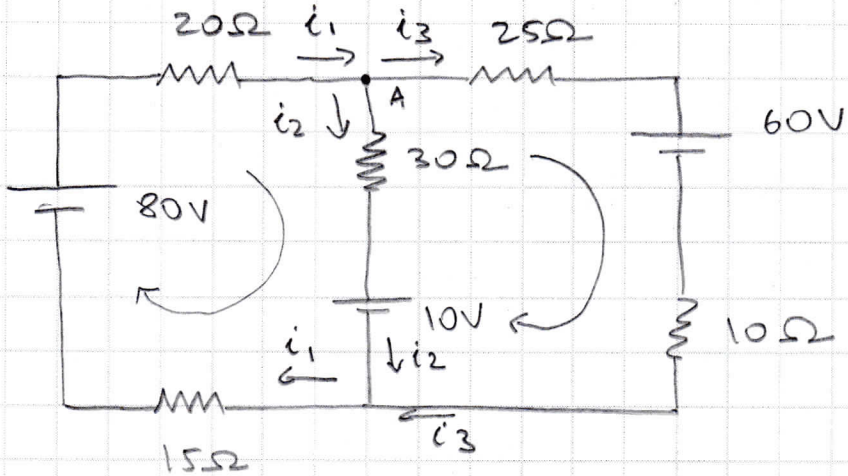
Kirchhoff - Exemplo com determinante



Suposição inicial: $i_1 = i_2 + i_3$ (1) (Lei dos nós)

Malha esquerda: $-30i_2 - 10 - 15i_1 + 80 - 20i_1 = 0$

$-30i_2 - 35i_1 = -80 + 10$

$-30i_2 - 35i_1 = -70 \quad (\div -5)$

$6i_2 + 7i_1 = 14$ (2)

Malha direita: $-25i_3 - 60 - 10i_3 + 10 + 30i_2 = 0$

$-35i_3 + 30i_2 = 60 - 10$

$-35i_3 + 30i_2 = 50 \quad (\div 5)$

$-7i_3 + 6i_2 = 10$ (3)

$$\begin{cases} i_1 = i_2 + i_3 \\ 6i_2 + 7i_1 = 14 \\ -7i_3 + 6i_2 = 10 \end{cases} \qquad \begin{cases} i_1 - i_2 - i_3 = 0 \\ 7i_1 + 6i_2 - 0i_3 = 14 \\ 0i_1 + 6i_2 - 7i_3 = 10 \end{cases}$$

$$D = \begin{vmatrix} 1 & -1 & -1 \\ 7 & 6 & 0 \\ 0 & 6 & -7 \end{vmatrix} \begin{matrix} 1 & -1 \\ 7 & 6 \\ 0 & 6 \end{matrix}$$

$0 \quad 0 \quad 49 \qquad -42 \quad 0 \quad -42$

$\Rightarrow D = (-42 - 42) - 49 = -133$

$$Di_1 = \begin{vmatrix} 0 & -1 & -1 \\ 14 & 6 & 0 \\ 10 & 6 & -7 \end{vmatrix} \begin{matrix} 0 & -1 \\ 14 & 6 \\ 10 & 6 \end{matrix}$$

$-60 \quad 0 \quad +98 \qquad 0 \quad 0 \quad -84$

$38 \qquad -84$

$Di_1 = -84 - 38 = -122$

$i_1 = \frac{Di_1}{D} = \frac{-122}{-133} \Rightarrow i_1 = 0{,}917\,A$

Kirchhoff c/ determinante, cont.

$$Di_2 = \begin{vmatrix} 1 & 0 & -1 \\ 7 & 14 & 0 \\ 0 & 10 & -7 \end{vmatrix} \begin{matrix} 1 & 0 \\ 7 & 14 \\ 0 & 10 \end{matrix}$$

0 0 0 −98 0 −70

$$Di_2 = -98 - 70 = -168$$

$$i_2 = \frac{Di_2}{D} = \frac{-168}{-133} \Rightarrow i_2 = 1{,}26\,A$$

$$Di_3 = \begin{vmatrix} 1 & -1 & 0 \\ 7 & 6 & 14 \\ 0 & 6 & 10 \end{vmatrix} \begin{matrix} 1 & -1 \\ 7 & 6 \\ 0 & 6 \end{matrix}$$

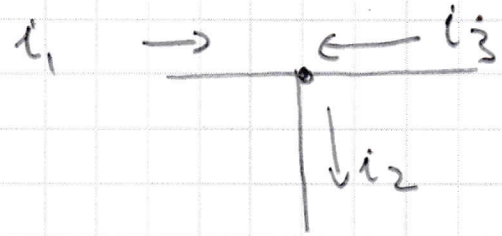
0 84 −70 60 0 0

$$Di_3 = 60 - (84 - 70) = 46$$

$$i_3 = \frac{Di_3}{D} = \frac{46}{-133}$$

$$i_3 = -0{,}346\,A$$

Portanto, o fluxo convencional correto é



$$i_2 = i_1 + i_3$$

$i_1 = 0{,}917\,A$
$i_2 = 1{,}26\,A$
$i_3 = 0{,}346\,A$