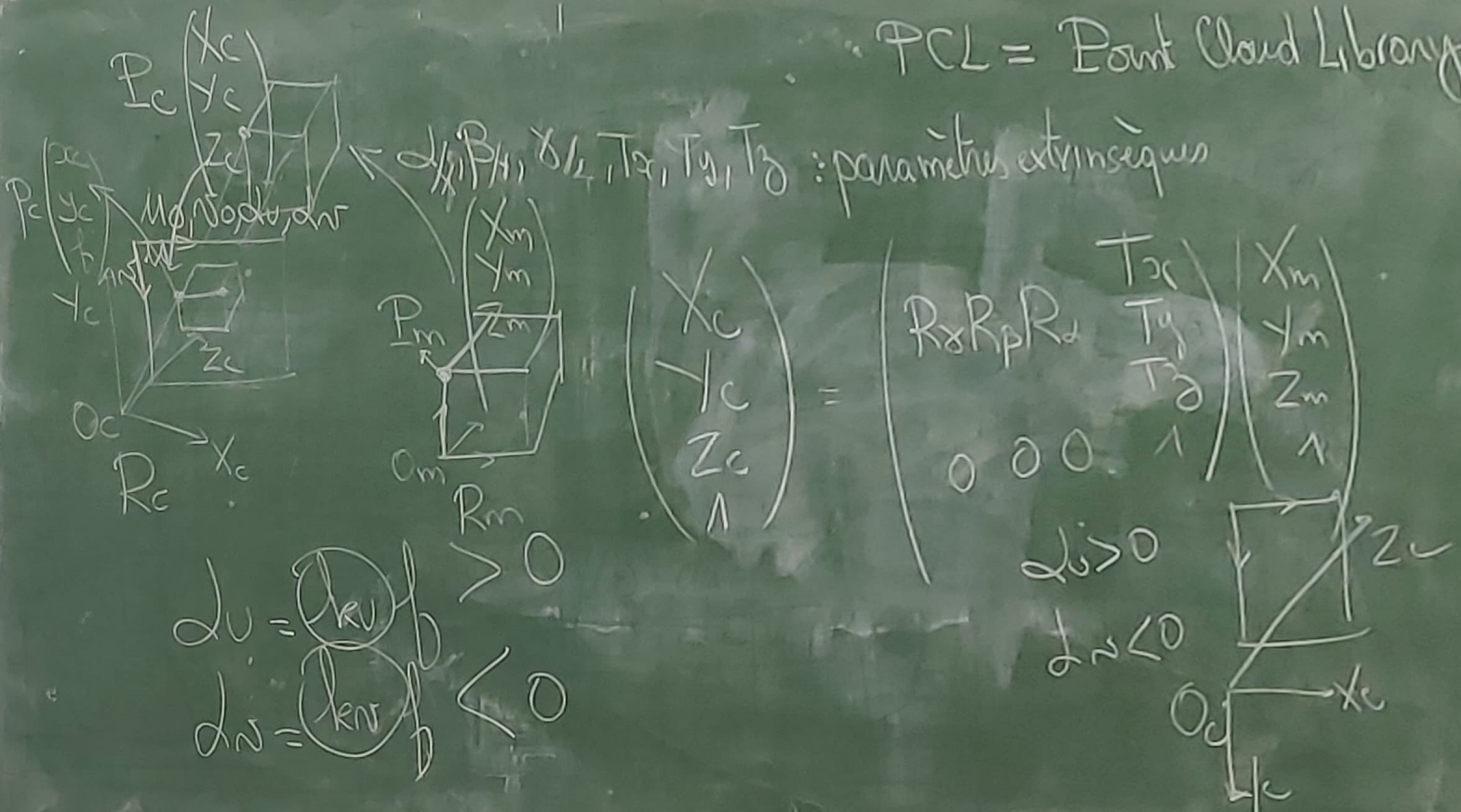
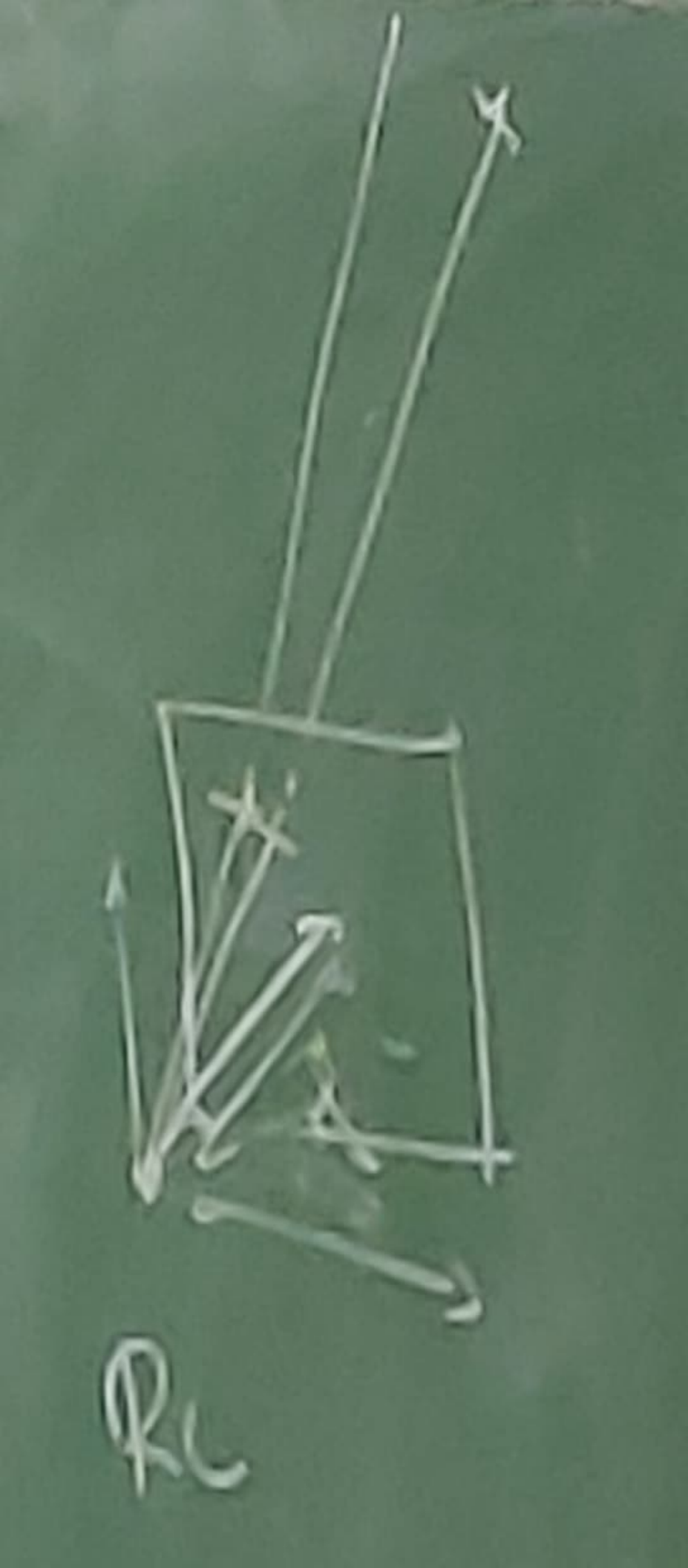
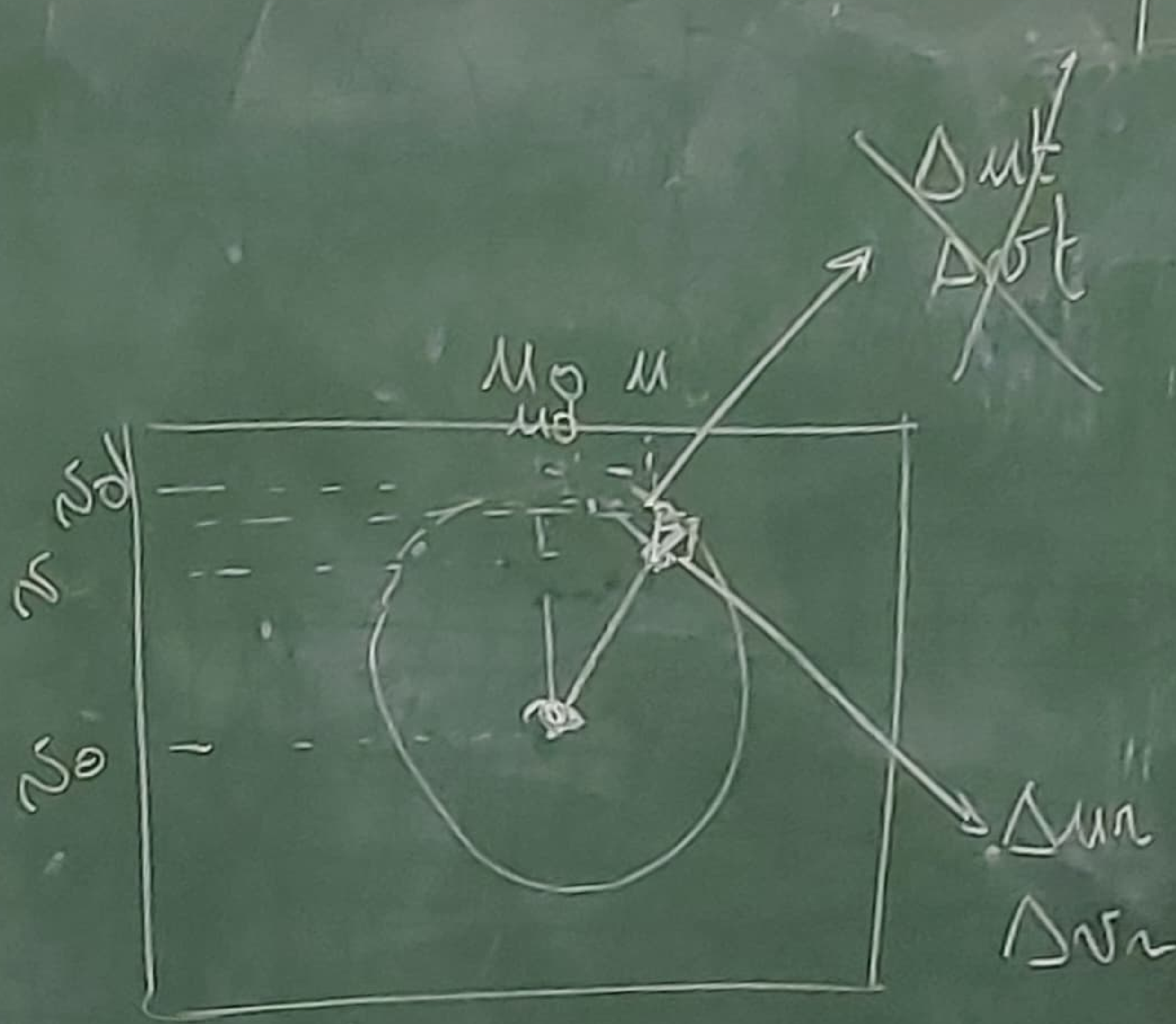
PCL = Point Cloud Library







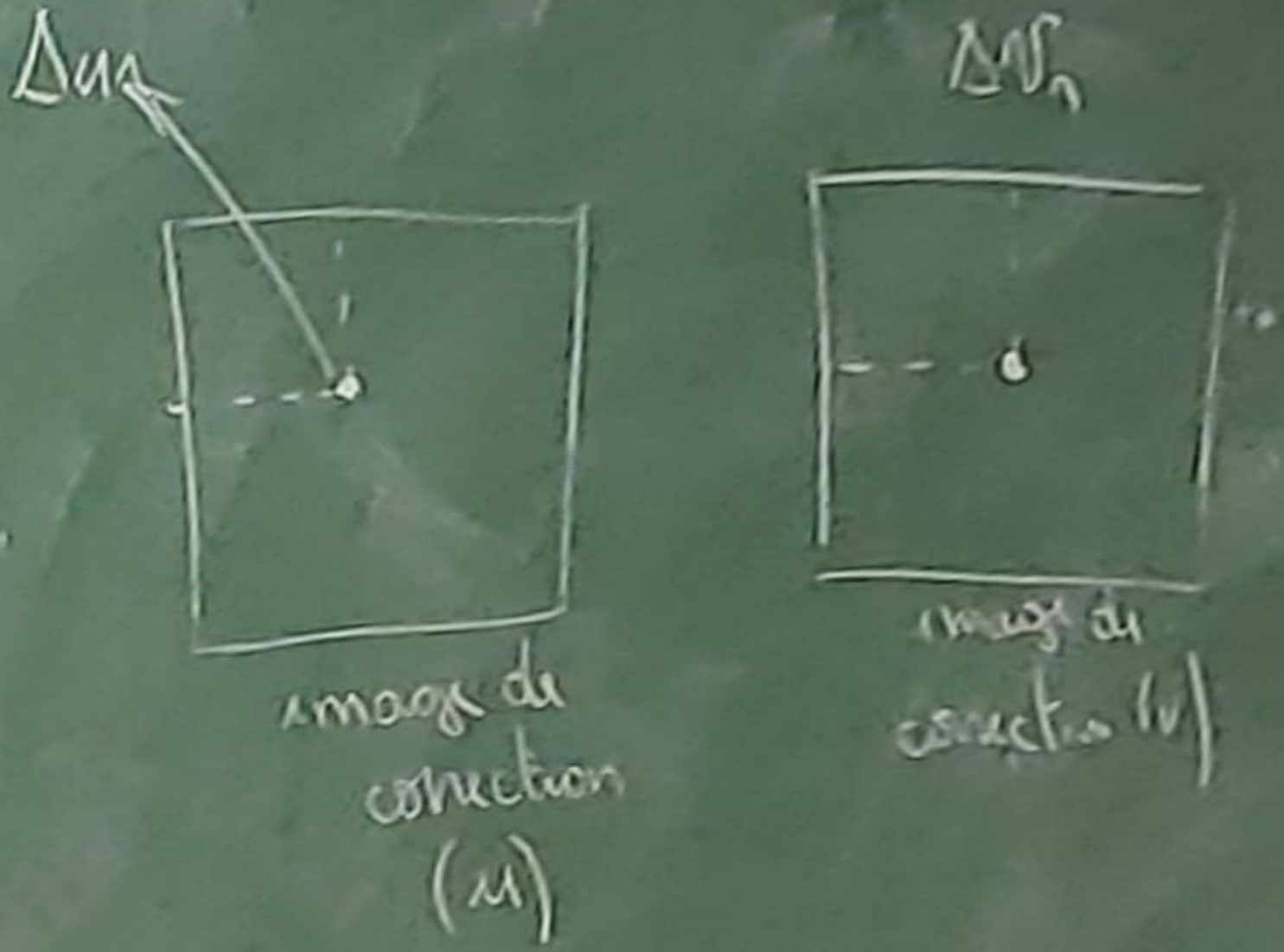
$$\begin{cases} u_{0l} = k_u x_d + u_0 \\ v_{0l} = k_v y_{dl} + v_0 \end{cases} \quad \begin{cases} u = k_u x_c + u_0 \\ v = k_v y_c + v_0 \end{cases}$$

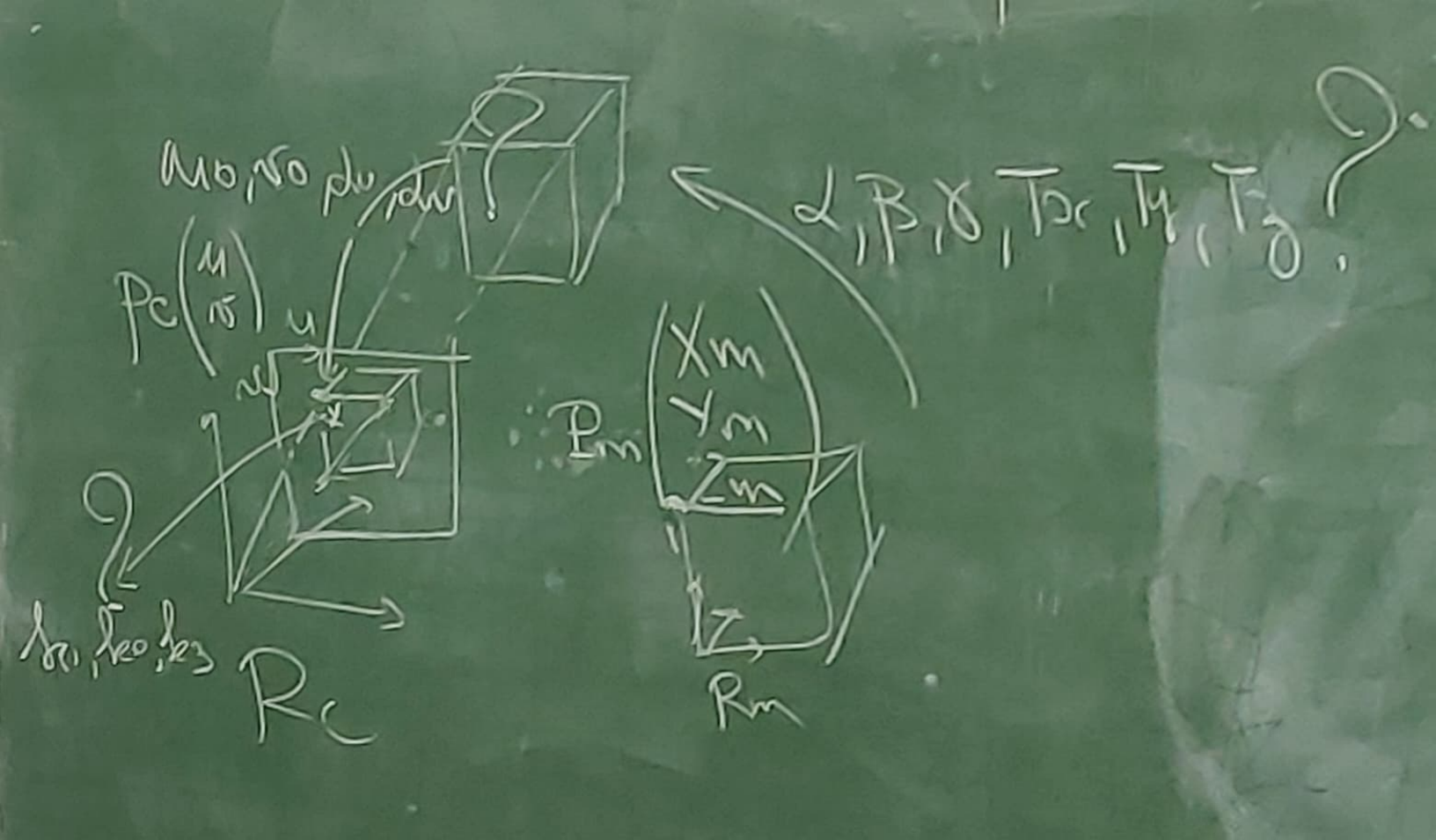
$$\begin{cases} x_d = x_c \left[1 + k_1 \left(x_c^2 + y_c^2 \right) \right] \\ y_d = y_c \left[1 + k_1 \left(x_c^2 + y_c^2 \right) \right] \end{cases}$$

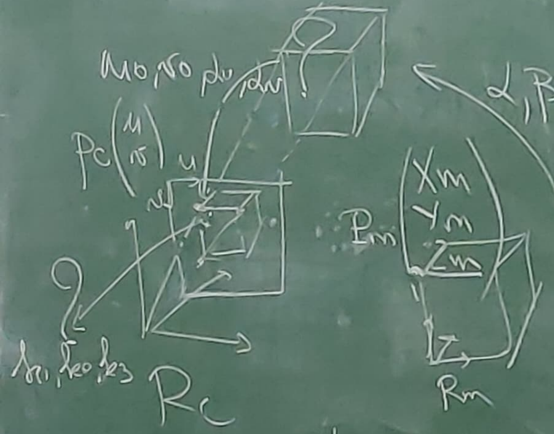
$$\begin{cases} u_d = u + (u - u_0) k_1 \left[\left(\frac{u - u_0}{\alpha_u} \right)^2 + \left(\frac{v - v_0}{\alpha_v} \right)^2 \right] \\ v_d = v + (v - v_0) k_1 \left[\left(\frac{u - u_0}{\alpha} \right)^2 + \left(\frac{v - v_0}{\alpha_v} \right)^2 \right] \end{cases}$$

Δu_1

Δv_1


Δu_1
ΔV_1
image de correction (u)
image de correction (v)


Mouvement du robot ?
$\alpha, \beta, \gamma, T_x, T_y, T_z$?
$P_c \begin{pmatrix} u \\ v \\ w \end{pmatrix}$
$P_m \begin{pmatrix} X_m \\ Y_m \\ Z_m \end{pmatrix}$
$i_{R_c}, j_{R_c}, k_{R_c}$
R_c
R_m



$$\begin{cases} u_i + V_{u_i} = P(X) = P(X_0) + \frac{\partial P}{\partial u_0}\Delta u_0 + \dots \frac{\partial P}{\partial T_z}\Delta T_z + \frac{\partial P}{\partial k}\Delta k \\ v_i + V_{v_i} = Q(X) = Q(X_0) \dots \end{cases}$$

$$\begin{pmatrix} V_{u_i} \\ V_{v_i} \end{pmatrix} = \begin{pmatrix} \frac{\partial P}{\partial u_0} & \dots & \frac{\partial P}{\partial k_3} \\ \frac{\partial Q}{\partial u_0} & \dots & \frac{\partial Q}{\partial k_3} \end{pmatrix} \begin{pmatrix} \Delta u_0 \\ \vdots \\ \Delta k_3 \end{pmatrix} - \begin{pmatrix} u_i - P(X_0) \\ v_i - Q(X_0) \end{pmatrix}$$

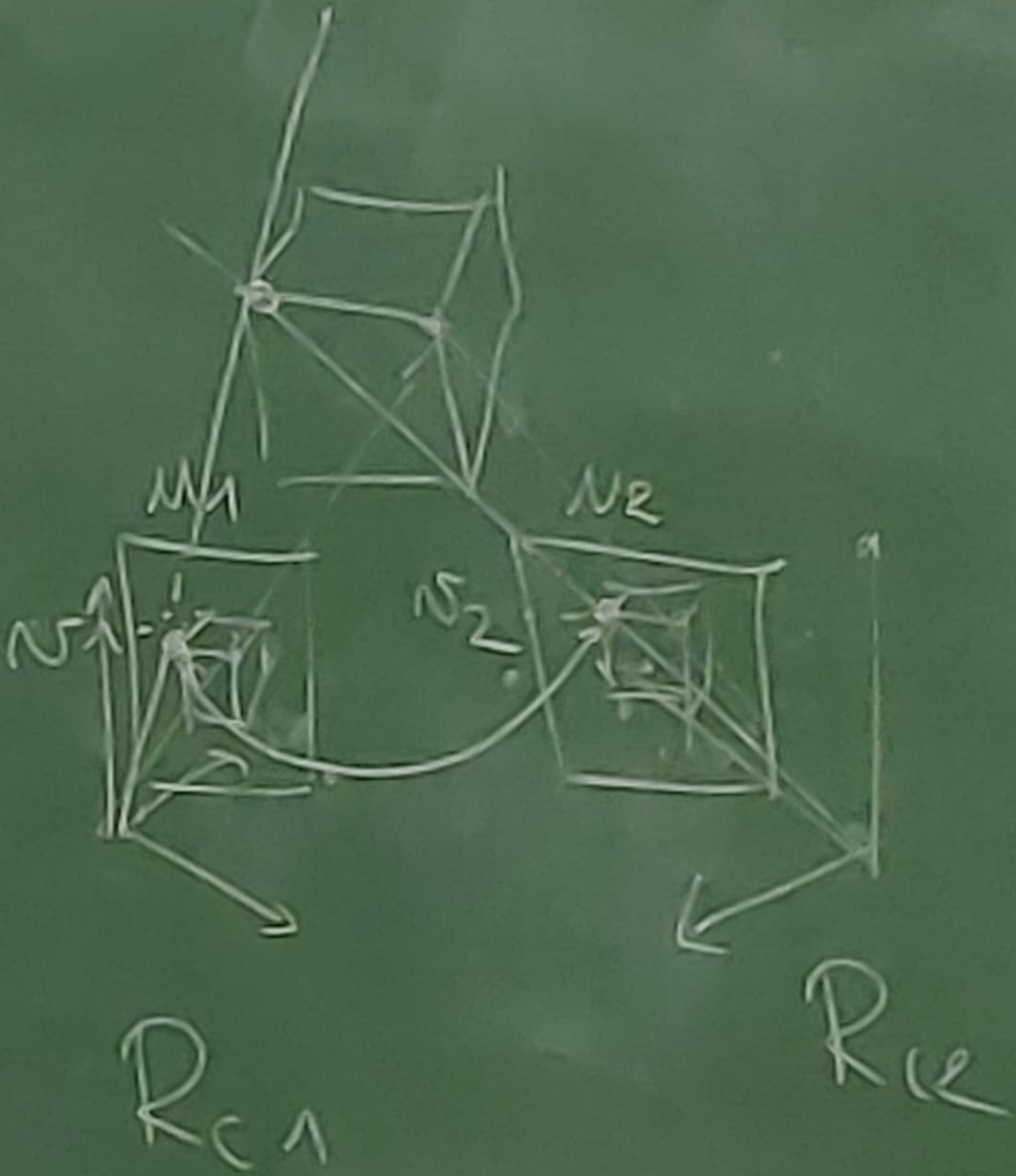
$$V = A \, \Delta X - L$$

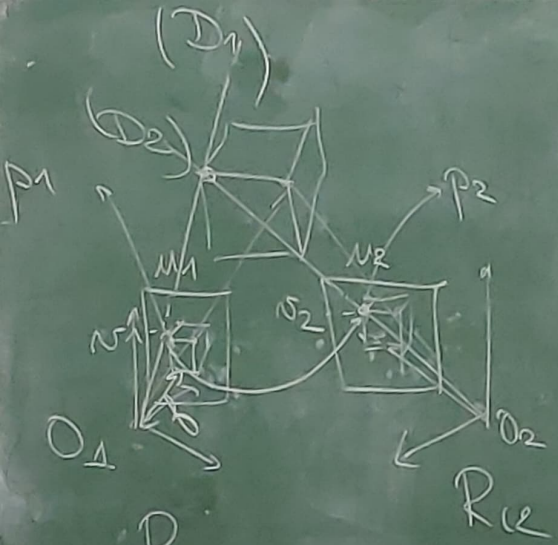
appariements 2D/3D.

$$\{ u_i^d, v_i^d, X_m^i, Y_m^i, Z_m^i \}_{i=1,\dots,m}$$

pseudo inverse

$$\min(V^t V) \Rightarrow \Delta X = (A^t A)^{-1} A^t L$$


N1
N2
N1
N2
RC1
RC2

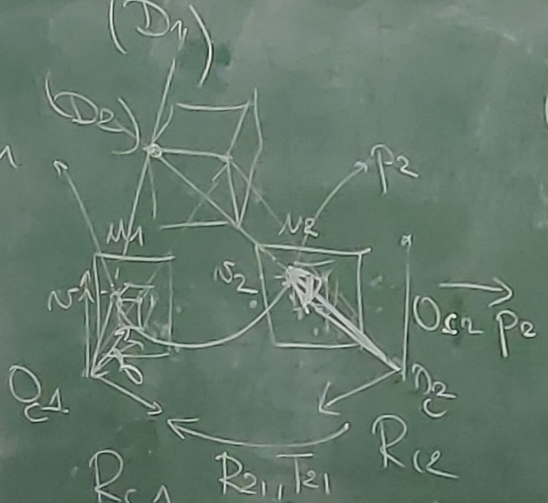


$$\overrightarrow{O_c p_1} = \begin{pmatrix} \frac{u_1 - u_0}{\alpha_u} \\ \frac{v_1 - v_0}{\alpha_v} \\ 1 \end{pmatrix} \qquad \overrightarrow{O_c p_2} = \begin{pmatrix} \frac{u_2 - u_0}{\alpha_u} \\ \frac{v_2 - v_0}{\alpha_v} \\ 1 \end{pmatrix}$$

$$\begin{cases} \overrightarrow{O_{c1}M} = \lambda \overrightarrow{O_{c1}p_1} \quad (M \in D_1) \\ \overrightarrow{O_{c2}M} = \lambda \overrightarrow{O_{c2}p_2} \quad (M \in D_2) \end{cases}$$

$$P_1 : \begin{pmatrix} u_1 \\ v_1 \end{pmatrix}_{R_{I1}} = \begin{pmatrix} x_1 \\ y_1 \\ 1 \end{pmatrix}_{R_{c1}} = \begin{pmatrix} \frac{u_1 - u_0}{k_u} \\ \frac{v_1 - v_0}{k_v} \\ 1 \end{pmatrix}$$

$$\begin{cases} u_1 = k_u x_1 + u_0 \\ v_1 = k_v y_1 + v_0 \end{cases}$$



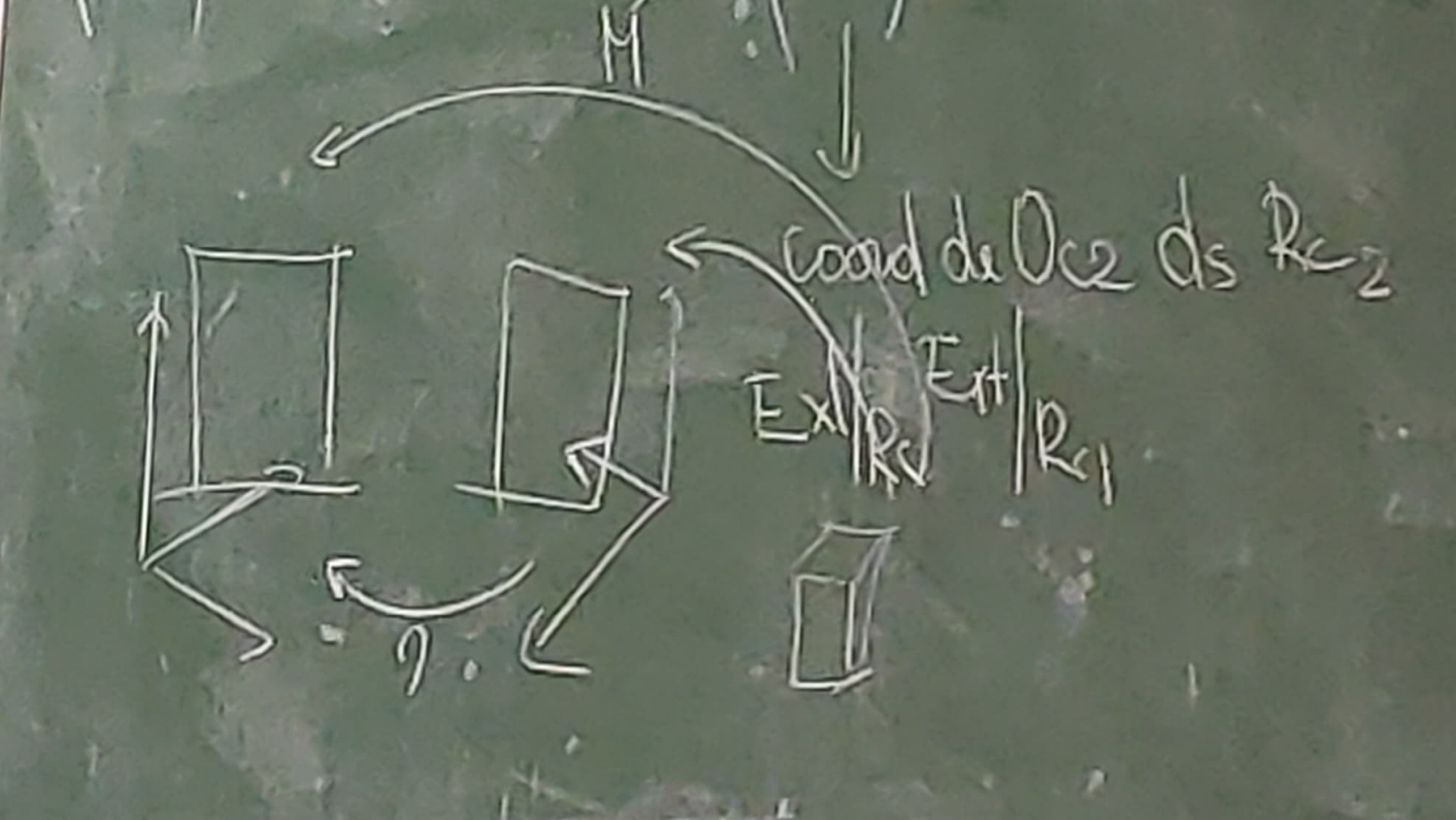
$$\vec{O_{c1}P_1} = \begin{pmatrix} \frac{u_1 - u_0}{\alpha_u} \\ \frac{v_1 - v_0}{\alpha_v} \\ 1 \end{pmatrix} \qquad \vec{O_{c2}P_2} = \begin{pmatrix} \frac{u_2 - u_0}{\alpha_u} \\ \frac{v_2 - v_0}{\alpha_v} \\ 1 \end{pmatrix}$$

$$P_1 = \begin{pmatrix} u_1 \\ v_1 \end{pmatrix}_{R_{I1}} = \begin{pmatrix} x_1 \\ y_1 \\ 1 \end{pmatrix}_{R_{c1}} = \begin{pmatrix} \frac{u_1 - u_0}{k_u} \\ \frac{v_1 - v_0}{k_v} \\ 1 \end{pmatrix}$$

$$\begin{cases} u_1 = k_u x_1 + u_0 \\ v_1 = k_v y_1 + v_0 \end{cases}$$

$$\begin{cases} \vec{O_{c1}M} = \lambda \vec{O_{c1}P_1} \quad (M \in D_1) \\ \vec{O_{c2}M} = \lambda \vec{O_{c2}P_2} \quad (M \in D_2) \end{cases} \Big| R_{c1}, R_{c2}$$

$$\vec{O_{c2}M} = \begin{pmatrix} x_1 - T_{21x} \\ y_1 - T_{21y} \\ z_1 - T_{21z} \end{pmatrix} = R_{21} \vec{O_{c2}P_2}$$


M
coord du Oc2 ds Rc2
Ext/Rc2
Ext/Rc1