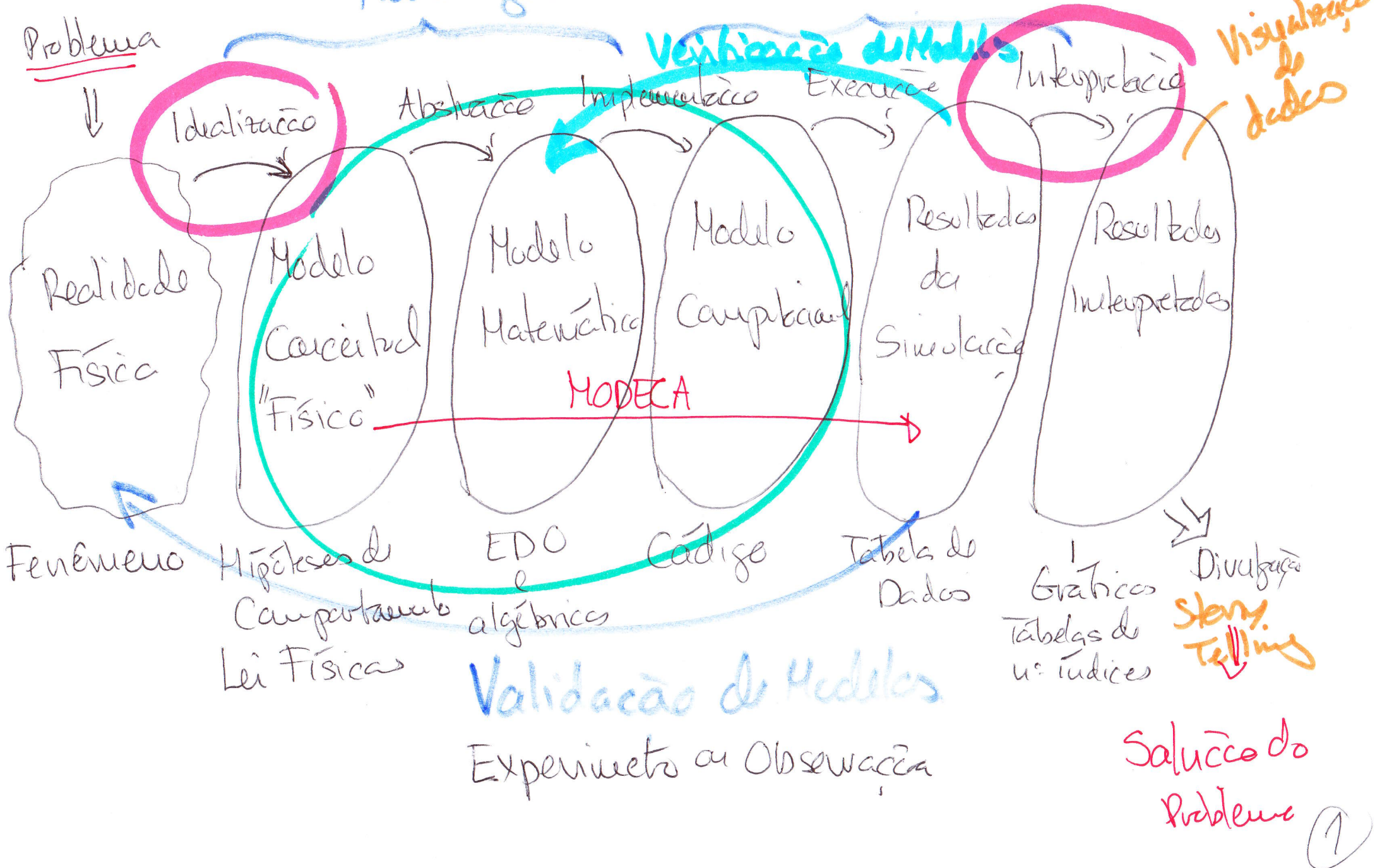


# Modelagem

# Simulação

Problema



**Verificação do Modelo**

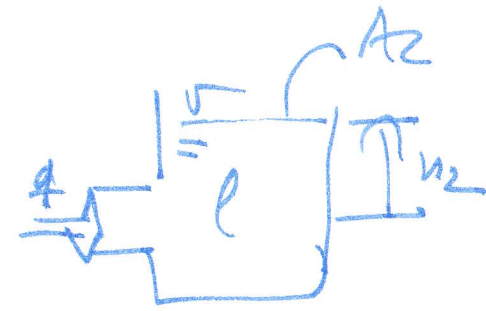
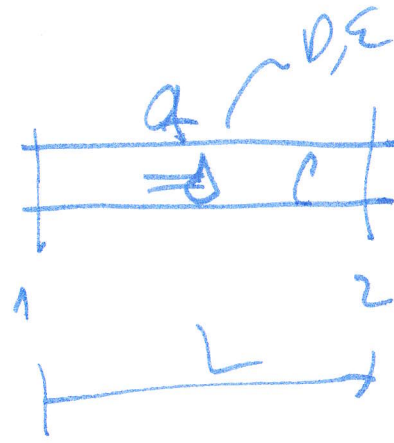
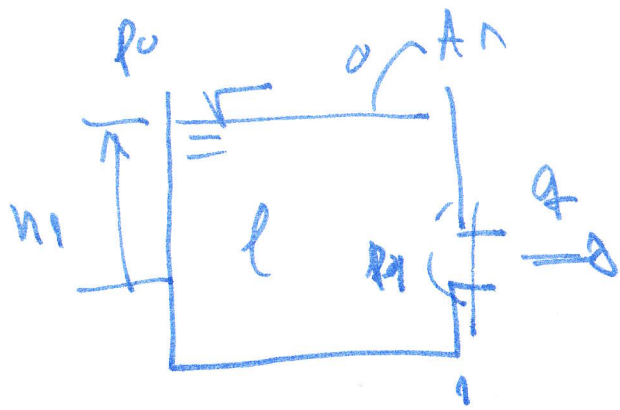
Visualizaçãõ de dados

**Validação de Modelos**

Experimento ou Observação

Divulgaçãõ Story Telling

Saluço do Problema



$$A_1 \frac{dh_1}{dt} = -q$$

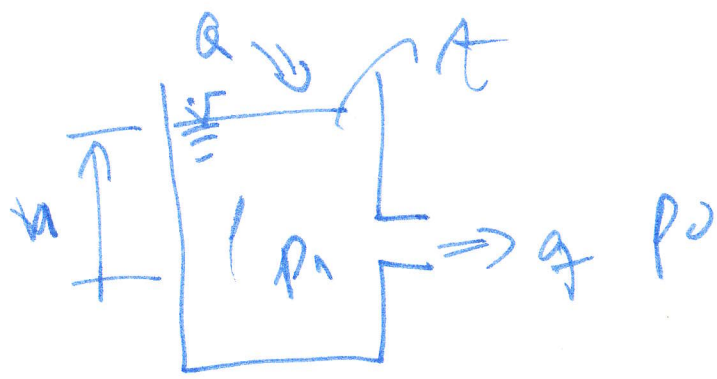
$$p_1 = p_0 + \rho g h_1$$

$$A_2 \frac{dh_2}{dt} = +q$$

$$p_2 = p_0 + \rho g h_2$$

$$p_1 - p_2 = Rq^2$$

$$p_1 > p_2 \quad R = f(Re)$$



$$A \frac{dh}{dt} = -q + Q$$

$$p_1 - p_0 = Rq^2 = \rho gh$$

$$p_1 = p_0 + \rho gh$$

$$\rho gh = Rq^2 \Rightarrow$$

$$\text{R.P.: } \begin{cases} q_0 = Q \\ q_0 = q(t=0) \end{cases}$$

$$\Rightarrow A \frac{dh}{dt} = - \sqrt{\frac{\rho g h}{R}} + Q$$

E.P.C. não linear

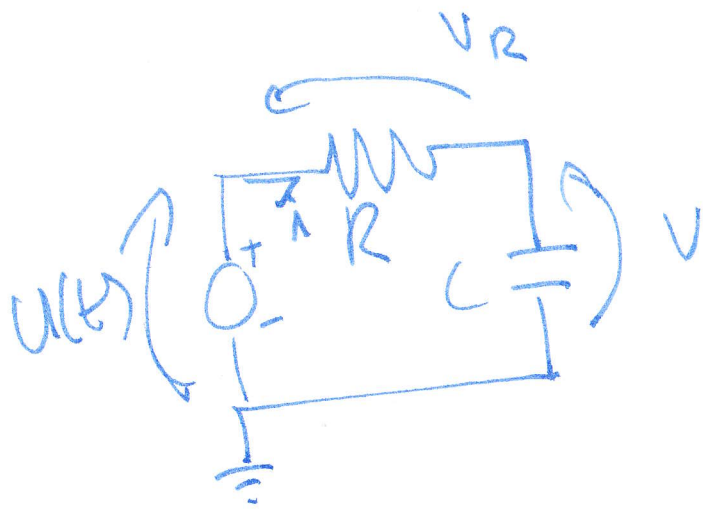
linearização.

$$\rho gh \approx R q_0 q \Rightarrow q = \frac{\rho g h}{R q_0}$$

$$A \frac{dh}{dt} + \frac{\rho g}{R q_0} \cdot h = Q$$

E.B.O. linearizada

$$\tau = \frac{A R q_0}{\rho g}$$



$$V_R = R i$$

$$i = C \frac{dV}{dt}$$

$$u(t) = V_R + V$$

$$u(t) = \begin{cases} 0 & | t < t_0 \\ U_0 & | t \geq t_0 \end{cases}$$

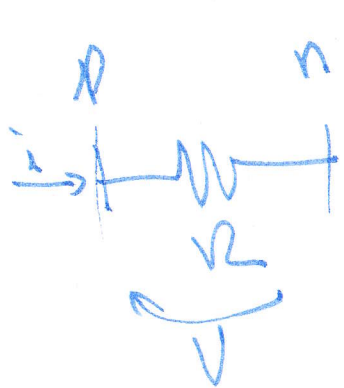
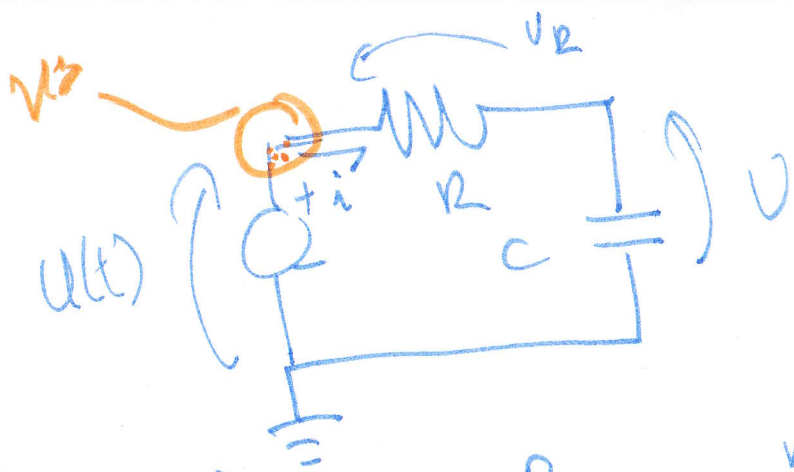
excitatione degen.

$$R i + V = u(t)$$

$$\boxed{RC \frac{dV}{dt} + V = u(t)}$$

E.N.O. circuit linear

$$\tau = RC$$

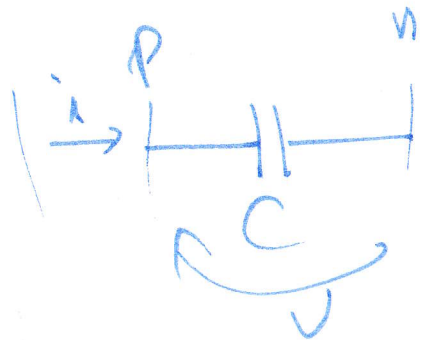


$$V = R i$$

$$i = p \cdot i$$

$$V = p \cdot U - n \cdot U$$

$$p \cdot i + n \cdot i = 0$$

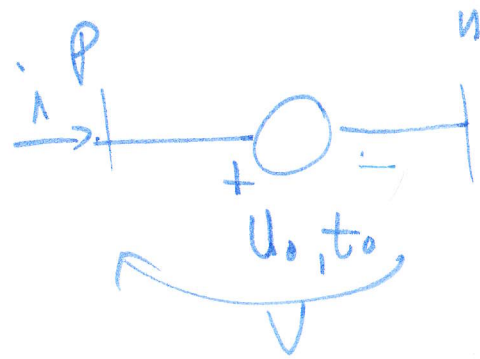


$$i = C \frac{dV}{dt}$$

$$i = p \cdot i$$

$$V = p \cdot U - n \cdot U$$

$$p \cdot i + n \cdot i = 0$$

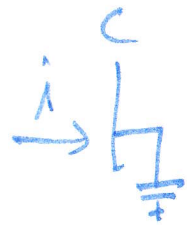


$$V = \begin{cases} 0 & | t < t_0 \\ u(t) & | t > t_0 \end{cases}$$

$$i = p \cdot i$$

$$V = p \cdot U - n \cdot U$$

$$p \cdot i + n \cdot i = 0$$



$$C \cdot U = 0 //$$

$$\forall \lambda \in \mathbb{R}$$