IRO Homework 2: 2D localization from ultrasound measurements.

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Robot on unknown position x measured three distances d_1, d_2, d_3 from three beacons located at coordinates $\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3$. Estimate robots position $\mathbf{x}$ minimizing sum of squares of residual distances $\|\mathbf{x} - \mathbf{a}_i\|_2^2$ for $i = 1 \dots 3$.

$$d_1 = 3.6056, d_2 = 2.0000, d_3 = 4.1231,$$

$$\mathbf{a}_1 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}, \mathbf{a}_2 = \begin{pmatrix} 3 \\ 2 \end{pmatrix}, \mathbf{a}_3 = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$$

1. Formulate the problem as an overdetermined set of non-linear equations.
2. Choose initial solution $\mathbf{x}_0$.
3. Linearize equation around point $\mathbf{x}_0$.
4. Solve overdetermined set of non-linear equations in the least squares sense.
5. Repeat from 3 until convergence is reached.