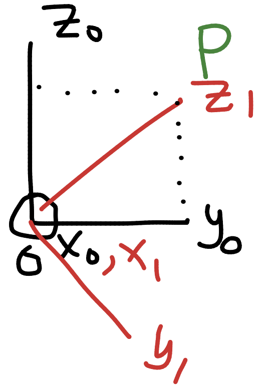



$$R_1^0 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \\ 0 & -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{bmatrix}$$

ex. $p^1 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = "z_1"$

$$p^0 = R_1^0 p^1 = \begin{bmatrix} 0 \\ \sqrt{2}/2 \\ \sqrt{2}/2 \end{bmatrix}$$

$$p^0 = R_1^0 p^1 \rightarrow p^1 = (R_1^0)^{-1} p^0$$

$$p^1 = R_0^1 p^0 \Rightarrow (R_1^0)^{-1} = R_0^1$$

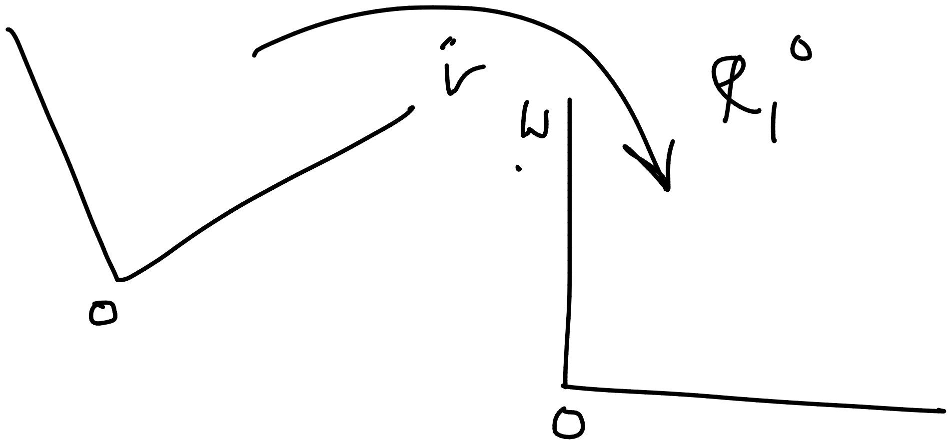
$$R_1^0 = \begin{bmatrix} x_1 \cdot x_0 & y_1 \cdot x_0 & z_1 x_0 \\ \vdots & \vdots & \vdots \end{bmatrix}$$

but $R_1^0 = \begin{bmatrix} x_0 x_1 & x_0 y_1 & x_0 z_1 \\ = & = & = \\ = & = & = \\ = & = & = \end{bmatrix}$

by def

$$R_0^1 = \begin{bmatrix} x_0 x_1 & x_1 y_0 & z_0 x_1 \\ = & = & = \\ = & = & = \\ = & = & \end{bmatrix}$$

$$= (R_1^0)^T$$




$$w^0 = A v^0$$

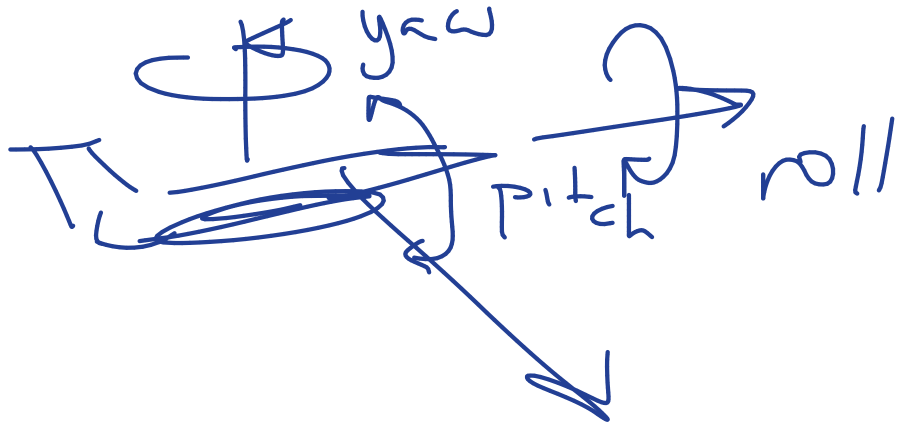
$$v^1 = R_0^1 v^0$$

$$v^0 = (R_0^1)^{-1} v^1$$

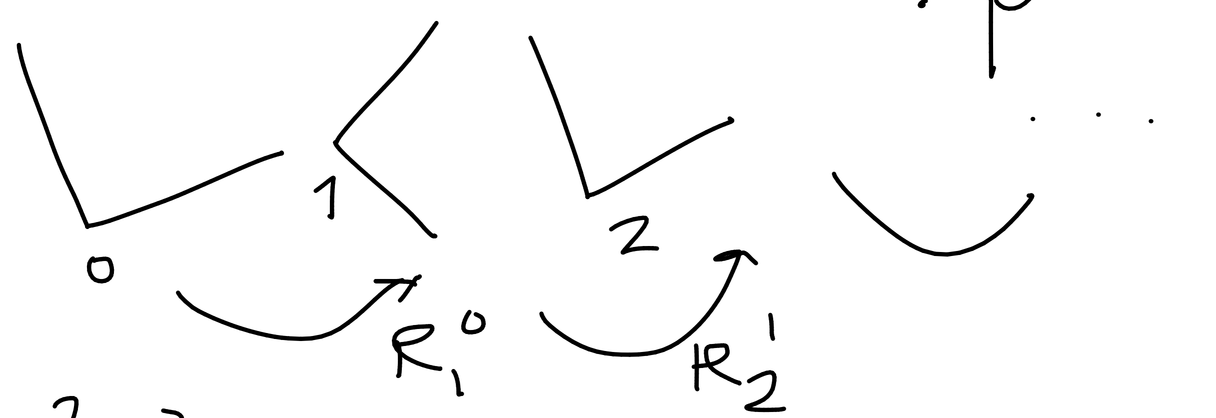
$$w^1 = R_0^1 w^0 \qquad w_0 = A v^0$$

$$\longrightarrow \quad w^1 = R_0^1 A v^0 = \underbrace{R_0^1 A (R_0^1)^{-1}}_{B} v^1$$

Eq. 2.11 : $\quad B = (R_1^0)^{-1} A R_1^0$




## current frame:




$$p^0 = R_1^0 p^1 \; ; \quad p^1 = R_2^1 p^2 \; ; \quad p^2 = R_3^2 p^3 \; - - -$$

$$p^0 = R_1^0 R_2^1 R_3^2 \cdots R_K^{k-1} p^K$$

$\longrightarrow$ forward

## fixed frame:

$$p^0 = R_1^0 p^1 \; \{ \quad p^1 = \underbrace{R_2^1}_{\text{in fram 1}} p^2$$

"A"

$$R_2^1 = (R_1^0)^{-1} R_2^0 (R_1^0)$$

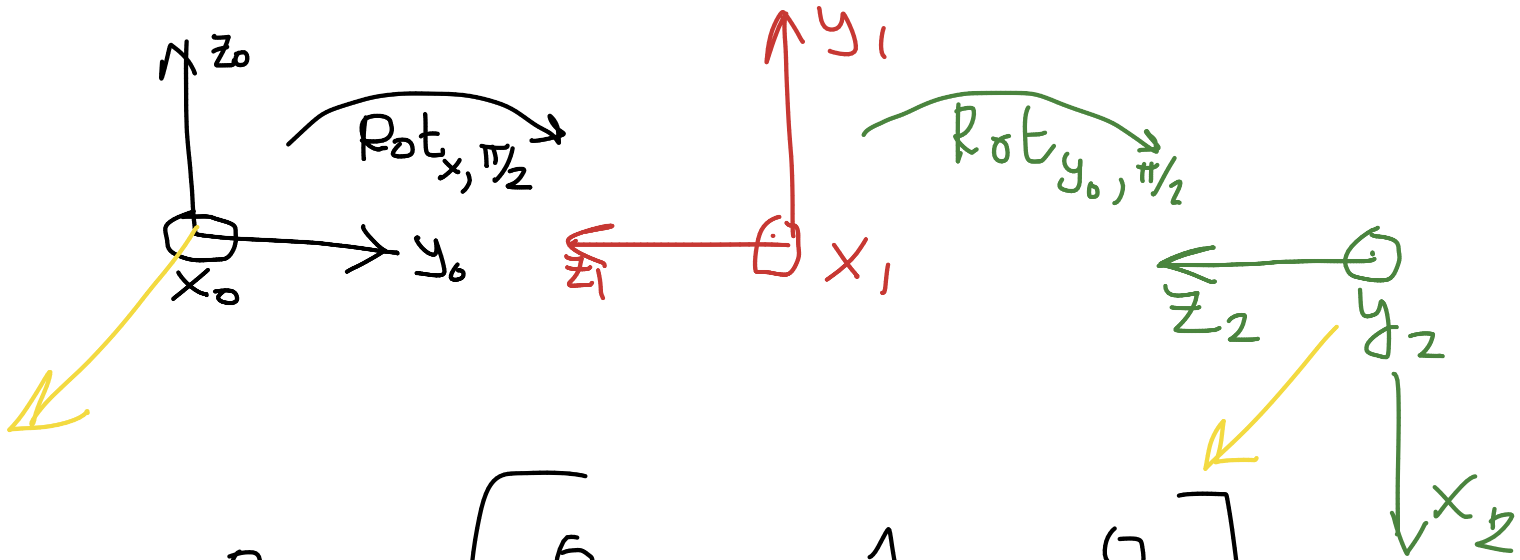
$$p^0 = \underbrace{\cancel{R_1^0 (R_1^0)^{-1}}}_{I} R_2^0 R_1^0 p^2$$

$$p^0 = R_2^0 R_1^0 p^2$$

$\longleftarrow$

reverse

Ex. SHV 2.14




$$R_2^0 = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & -1 \\ -1 & 0 & 0 \end{bmatrix}$$

(by projection)

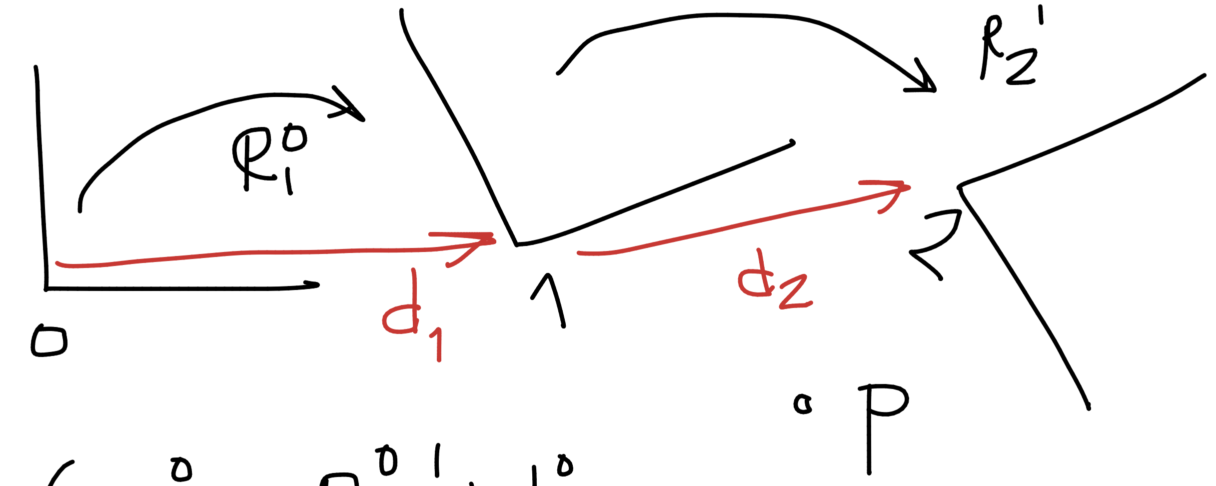
<u>Check</u> :

Take (in frame 2)

$$\left( \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \right) = p^2$$

$$p^0 = R_2^0 p^2 = \begin{bmatrix} 0 \\ -1 \\ -1 \end{bmatrix}$$

By sequential rotations (Matlab)




$$\begin{cases} p^0 = R_1^0 p^1 + d_1^0 \\ p^1 = R_2^1 p^2 + d_2^1 \end{cases}$$

$$\Rightarrow p^0 = R_1^0 (R_2^1 p^2 + d_2^1) + d_1^0 = R_2^0 p^2 + R_1^0 d_2^1 + d_1^0$$