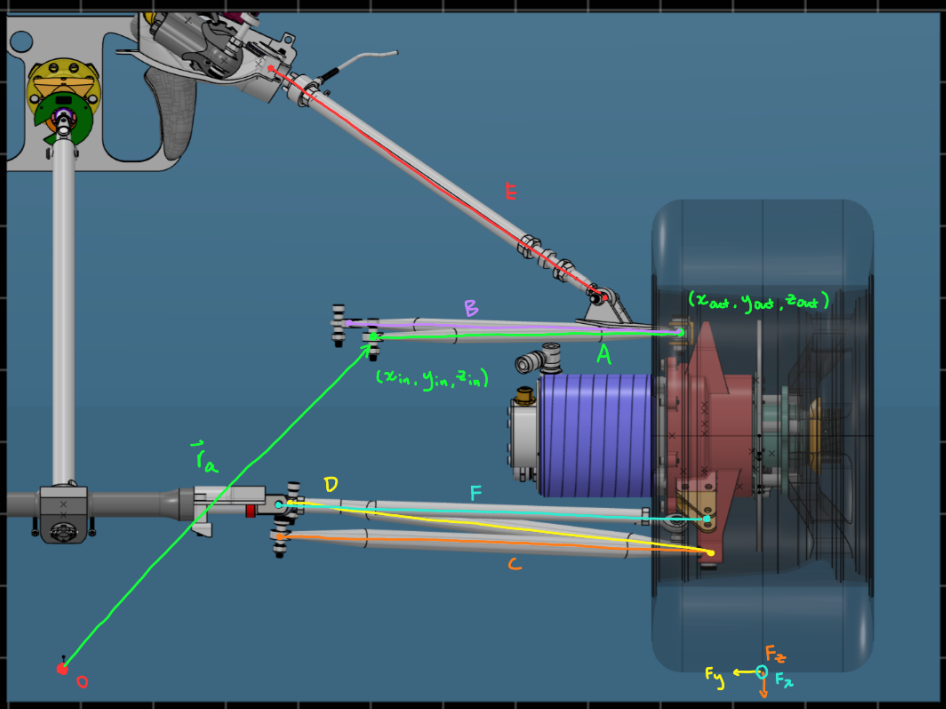

$$L = \sqrt{(\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2}$$

$$\Delta x = x_{out} - x_{in}$$

$$\Delta y = y_{out} - y_{in}$$

$$\Delta z = z_{out} - z_{in}$$

Force per tube $(F) = \text{dir} \cdot |F|$

$$= \left(\frac{\Delta x}{L}, \frac{\Delta y}{L}, \frac{\Delta z}{L}\right) \cdot |F|$$

$$\sum \vec{F}_{i,j,k} = \emptyset$$

$$\frac{\Delta x_A}{L_A} \cdot F_A + \frac{\Delta x_B}{L_B} \cdot F_B + \frac{\Delta x_C}{L_C} \cdot F_C + \frac{\Delta x_D}{L_D} \cdot F_D + \frac{\Delta x_E}{L_E} \cdot F_E + \frac{\Delta x_F}{L_F} \cdot F_F + F_{x\,tire} = \emptyset$$

$$\frac{\Delta y_A}{L_A} \cdot F_A + \frac{\Delta y_B}{L_B} \cdot F_B + \frac{\Delta y_C}{L_C} \cdot F_C + \frac{\Delta y_D}{L_D} \cdot F_D + \frac{\Delta y_E}{L_E} \cdot F_E + \frac{\Delta y_F}{L_F} \cdot F_F + F_{y\,tire} = \emptyset$$

$$\frac{\Delta z_A}{L_A} \cdot F_A + \frac{\Delta z_B}{L_B} \cdot F_B + \frac{\Delta z_C}{L_C} \cdot F_C + \frac{\Delta z_D}{L_D} \cdot F_D + \frac{\Delta z_E}{L_E} \cdot F_E + \frac{\Delta z_F}{L_F} \cdot F_F + F_{z\,tire} = \emptyset$$

$$\sum \vec{M}_o = \emptyset$$

$$\left(\frac{\Delta x_A}{L_A}, \frac{\Delta y_A}{L_A}, \frac{\Delta z_A}{L_A}\right) = \hat{a}$$

$$(\vec{r}_A \times \hat{a}) \cdot F_A + \ldots + \begin{bmatrix} M_{overturning} \\ M_{y\,torque} \\ M_{z\,aligning} \end{bmatrix} + \vec{r}_{contact\ patch} \times \begin{bmatrix} F_{x\,tire} \\ F_{y\,tire} \\ F_{z\,tire} \end{bmatrix}$$

6 eqs. 6 unknowns