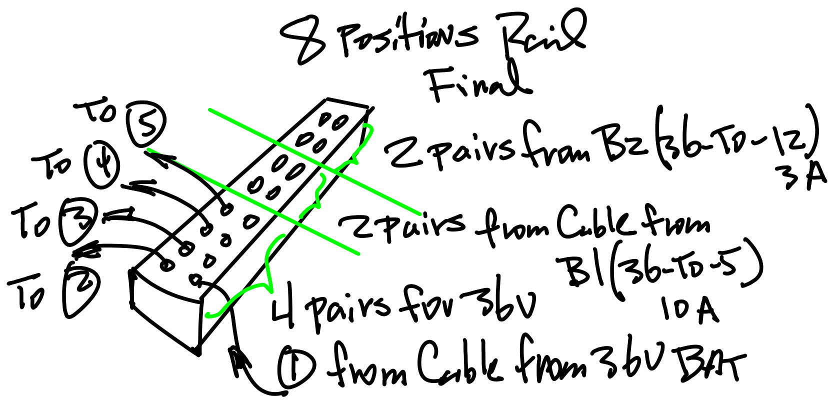
8 Positions Rail

Power Rail 2 Contacts.
2-1 To Relay Board 1 for HDMI
2-2 To " " 2 for LED
2-3 Input from B2's Output (36-to-12)

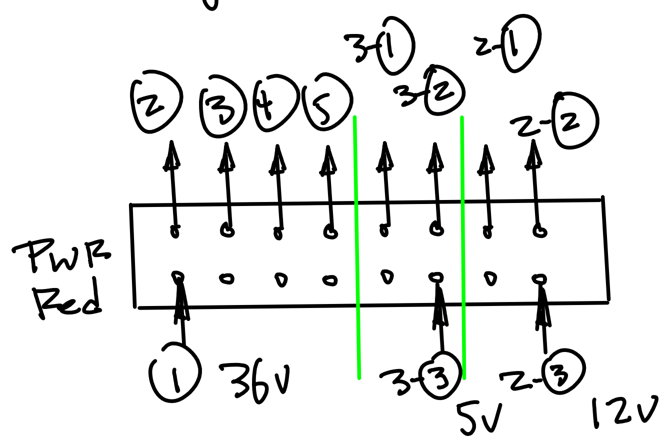


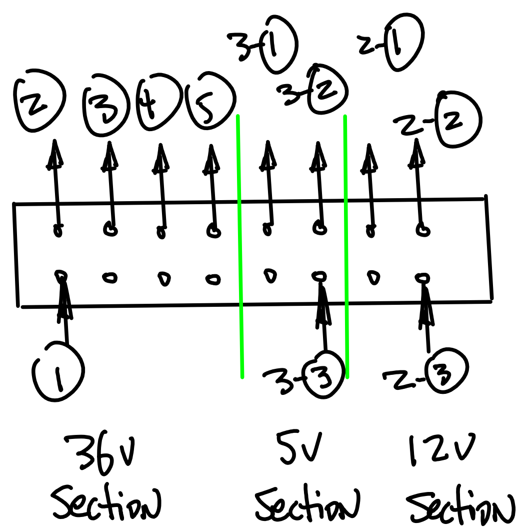


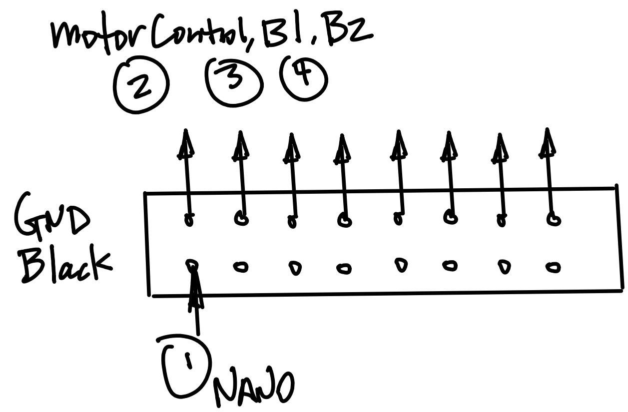
ReDesigned



August 3rd Thursday







1. M.V.
2. Berkeley Cedar St.
3. Lowes
4. Mid-town
5. Visit Manufacturing Integration Facility.

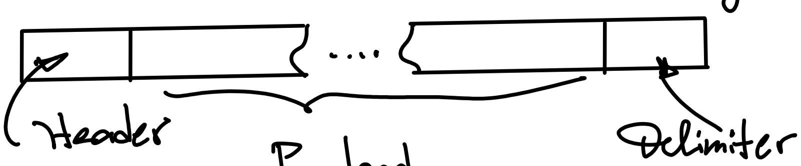
August 7 (Monday)

Controller   H-Sen

Meeting On Gesture Recognition.

For TCP/IP Network Communication

Fig 1

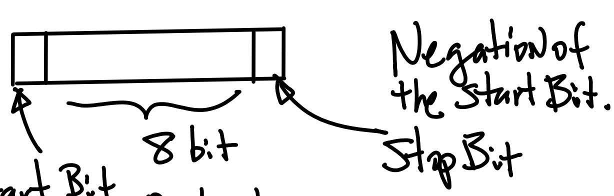


Similarly, in Hardware/physical Level, such as UART, RS232, RS485 etc.

8N1

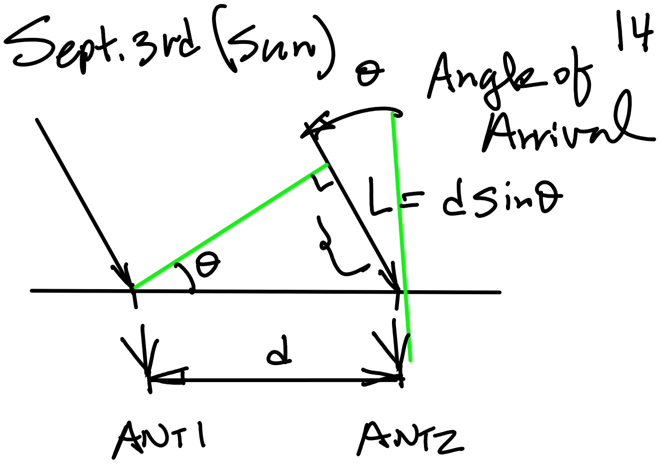
"1"

Fig. 2



Now, Let's Design A protocol for Gesture Recog. using Gesture(s)

Sept. 3rd (Sun)



Let attenuation at ANT_i be

$$\gamma = -2\pi \frac{f}{c} \quad \dots (1)$$

Note: free space attenuation

$$\lambda = c/f \quad \dots (2)$$

Range (Path_Loss)

$$= \frac{\lambda}{4\pi} \cdot 10^{PL/20} \quad \dots (3)$$

$$\text{PathLoss} = 20\log\left(\frac{4\pi r}{\lambda}\right) \quad \dots (4)$$

$$\begin{pmatrix}\text{phase @} \\ \text{ANT}_1\end{pmatrix} = \begin{pmatrix}\text{phase} \\ \text{delay}\end{pmatrix}\begin{pmatrix}\text{Attenuation} \\ \text{phase delay} \\ \text{factor}\end{pmatrix} \quad \dots (5)$$

where

$$\begin{pmatrix}\text{phase} \\ \text{delay}\end{pmatrix} = d\sin\theta \quad \dots (6)$$

And

$$\begin{pmatrix}\text{Attenuation} \\ \text{phase delay} \\ \text{factor}\end{pmatrix} = \gamma = -2\pi \frac{f}{c}$$

Hence, Eqn (5):

$$\begin{pmatrix}\text{phase @} \\ \text{ANT}_1\end{pmatrix} = -2\pi \frac{f}{c} d\sin\theta \quad \dots (5\text{-}b)$$

Extend Eqn (5-b) to ANT_M. Since the Attenuation phase delay factor for the Mth ANT becomes.

$$\begin{pmatrix}\text{Attenuation}\\ \text{phase delay}\\ \text{factor at}\\ \text{Mth ANT1}\end{pmatrix} = \begin{pmatrix}\text{Attenuation}\\ \text{phase delay}\\ \text{factor}\end{pmatrix}^{(m-1)} \quad \cdots (7)$$

So, we have the total phase delay at Mth ANT:

$$\begin{pmatrix}\text{phase @}\\ ANT_M\end{pmatrix} = \begin{pmatrix}\text{phase}\\ \text{delay}\end{pmatrix}\begin{pmatrix}\text{Attenuation}\\ \text{phase delay}\\ \text{factor at}\\ \text{Mth ANT1}\end{pmatrix}$$

$$= \begin{pmatrix}\text{phase}\\ \text{delay}\end{pmatrix}\begin{pmatrix}\text{Attenuation}\\ \text{phase delay}\\ \text{factor}\end{pmatrix}^{(m-1)} \quad \cdots (8)$$

Hence,

$$\begin{pmatrix}\text{phase @}\\ ANT_M\end{pmatrix} = -2\pi f/c\,(m-1)\, d\sin\theta \quad \cdots (8\text{-b})$$

Using Exponential function,

$$e^{j\begin{pmatrix}\text{phase @}\\ ANT_M\end{pmatrix}} = e^{+j\left(-\frac{2\pi f}{c}(m-1)\, d\sin\theta\right)}$$

$$= e^{j\left(-2\pi(m-1)\frac{f}{c}\cdot d\sin\theta\right)} \checkmark$$

$$= e^{j\left(-2\pi m\cdot\frac{f}{c} d\sin\theta\right)} e^{+j\left(-2\pi\frac{f}{c} d\sin\theta\right)}$$

$$= \left(e^{-j2\pi\frac{f}{c}d\sin\theta}\right)\left(e^{-j2\pi\frac{f}{c}d\sin\theta}\right)\cdots\left(e^{-j2\pi\frac{f}{c}d\sin\theta}\right)e^{j2\pi\frac{f}{c}d\sin\theta} = \left(e^{-j2\pi\frac{f}{c}d\sin\theta}\right)^{m-1}$$

Denote

$$\phi(\theta) = e^{j2\pi\frac{f}{c}d\sin\theta} \quad \cdots (9)$$

Now, generalize it as AoA

k for ANTs

θ for Wireless Path.

$$\underbrace{\alpha_k}_{\substack{\text{Angle of}\\ \text{Arrival at}\\ \text{ANT k}}}(\theta_{\cancel{k}}) = \phi(\underbrace{\theta_{\cancel{k}}}_{\substack{\text{phase}\\ \text{delay}}}, \underbrace{\gamma_{\cancel{k}}}_{\text{Attenuation}}) \quad \cdots (10)$$

So, for ANT_0, $\alpha_0(\theta_0) = 1$, No Phase Delay

" ANT_1, $\alpha_1(\theta_1)$,

⋮

" ANT_M, $\alpha_m(\theta_m)$

Form A vector of the phase delay

$$\begin{bmatrix}\alpha_1(\theta)\\ \alpha_2(\theta_{\cancel{1}})\\ \alpha_3(\theta_{\cancel{2}})\\ \vdots\\ \alpha_m(\theta_{\cancel{m}})\end{bmatrix} \rightarrow \begin{bmatrix}\alpha_1(\theta)\\ \alpha_2(\theta)\\ \alpha_3(\theta)\\ \vdots\\ \alpha_M(\theta)\end{bmatrix} \quad \cdots (11)$$

Note: Steering Matrix

So,

$$\alpha_m(\theta_m) = \left(e^{-j2\pi \frac{f}{c} d \sin\theta}\right)^{m-1} \quad \cdots (12)$$

Now, Consider multiple pathes. denoted as

θ_1 for path 1

θ_2 for path 2

$\vdots$

θ_L for path L.

To form a matrix (steering matrix) as

$$A = \begin{pmatrix} \text{Path 1} & \text{Path 2} & & \text{Path L} \\ M & M & & M \\ \text{ANTs} & \text{ANTs} & & \text{ANTs} \end{pmatrix}. \quad \cdots (13)$$

Substitute Eqn (11) into (13),

$$A = \begin{pmatrix} \alpha_1(\theta_1) & \alpha_1(\theta_2) & & \alpha_1(\theta_L) \\ \alpha_2(\theta_1) & \alpha_2(\theta_2) & & \alpha_2(\theta_L) \\ \alpha_3(\theta_1) & \alpha_3(\theta_2) & \cdots & \alpha_3(\theta_L) \\ \vdots & \vdots & & \vdots \\ \alpha_M(\theta_1) & \alpha_M(\theta_2) & & \alpha_M(\theta_L) \end{pmatrix} \quad \cdots (13\text{-}b)$$

Now, Received Signal in A vector form

$\vec{x}_1$ for path 1 with M ANTs

$\vec{x}_2$ for path 2 ... M ..

$\vdots$

$\vec{x}_L$ for Path L, ... M ANTs

AND Denote for all pathes

$$\mathbb{X} = \left(\vec{x}_1, \vec{x}_2, \cdots, \vec{x}_L\right)^t \quad \cdots (14)$$

$\vec{x}_1$: at path 1; $\vec{x}_2$: Path 2; $\vec{x}_L$: Path L

AND

$$\mathbb{X} = A\Gamma \quad \cdots (15)$$

where

$$\Gamma = (\gamma_1, \gamma_2, \cdots, \gamma_L)^t \quad \cdots (16)$$

Attenuation along L Path.

Hence,

$$\begin{pmatrix} \text{Received Signal with M ANTs along L Path} \end{pmatrix} = \begin{pmatrix} \text{Steering matrix A for the phase Delays with M \& L} \end{pmatrix} \begin{pmatrix} \text{Attenuation along L Path} \end{pmatrix} \quad \cdots (17)$$

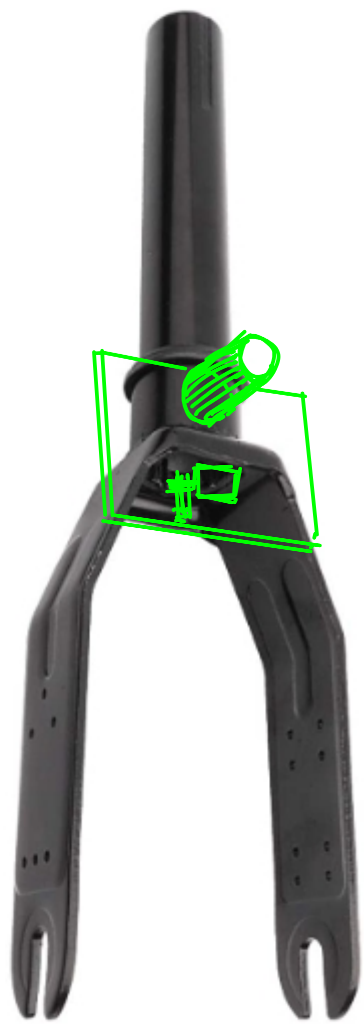
Hence

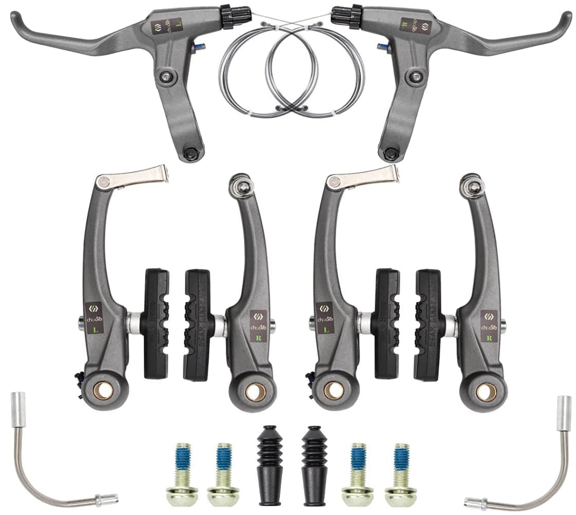
$$\underline{X} = A\,\Gamma$$

OR

$$(\vec{x}_1, \vec{x}_2, \dots, \vec{x}_L)^t = \begin{pmatrix} \alpha_1(\theta_1) & \alpha_1(\theta_2) & & \alpha_1(\theta_L) \\ \alpha_2(\theta_1) & \alpha_2(\theta_2) & & \alpha_2(\theta_L) \\ \alpha_3(\theta_1) & \alpha_3(\theta_2) & \cdots & \alpha_3(\theta_L) \\ \vdots & \vdots & & \vdots \\ \alpha_M(\theta_1) & \alpha_M(\theta_2) & & \alpha_M(\theta_L) \end{pmatrix} (\gamma_1, \gamma_2, \dots, \gamma_L)^t \quad \dots (18)$$

Oct. 16 (Monday) Mounting ~~fork~~ Caliper B I r race





Oct. 17 (Tue)

Note1. Cable Connections (1) to (5) Build Connectivity Table. Note2. Design Objectives.

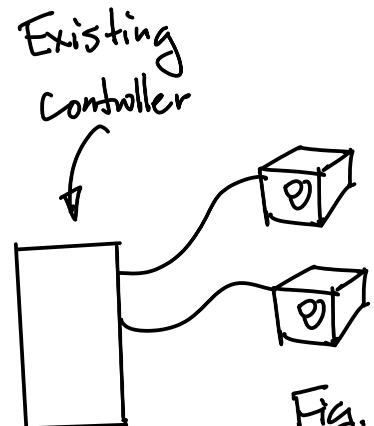
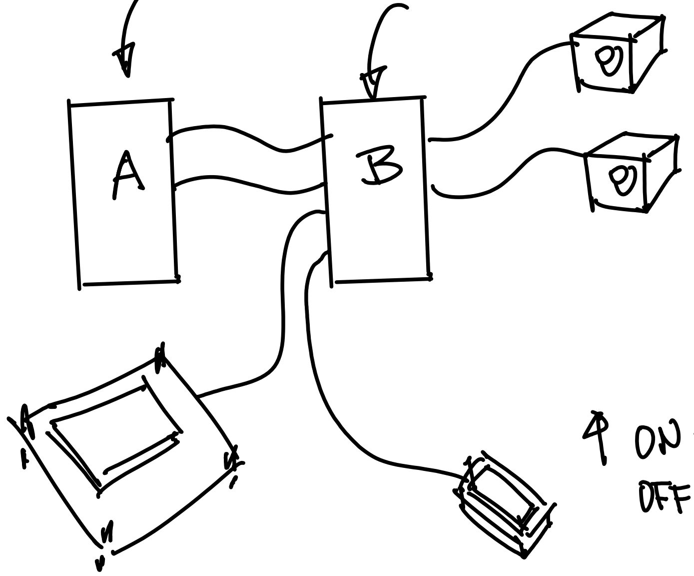


Fig. 1a.

Existing controller

New Controller Mux



↑ ON: for Jetson NANO
OFF: for Hand Control

Jetson NANO

Toggle Switch
Hand Controlled.

Fig.1b.

Nov.6 (Monday) HL, Dn, Srba.

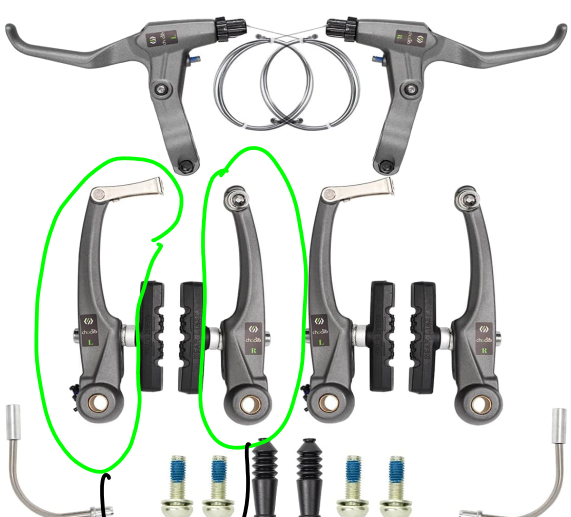


Fig 1a

To Be Mounted On the
ARM of the Fork.

Fig.1b

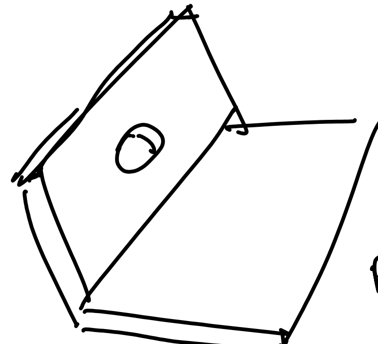


Fig.1d

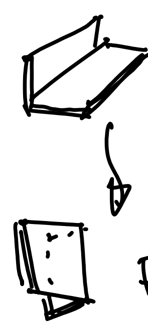


Fig.1c.

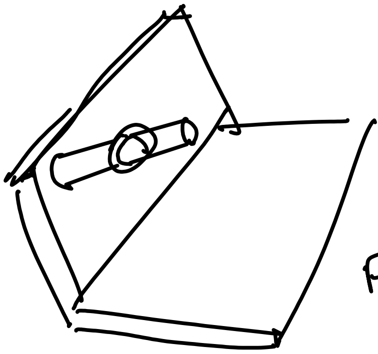


Fig.1d

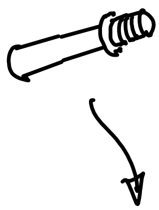
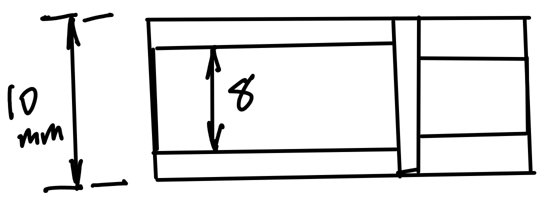


Fig.1e



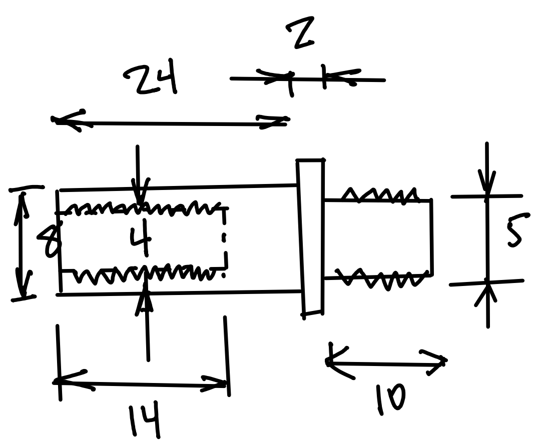


Fig.1f

Fig.1g

Jan 4 (Thursday) First Day of the work.

Meeting (Leadership circle).
HL, YY.

1. 2024 Payscale Update, the guideline 30~40% for 2024 Product Development Effort from YY.

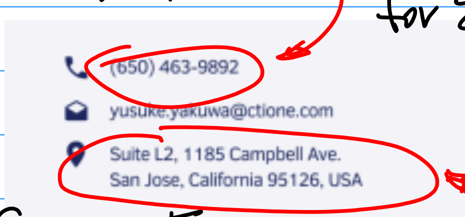
2. Update on Company Website Development, In the process Review Contract for S.F. Based Professional Website Dev. Service.

Focus on W100 Only.

- E-commerce
- Shipping
- Technical Support

Expect to Sign the Contract Jan 5. or so.

3. Company phone. Set up phone for Each Department


(650) 463-9892
yusuke.yakuwa@ctione.com
Suite L2, 1185 Campbell Ave.
San Jose, California 95126, USA

4. Company Facility A

Facility A: Integration.
Shipping Orders.
San Jose
(Not Hayward Anymore)

Facility B: Machining etc.
S.F.

Facility C: Palo Alto.

5. Manufacturing.

Goal: To Be Able to manufacture W100 to 100~200 units/yr. Locally.

① Materials Acquisition, Done. San Jose

② Cutting/Size the material pipes. Done. Machine @ F.C.

③ CNC Maching. { F.C. Done
F.B.

④ CAD Design. 2D. Design. Coding. gcode Done
3D Design.
FreeCAD.
for Adv. Design is enabled;

⑤ Lathe Machine. Done @ Facility C. and B

CTI

S2024

⑥ Welding. Try. Electric Done. @ F.C.

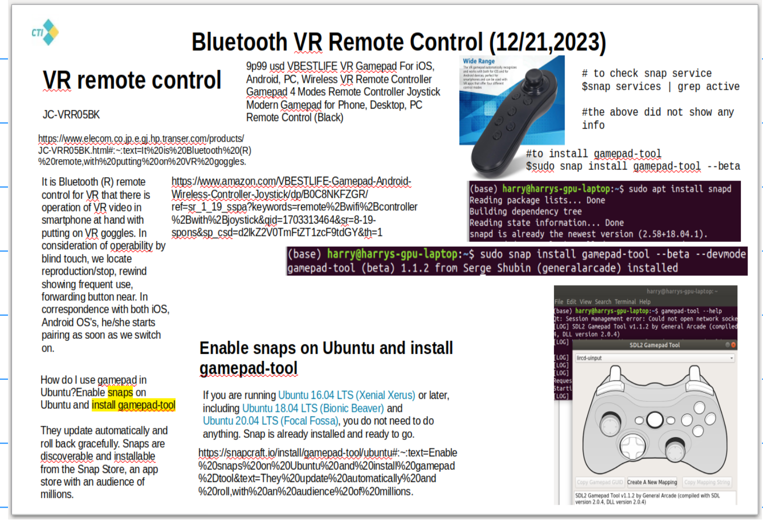
Equipment, Ready for Testing F.C.

⑦ Power Coating. Painting.

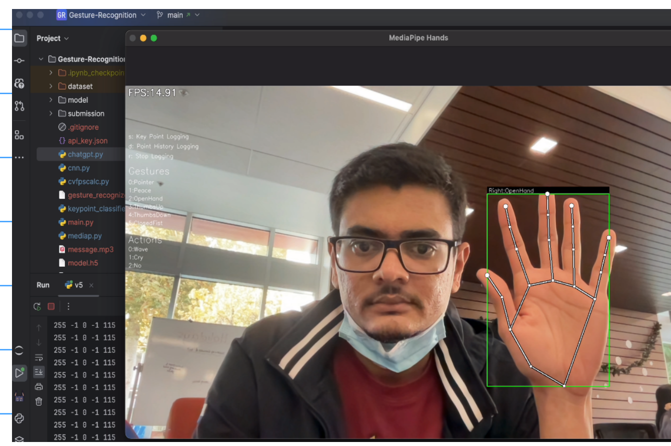
Construction of the Painting Shop. Done, Jan. 3.

Luis.

Installation of the filtering System for Environment protection and worker protection. Done.



⑧ IrDA Based Paint Bake Facility is under Construction. To Be finished By Friday @ F.C.



6. Software

Task List Update. YY.

New Features

Remote Control.

Facial Recognition.

Gesture Recognition.

YZ. → Repeat.