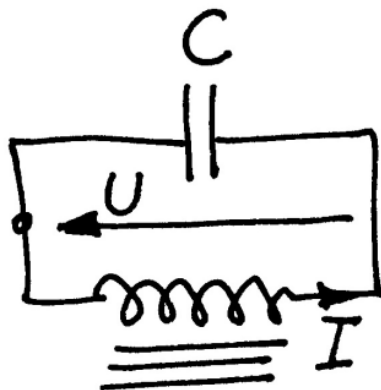




Mästarprov 13: Strömkretsen

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LC-circuit

- ▶ What is an LC-circuit?





Electronic article surveillance





Project requirements

- What is the current in the circuit?



Project requirements

- ▶ What is the current in the circuit?
- ▶ How is the current affected by the voltage?



Mathematical equations

$$L = \frac{L_0}{1 + I^2}$$

$$U = L \frac{dI}{dt}$$

$$I = -C \frac{dU}{dt}$$

$$t = 0, \quad I = 0, \quad \frac{dI}{dt} = \frac{U_0}{L_0}$$

Mathematical equations

$$\frac{d^2 I}{dt^2} = \frac{2I}{1 + I^2} \left(\frac{dI}{dt} \right)^2 - \frac{I(1 + I^2)}{L_0 C}$$

$$\tilde{y}'(t) = \begin{bmatrix} y_1'(t) \\ y_2'(t) \end{bmatrix} = \begin{bmatrix} y_2(t) \\ \frac{2y_1(t)y_2^2(t)}{1+y_1(t)^2} - \frac{1+y_1(t)^2}{L_0C} \end{bmatrix}$$

Numerical Methods - Runge Kutta 4

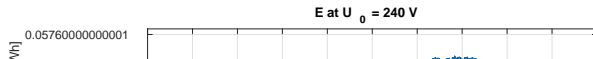
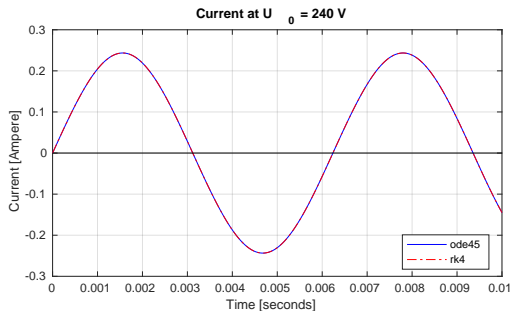
$$K_1 = hf(x_n, y_n)$$

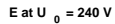
$$K_2 = hf(x_n + \frac{h}{2}, y_n + \frac{k_1}{2})$$

$$K_3 = hf(x_n + \frac{h}{2}, y_n + \frac{k_2}{2})$$

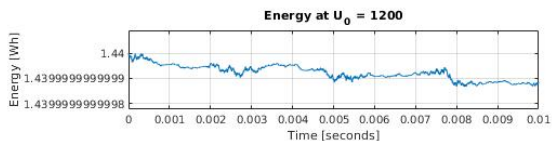
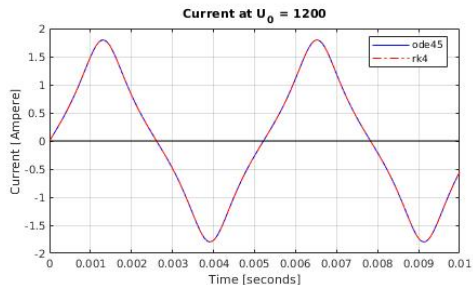
$$K_4 = hf(x_n + h, y_n + k_3)$$

$$y_{n+1} = y_n + \frac{1}{6} (K_1 + 2K_2 + 2K_3 + K_4) + O(h^5)$$





Numerical Results



Numerical Results

