Exercises on physical design

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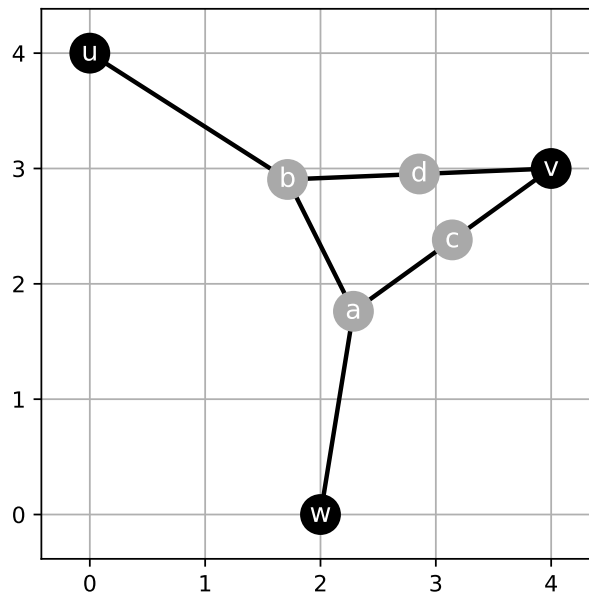October 21, 2017

1 Quadratic placement

By computing the Laplacian matrix of the graph, and removing the rows and columns of the fixed cells, we get the matrix A used in the linear equation system.

$$A = \begin{pmatrix} 3 & -1 & -1 & 0 \\ -1 & 3 & 0 & -1 \\ -1 & 0 & 2 & 0 \\ 0 & -1 & 0 & 2 \end{pmatrix}$$

The right hand side for x is $b^x = \begin{pmatrix} 2 & 0 & 4 & 4 \end{pmatrix}^T$ and for y is $b^y = \begin{pmatrix} 0 & 4 & 3 & 3 \end{pmatrix}^T$, so we can solve now the two systems: $AX = b^x$ and $AY = b^y$ and obtain the coordinates of the non-fixed cells.

$$X = \begin{pmatrix} 2.29 & 1.71 & 3.14 & 2.86 \end{pmatrix}^T, \quad Y = \begin{pmatrix} 1.76 & 2.90 & 2.38 & 2.95 \end{pmatrix}^T$$

The graph can be plotted now, where the black nodes are the fixed ones $\{u, v, w\}$ while the gray nodes are the non-fixed cells $\{a, b, c, d\}$. For details see the python script `placement.py`.

2 Channel routing