Colorful Roses

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1 Introduction

We will attempt to develop colorful roses by transforming mathematical equations. The equations that are going to be transformed are trigonometric equations, and computer software may be used to perform plotting.

2 Condensing Points

It is a challenging process to develop colorful roses because they are solid objects that consist of a mixture of colors. But roses are basically red, some parts are darker and some parts are lighter. Since they are solid objects the equations will have to change so that more points are obtained in a smaller interval. Observe the graph of $\sin\theta$ and the graph of $\sin\theta^n$ in figures 1 and 2 respectively.

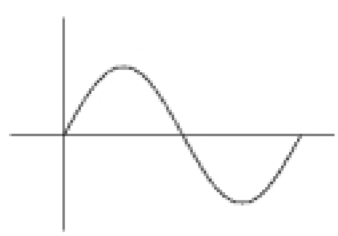

Figure 1: $\sin\theta$ function graph

The equation $y = \sin\theta$ is of the form $y = \sin k\theta$, where k determines the period, and the period is constant. But the equation $y = \sin\theta^n$ is a function of the form

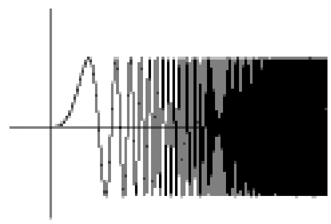

Figure 2: $\sin\theta^n$ function graph

$f(\theta) = \sin g(\theta)$, where $g(\theta) = \theta^n$ and $g(\theta)$ is forever increasing, affecting the period which becomes smaller. For very large values of θ the period is extremely small so that the points are very close together.

3 Modeling the Rose

Consider the rose with the shape on figure 3.

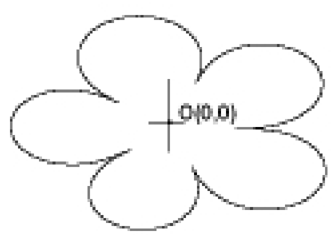

Figure 3: Shape of a rose

Every point on the rose is a distance r from the point O. The colors on a computer are a mixture of reds, greens, and blues. Because roses are red we will work with the red scale (see figure 4)

As a point moves away from O the color of the point on the rose gets lighter so that the value of the color is directly proportional to r. Let c indicate a certain value of red and R the maximum value of r. Then the color of a point on the rose is given by

$$c = 64 + 191\left(\frac{r}{R}\right) \tag{1}$$

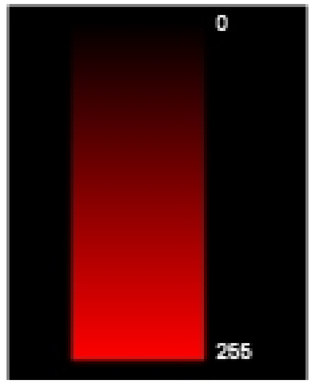

Figure 4: Color scale

and the equation of the rose is given by

$$r = \frac{R}{2}\left|\sin\left(\frac{n\theta}{2}\right)\right|^{m} + \frac{R}{2}\sin\theta^{3} \tag{2}$$

where $10\pi < \theta < 12\pi$, and n determines the number of petals and m is the explosive factor. An exploded rose is bigger than normal. Thus in the case of a normal rose $m = 1$ and of an exploded rose $m = 0.5$. A rose developed with these equations is shown on figure 5.

To make roses more realistic we must introduce what shall be called a ribbing effect. This effect is a mere change in the equation of determination of color. The equation must change to

$$c_r = c + 5\sin f\theta \tag{3}$$

where c_r determines the new color with the ribbing effect, and f the degree of the ribbing effect. This ribbing effect causes alternating dak and light bands to appear on the rose. This is due to the fact that $5\sin f\theta$ will cause c_r to increase and decrease as the revolution progresses. An increase in c_r means that a point on the rose becomes lighter, and a decrement means that a point on the rose becomes darker. An example of a rose developed with the ribbing effect is shown on figure 6.

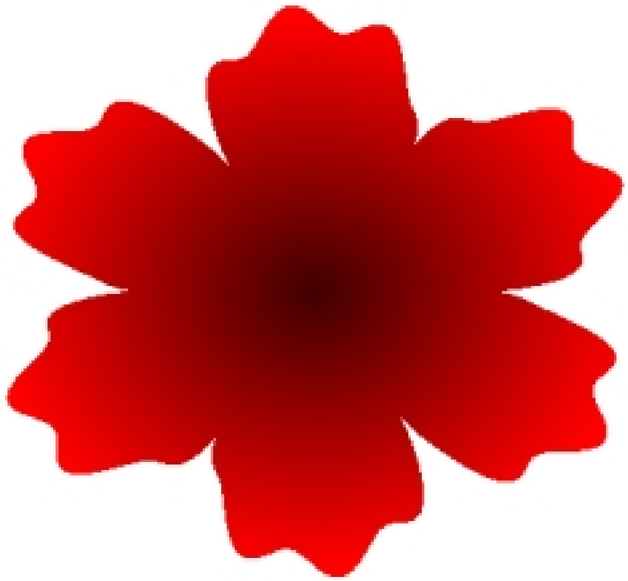

Figure 5: Simple rose

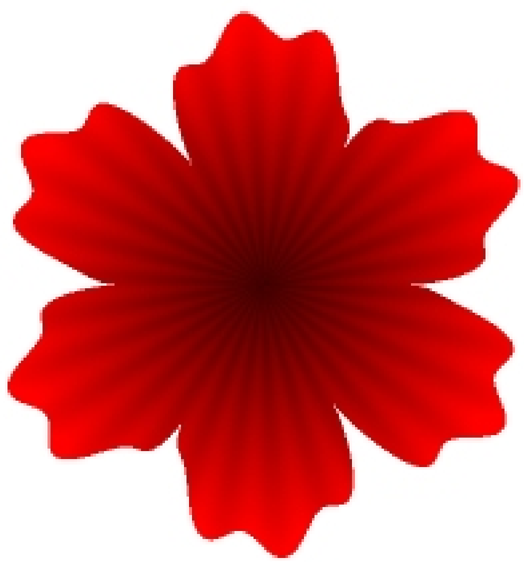

Figure 6: Rose with ribbing effect