

Surface Curvature problem set - 1

Try Python to solve the problems below for two-dimensional circles.

- 1) A) Draw a circle with radius $a=1$ and has the center \mathbf{r} at $(2,2)$
The equation for a fuzzy surface is expressed by $G(\mathbf{x}) = \exp(-(|\mathbf{x}-\mathbf{r}|-a)/\sigma)$. \mathbf{x} is a two-dimensional vector.
A new circumference can be drawn by plotting all the points \mathbf{x} where the value of $1/G(\mathbf{x})=C$.
B) In one plot, draw the original circle and new circumferences for $\sigma=0.1$ and $C=0.8, 1.0$, and 1.2 . In this equation, a value of $1/G(\mathbf{x})=C$ will be satisfied by \mathbf{x} either inside or outside the original circle, not both. The simplified equation we dealt with during the group meeting differs from this.
C) In another plot, draw the original circle and new circumferences for $C=0.8$ and $\sigma=0.1, 0.3$, 0.5 , and 0.7 .
D) In another plot, draw the original circle and new circumferences for $C=1.2$ and $\sigma=0.1, 0.3$, 0.5 , and 0.7 . σ

- 2) A) Draw two circles. One with radius $a_1=1$ and has the center \mathbf{r}_1 at $(2,2)$, and another with radius $a_2=1.2$ and has the center \mathbf{r}_2 at $(4,2)$
The equation for a fuzzy surface is expressed by $G(\mathbf{x}) = \sum_i \exp(-(|\mathbf{x}-\mathbf{r}_i|-a_i)/\sigma)$, where i runs over the number of atoms. In the above case, i goes from 1 to 2.
A new surface combining both the circles can be drawn by plotting all the points \mathbf{x} where the value of $1/G(\mathbf{x})=C$
B) In one plot, draw the original circle and new circumferences for $\sigma=0.1$ and $C=0.8, 1.0$, and 1.2 .
C) In another plot, draw the original circle and new circumferences for $C=0.8$ and $\sigma=0.1, 0.3$, 0.5 , and 0.7 .
D) In another plot, draw the original circle and new circumferences for $C=1.2$ and $\sigma=0.1, 0.3$, 0.5 , and 0.7 .