Mathematical Description

Equations:

$$x_1 = \begin{cases} 0 & t<1 \quad or \quad 2 \le t < 5 \\ 1 & else \end{cases}, \; x_2 = \begin{cases} 0 & t<3 \quad or \quad 4 \le t < 6 \\ 1 & else \end{cases},$$

$$x_3 = \begin{cases} 3 & x_1 > 0 \quad and \quad x_2 \le 0.01 \quad and \quad x_4 < 2.5 \\ -3 & x_1 \le 0.001 \quad and \quad x_2 > 0 \quad and \quad x_4 > -2.5 \\ 0 & else \end{cases}$$

$$\dot{x}_4 = 2 * x_3$$

Independent variable:

$$t, \; t \in [0,T], \; T = 10$$

To solve for: 4 variables:

$$x_1, x_2, x_3, x_4$$

Decomposition

Number of parts: 3

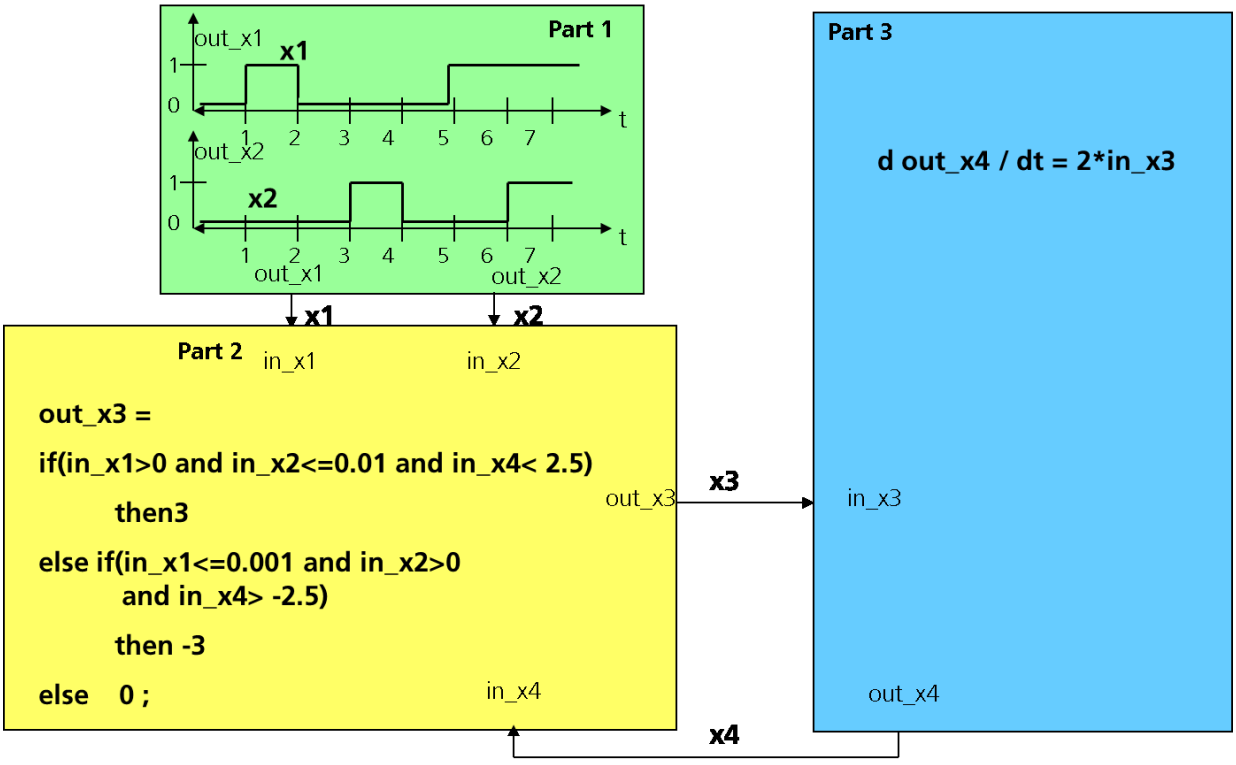
Part	Input	Equations	Output
1	-	$x_1 = \begin{cases} 0 & t<1 \quad or \quad 2 \le t < 5 \\ 1 & else \end{cases}$, $x_2 = \begin{cases} 0 & t<3 \quad or \quad 4 \le t < 6 \\ 1 & else \end{cases}$,	$x_1, \; x_2$
2	x_1, x_2, x_4	$x_3 = \begin{cases} 3 & x_1 > 0 \quad and \quad x_2 \le 0.01 \quad and \quad x_4 < 2.5 \\ -3 & x_1 \le 0.001 \quad and \quad x_2 > 0 \quad and \quad x_4 > -2.5 \\ 0 & else \end{cases}$	x_3
3	x_3	$\dot{x}_4 = 2 * x_3$	x_4

Priority table

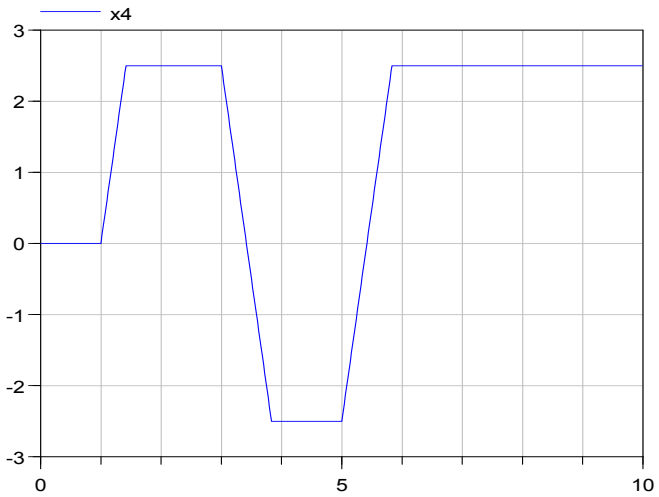
The parts with smaller priority should be calculated before the parts with higher priority because of the directed signal flow between the parts. Begin with priority 0.

Priority	Part
0	1
1	2, 3

The decomposition can be visualized by:



Expected Solution



Remarks

Quasi digitale Signale steuern eine Differentialgleichung (Anstieg). Kopplung Boolescher Ausdrücke mit analogem Verhalten. Ein Zyklus.

Former internal name of example was example C.

Source

Designed by Fraunhofer IIS EAS, C. Clauß.