Charging Capacitor in a RC Circuit

Fluxion Example Description

1 Physical Background

The circuit below is set up and then the switch is closed. The capacitor then starts to accumulate charge.

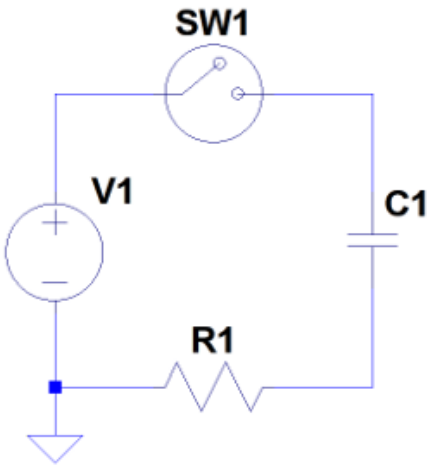

Abb. 1: Circuit Diagram

We then apply Kirchhoff's Loop Rule:

$$U_q = U_c + I \cdot R \tag{1}$$

Since this is a series circuit, the same current I that passes through the resistor is also the charging current of the capacitor. If Equation 1 is solved for I, then we obtain an equation for the charging current.

If we then divide by C on both sides, we get:

$$\frac{I}{C} = \frac{U_q - U_c}{R \cdot C} \tag{2}$$

The voltage for the capacitor can be expressed by another equation (Defintion of capacitance):

$$U_c = \frac{Q}{C} \tag{3}$$

If we now differentiate on both sides considering that $Q' = I$ and substitute the result into Equation 2 we obtain a differential equation for U_c, which we can simulate with Fluxion:

$$U_c' = \frac{U_q - U_c}{R \cdot C} \tag{4}$$