Trigger Circuit

exa2

Variables and parameters:

y_i: voltages, $i = 1, \ldots, 6$
λ: input voltage (bifurcation parameter)
y_6: output voltage

System of equations resulting from Kirchhoff's law:

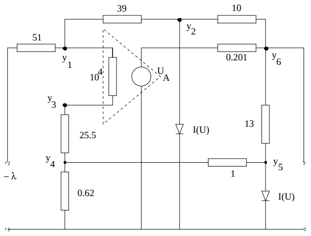
$$\begin{aligned}
f_1 &= (y_1 - y_3)/10000 + (y_1 - y_2)/39 + (y_1 + \lambda)/51 = 0 \\
f_2 &= (y_2 - y_6)/10 + I(y_2) + (y_2 - y_1)/39 = 0 \\
f_3 &= (y_3 - y_1)/10000 + (y_3 - y_4)/25.5 = 0 \\
f_4 &= (y_4 - y_3)/25.5 + y_4/0.62 + y_4 - y_5 = 0 \\
f_5 &= (y_5 - y_6)/13 + y_5 - y_4 + I(y_5) = 0 \\
f_6 &= (y_6 - y_2)/10 - [U_{\mathrm{A}}(y_3 - y_1) - y_6]/0.201 + (y_6 - y_5)/13 = 0
\end{aligned}$$

with amplifier and diodes modelled as

$$U_{\mathrm{A}}(U) = 7.65\ \arctan(1962U), \quad I(U) = 5.6 \cdot 10^{-8}(e^{25U} - 1).$$

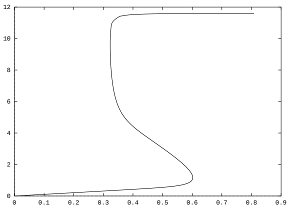
Figures:

1



Trigger Circuit with operational amplifier and two diodes.

2



Trigger, output voltage y_6 versus input voltage λ.

Comments and explanations:
Original source of the model: G. Pönisch, H. Schwetlick: Ein lokal überlinear konvergentes Verfahren zur Bestimmung von Rückkehrpunkten implizit definierter Raumkurven. Numer. Math. **38** (1982) 455–465
Bistability range: $0.322866 < \lambda < 0.601853$