Matrix-circle

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CONTENTS

***Abstract*—This document shows how to find a variable k given that 2 circles intersect Orthogonally using python.**

I. PROBLEM STATEMENT

If circles $x^2+y^2+2x+2ky+6=0$, $x^2+y^2+2ky+k=0$ intersect orthogonally then find k.

II. CONSTRUCTION

figs/assign5.png

Fig. 1. Orthogonal Circles C1 and C2

III. SOLUTION

Equation of a circle is $(x-a)^2+(y-b)^2=r^2$ with center C = $\begin{pmatrix} a \\ b \end{pmatrix}$ and radius r.
So,
The First circle can also be written as

$$(x+1)^2+(y+k)^2=k^2-5 \tag{1}$$

Symbol	Value	Description
C1	$\begin{pmatrix} -1 \\ -k \end{pmatrix}$	Center of circle C1
C2	$\begin{pmatrix} 0 \\ -k \end{pmatrix}$	Center of circle C2
r1	$\sqrt{k^2-5}$	Radius of circle C1
r2	$\sqrt{k^2-k}$	radius of circle C2
θ	90°	Given that C1 and C2 are Orthogonal
d	1	Distance between centers of the circles C1 and C2

TABLE I
PARAMETERS

The Second circle can also be written as

$$(x-0)^2+(y+k)^2=k^2-k \tag{2}$$

Given that the two circles are orthogonal so tangents at the point of intersection are also orthogonal also radius vectors of circles at the point of intersection are also orthogonal so from figure 1, the angle between the radii r1 and r2 is 90°.

From figure $\triangle$PC1C2 is a Right angled triangle with hypotenuse d = $||C1-C2||$.

So, by using **Pythagoraus theorem**

$d^2=r1^2+r2^2$

Therefore,

1 = k^2-5+k^2-k

i.e, $2k^2-k-6=0$

Thus, k = 2 or $\frac{-3}{2}$

Therefore, the value of k is

k = 2 or $\frac{-3}{2}$

IV. SOFTWARE

Download the following code using,

$$\boxed{\text{svn co}}$$

and execute the code by using command

Python3 Assignment5.py

V. Conclusion

We found a variable k given that 2 circles intersect Orthogonally.