Weekly report, testing NILT0 code.

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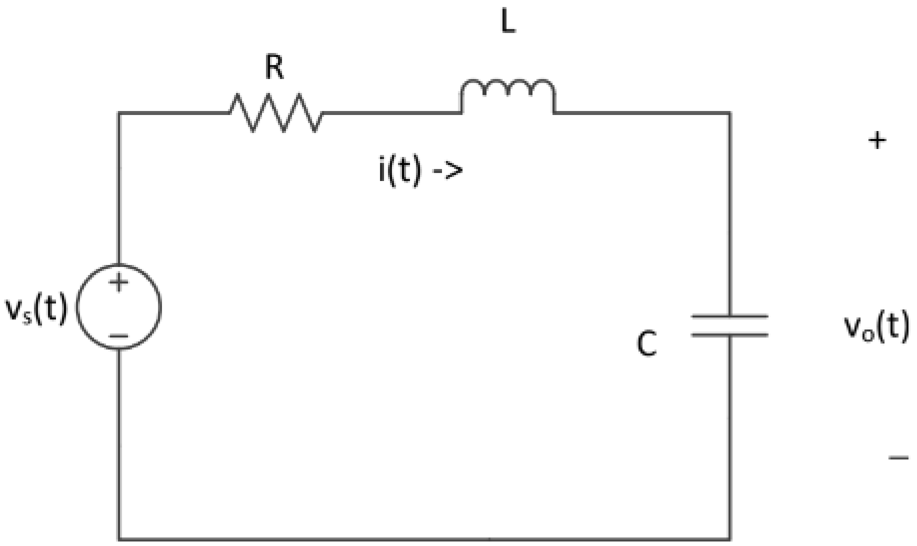
Date: 25/10/2024

Achieved goals through last week,

1. Fixed the code to accept odd values for M, as the issue was with the real pair of (ki,pi) and removed unnecessary loops.
2. Reorganised the code and tested NILT with a unit step response for different values of M and t.
3. Compare ode45 to NILT0 and see the error, then find a suitable value for M.
4. Tried to use NILT0 to find the voltage at the end of a transmission line.
5. Went over the transmission line parameters (complex propagation constant, characteristic impedance and ..etc) to classify the transmission line.

- In the following circuit, Vs was set to 5, R=0.75Ω, L=0.25H and C=2F,



Solving this circuit gives:

$$\frac{d^2vo}{dt^2} + \frac{R}{L}\frac{dvo}{dt} + \frac{1}{LC}vo = \frac{1}{LC}vs$$

In the s domain,

$$G(s) = \frac{vo}{vs} = \frac{\frac{1}{LC}}{s^2 + \frac{R}{LC}s + \frac{1}{LC}} = \frac{2}{s^2 + 3s + 2}$$

Using partial fraction, the output should be,

$$y(t) = -10e^{-t} + 5e^{-2t} + 5$$

Using `ode45` and NILT to approximate the exact solution from (t = 0) to (t = 10), we see that NILT provides highly accurate results at lower (t) values and performs comparably to `ode45` at (M = 9). However, `ode45` maintains lower error over longer times, making it more reliable for steady-state accuracy, while NILT is particularly effective for capturing transient behaviour.