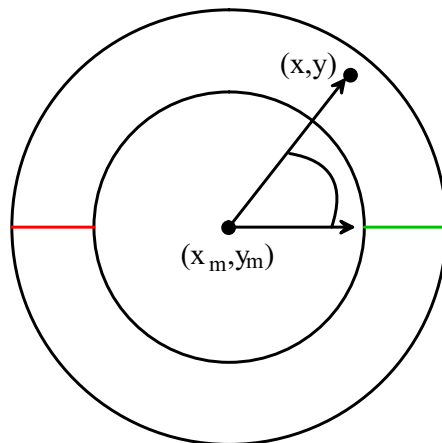


Exercise 4.3:

Define an algorithm for filling an annulus with a nonlinear colour gradient. Assume that two colours at 0° and 180° are specified and the interpolation between these two colours shall take place along the arc of the circle. Use polar coordinates to describe the points in the annulus. Implement your algorithm for this colour interpolation technique in Java 2D.

Solution (sketch):



In order to determine the colour for the pixel (x, y) , compute the angle α in the figure above.

The interpolated colour for the pixel (x, y) is then

$$\frac{\pi - \alpha}{\pi} \cdot \text{ColorAt0} + \frac{\alpha}{\pi} \cdot \text{ColorAt180}$$

where $0 \leq \alpha \leq \pi$.

We have

$$\cos \alpha = \frac{(1, 0) \cdot \begin{pmatrix} x - x_m \\ y - y_m \end{pmatrix}}{\left\| \begin{pmatrix} x - x_m \\ y - y_m \end{pmatrix} \right\|} = \frac{x - x_m}{\sqrt{(x - x_m)^2 + (y - y_m)^2}}$$

The programs `CircleColouring.java` and `Kreisverlauf.java` show possible solutions. `Kreisverlauf.java` draws small ellipse arcs for the colour interpolation.