The marking equation

$I \cdot C = 0$

For every $M_0 \rightsquigarrow M$

$$M_0 + C \cdot X = M$$

M_0: initial marking; C: incidence matrix; X: counting Parikh vector of σ

$I \cdot C = 0$

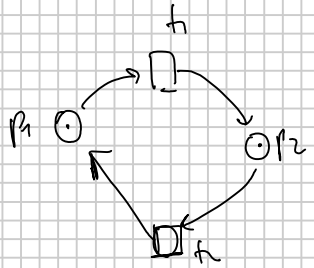
$$(i_1 \dots i_m) \cdot \begin{pmatrix} t_1 & \dots & t_n \\ & & \end{pmatrix} \begin{matrix} p_1 \\ \vdots \\ p_m \end{matrix}$$

$I \cdot C = 0$

$$I \cdot M_0 + \underbrace{I \cdot C}_{0} \cdot X = I \cdot M$$

For every $M_0 \rightsquigarrow M$

$$\boxed{I \cdot M_0 = I \cdot M} \Leftarrow$$



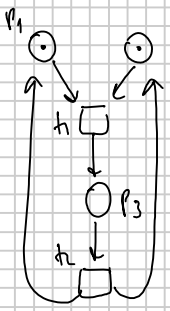
$I \cdot M_0 =$

$= (1,1) \cdot \begin{pmatrix} 1 \\ 1 \end{pmatrix} = 2$

$(1,1) \begin{pmatrix} m_1 \\ m_2 \end{pmatrix} = 2$

$m_1 + m_2 = 2$

$$\underbrace{(1,1)}_{I} \cdot \begin{matrix} \\ p_1 \\ p_2 \end{matrix} \begin{matrix} \begin{matrix} t & t_2 \end{matrix} \\ \begin{pmatrix} -1 & 1 \\ 1 & -1 \end{pmatrix} \end{matrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

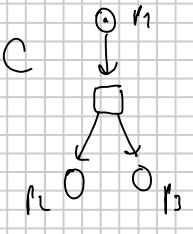


$(1,1,2) \begin{pmatrix} t & t_2 \\ -1 & 1 \\ -1 & 1 \\ 1 & -1 \end{pmatrix} = 0$

$(1,1,2) \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix} = 2$

$(1,1,2) \begin{pmatrix} m_1 \\ m_2 \\ m_3 \end{pmatrix} = 2 \qquad m_1 + m_2 + 2m_3 = 2$

$I \cdot C$



$(0,1,-1) \begin{pmatrix} t \\ -1 \\ 1 \\ 1 \end{pmatrix} = 0$

$(0,1,-1) \begin{pmatrix} m_1 \\ m_2 \\ m_3 \end{pmatrix} = m_2 - m_3$

//

$(0,1,-1) \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} = 0$

$\underline{I} \cdot C = 0$ $\quad m_2 = m_3$

$$\begin{pmatrix} \downarrow \\ -1 \\ 1 \\ -1 \end{pmatrix}$$

$(1, 2, 1)$

$\downarrow$

$m_1 + 2m_2 + m_3$

$\underline{I} \cdot C = 0$

P- invariants
place - invariants
S- invariant
↖ Stellen
P- flows
linear invariant

$C \cdot J = 0$

$M = M_0 + C \cdot X \quad \Leftarrow$

$M_0 \xrightarrow{\sigma} M \quad s.t \quad \vec{\sigma} = J$

$M = M_0 + \underbrace{C \cdot J}_{0} = M = M_0$

$M = M_0' + C \cdot X \qquad M = M_0'$

$\boxed{C \cdot J = 0}$

$0,3 \quad 1$

$0,5 \quad -1$

$1,2$

$$P_i \begin{pmatrix} t_1 & t_2 & t_3 \\ 1 & -1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$$