Matrix Theory(EE5609) Assignment 5

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***Abstract*—This Assignment finds the radius and centre of a given circle.**

Download latex-tikz codes from

https://github.com/anshum0302/EE5609/blob/master/assignment5a/assign5.tex

1 PROBLEM STATEMENT

Find the radius and the coordinates of the centre of the circle

$$2\mathbf{x}^T\mathbf{x} + \begin{pmatrix}16 & -4\end{pmatrix}\mathbf{x} + 88 = 0 \tag{1.0.1}$$

2 Solution

The general equation of a circle is given by

$$\mathbf{x}^T\mathbf{x} - 2\mathbf{c}^T\mathbf{x} + f = 0 \tag{2.0.1}$$

where $\mathbf{c}$ is the centre of the circle and r = $\sqrt{\|\mathbf{c}\|^2 - f}$ is the radius of the circle.

Dividing (1.0.1) by 2 and rearranging terms (1.0.1) can be rewritten as

$$\mathbf{x}^T\mathbf{x} - 2\begin{pmatrix}-4\\1\end{pmatrix}^T\mathbf{x} + 44 = 0 \tag{2.0.2}$$

Comparing (2.0.1) and (2.0.2) we get

$$\mathbf{c} = \begin{pmatrix}-4\\1\end{pmatrix} \tag{2.0.3}$$

$$f = 44 \tag{2.0.4}$$

Then centre of the circle (1.0.1) is $\mathbf{c} = \begin{pmatrix}-4\\1\end{pmatrix}$ and radius

$$r = \sqrt{\|\mathbf{c}\|^2 - f} \tag{2.0.5}$$

$$= \sqrt{(-4)^2 + 1^2 - 44} \tag{2.0.6}$$

$$= \sqrt{-27} \tag{2.0.7}$$

But radius of the circle cannot be a imaginary number. So the given equation (1.0.1) doesn't represent a circle.