Mästarprov 13: Strömkretsen

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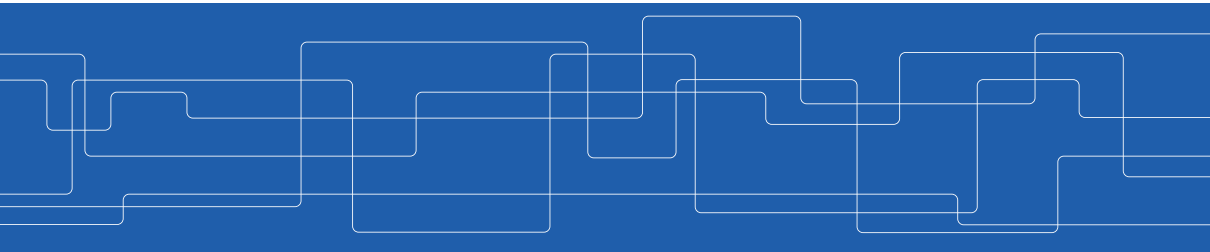
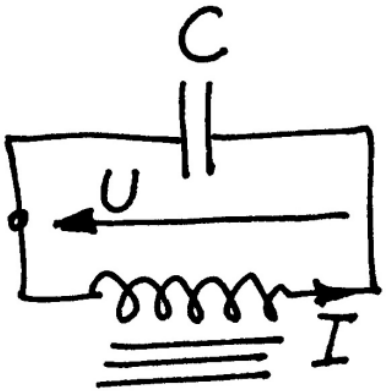



C
U
I

LC-circuit

- What is an LC-circuit?

RFID

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

$$L = \frac{L_0}{1 + I^2} \qquad U = L\frac{dI}{dt}$$

$$I = -C\frac{dU}{dt} \qquad t = 0, \quad I = 0, \quad \frac{dI}{dt} = \frac{U_0}{L_0}$$

Mathematical equations

$$\frac{d^2I}{dt^2} = \frac{2I}{1+I^2}\left(\frac{dI}{dt}\right)^2 - \frac{I(1+I^2)}{L_0C}$$

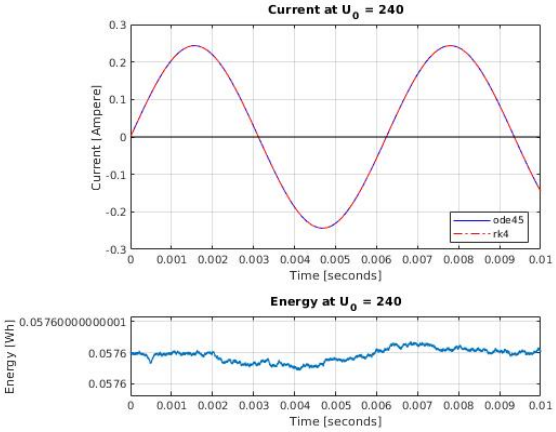
Mathematical equations

$$\tilde{y}'(t) = \begin{bmatrix} y_1'(t) \\ y_2'(t) \end{bmatrix} = \begin{bmatrix} y_2(t) \\ \frac{2y_1(t)y_2^2(t)}{1+y_1(t)^2} - \frac{1+y_1(t)^2}{L_0 C} \end{bmatrix}$$

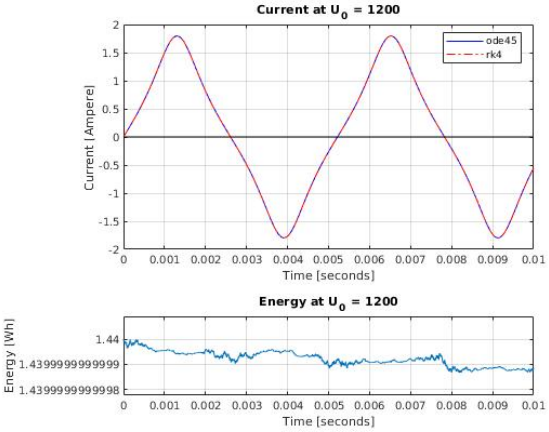
Numerical Methods - Runge Kutta 4

$$
\begin{aligned}
K_1 &= hf(x_n, y_n) \\
K_2 &= hf(x_n + \frac{h}{2}, y_n + \frac{k_1}{2}) \\
K_3 &= hf(x_n + \frac{h}{2}, y_n + \frac{k_2}{2}) \\
K_4 &= hf(x_n + h, y_n + k_3) \\
y_{n+1} &= y_n + \frac{1}{6}\left(K_1 + 2K_2 + 2K_3 + K_4\right) + O(h^5)
\end{aligned}
$$

Numerical Results



Numerical Results



Numerical Results