This program has functions that allow conversion of Foster form RC networks to Cauer form ladders, with series R and shunt C configuration. It is a numeric program, and does not depend on symbolics for the resulting calculations. Some function examples do use symbolics.

polynomial function library

polydiv example

RCpoles2Z

Z2RCladder

Example calc:

$$RCfoster := \begin{pmatrix} 0.059444 & 0.024318 \\ 0.148191 & 0.39228 \\ 0.791593 & 0.515461 \\ 1.457584 & 1.412879 \\ 2.39196 & 3.40021 \\ 2.398542 & 10.99588 \\ 5.806863 & 35.43984 \\ 3.851088 & 109.1318 \end{pmatrix}$$

change RC form into GC form:

$$GCfoster := \text{augment}\left(\overrightarrow{\left(\frac{1}{RCfoster^{\langle 0 \rangle}}\right)}, RCfoster^{\langle 1 \rangle}\right) \qquad GCfoster = \begin{pmatrix} 16.823 & 0.024 \\ 6.748 & 0.392 \\ 1.263 & 0.515 \\ 0.686 & 1.413 \\ 0.418 & 3.4 \\ 0.417 & 10.996 \\ 0.172 & 35.44 \\ 0.26 & 109.132 \end{pmatrix}$$

convert foster GC sections into a rational Z(s), wiht numerator and denominator coef vectors:

$$Zrational := RCpoles2Z(GCfoster) \qquad Zrational^{T} = \begin{bmatrix} \begin{pmatrix} 16.905 \\ 8310.374 \\ 864484.215 \\ 1.728 \times 10^{7} \\ 7.496 \times 10^{7} \\ 6.209 \times 10^{7} \\ 6272002.149 \\ 61234.365 \end{pmatrix} & \begin{pmatrix} 1 \\ 663.105 \\ 109979.179 \\ 3393191.181 \\ 2.654 \times 10^{7} \\ 4.997 \times 10^{7} \\ 1.848 \times 10^{7} \\ 932876.793 \\ 1310.072 \end{pmatrix} \end{bmatrix}$$

num_coef_vec := Zrational_0

$\text{num_coef_vec}^T = (16.905 \quad 8310.374 \quad 864484.215 \quad 1.728 \times 10^7 \quad 7.496 \times 10^7 \quad 6.209 \times 10^7 \quad 6272002.149 \quad 61234.365)$

denom_coef_vec := Zrational_1

$\text{denom_coef_vec}^T = (1 \quad 663.105 \quad 109979.179 \quad 3393191.181 \quad 2.654 \times 10^7 \quad 4.997 \times 10^7 \quad 1.848 \times 10^7 \quad 932876.793 \quad 1310.072)$

RCcauer := Z2RCladder(num_coef_vec, denom_coef_vec)

$$\text{RCcauer} = \begin{pmatrix} 0.076668 & 0.021394 \\ 0.640425 & 0.161112 \\ 1.469714 & 0.221559 \\ 2.49764 & 0.837544 \\ 2.757703 & 2.759451 \\ 2.896645 & 10.735223 \\ 5.865402 & 22.800795 \\ 0.701068 & 512.198301 \end{pmatrix}$$

We can create a single function that does the entire conversion:

RCfoster2RCcauer(RCfoster_values) ≡

"Input is 2-col array of R and C of Foster network values."

"Return is 2-col array of R-C Cauer ladder network values. "

GCfoster ← augment$\left(\left(\overrightarrow{\frac{1}{\text{RCfoster_values}^{\langle 0 \rangle}}}\right), \text{RCfoster_values}^{\langle 1 \rangle}\right)$

Z ← RCpoles2Z(GCfoster)

Z2RCladder(Z_0, Z_1)

$$\text{RCfoster} = \begin{pmatrix} 0.059 & 0.024 \\ 0.148 & 0.392 \\ 0.792 & 0.515 \\ 1.458 & 1.413 \\ 2.392 & 3.4 \\ 2.399 & 10.996 \\ 5.807 & 35.44 \\ 3.851 & 109.132 \end{pmatrix}$$

RCcauer := RCfoster2RCcauer(RCfoster)

$$\text{RCcauer} = \begin{pmatrix} 0.077 & 0.021 \\ 0.64 & 0.161 \\ 1.47 & 0.222 \\ 2.498 & 0.838 \\ 2.758 & 2.759 \\ 2.897 & 10.735 \\ 5.865 & 22.801 \\ 0.701 & 512.198 \end{pmatrix}$$