Lewis O. Harvey, Jr.–Instructor
Clare Sims–Assistant
MUEN D156, 09:30–10:45 TR

Homework 6: Size Constancy
10 Points: Due at the beginning of class, Thursday, 19 March 2009

There are two parts to this homework assignment. Each part counts 5 points. Late homework will receive a grade of zero.

Part 1:

The size in degrees of visual angle of an object's retinal image is a function of both the height (h) of the object and the distance (D) at which it is viewed. It is calculated by this formula: $rs = 2 * \tan^{-1}\left((h/2)/D\right)$. Here is an R function that takes the height of an object and its viewing distance and returns the size of the retinal image in degrees:

```
theta <- function(h,D) {2*atan2(h/2,D)*180/pi}
```

where h and D are in the same units. After you define the function you can use it to calculate the retinal image size of any object. For example, the moon is 2159 miles in diameter and is about 238,863 miles from the earth and therefore has a retinal size of 0.52 degrees. In R you would type `theta(2159, 238863)` to compute this value.

Calculate the retinal size (rs) of a 6 foot tall person viewed from these distances:

Distance in feet	25	50	100	150	200	250	300	350	400
Visual Angle Degrees									
Perceived Size									

Plot a graph of the results with Distance on the x-axis and degrees on the y-axis. What happens to the retinal image as viewing distance gets bigger?

Part 2:

The size-distance hypothesis predicts a relationship between perceived size (PS) and retinal size (RS) and apparent distance (AD): $PS = RS * AD$. To scale perceived size correctly, given accurate perception of apparent distance, this R function can be defined:

```
ps <- function(RS, AD) {RS * AD / (180 / pi)}
```

Assume that the perception of apparent distance (AD) is correct, what will be the perceived size of the person viewed at the above distances? Plot a graph of perceived size (y-axis) as a function of distance (x-axis). What happens to perceived size as viewing distance changes?