SDP relaxation of SNL

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In our notation, dim represents the number of dimensions we are considering. In other words, dim = 2 means we are in Euclidean space, and every anchor/sensor is a 2-dimensional vector.

pts = 50 means we are solving for 50 sensor locations, and anc = 3 means we are given 3 anchor locations. I have described the rest in code comments. I also formulate the SDP relaxation below. This is adapted from Equation 7 from https://web.stanford.edu/ yyye/adhocn4.pdf, and I have omitted the sensor-sensor distances for now (i.e. the equality constraints as well as the inequality constraints), which are trivial to add.

$$Z := \begin{pmatrix} I & X \\ X^T & Y \end{pmatrix} \succeq 0$$

Note that $I \in R^{dimxdim}, X \in R^{dimxpts}, andY \in R^{ptsxpts}$. Then, the problem can be written as a standard SDP problem:

$$\sum_{k,j \in N_e} \left(\alpha_{kj}^{+} + \alpha_{kj}^{-} \right)$$

s.t.

$$\begin{aligned}
&(1;0;\mathbf{0})^T Z (1;0;\mathbf{0}) = 1 \\
&(0;1;\mathbf{0})^T Z (0;1;\mathbf{0}) = 1 \\
&(1;1;\mathbf{0})^T Z (1;1;\mathbf{0}) = 2 \\
&\left(a_k; e_j\right)^T Z \left(a_k; e_j\right) - \alpha_{kj}^{+} + \alpha_{kj}^{-} = \left(\hat{d}_{kj}\right)^2, \forall k, j \in N_e, \\
&\alpha_{kj}^{+}, \alpha_{kj}^{-} \geq 0 \\
&Z \succeq 0.
\end{aligned}$$