CASE STUDY – DRAWING ARCHES

Arches have been used throughout history in architectural compositions. Their structural strength and ornamental beauty make them very important elements in structural design, and a rich variety of shapes have been incorporated into cathedrals, bridges, doorways, and so on.

Figure 3.52 shows two basic arch shapes. The arch in part a) is centered at the origin and has a width of 2W. The arch begins at height H above the base line. Its principal element is a half- circle with a radius R = W. The ratio H/W can be adjusted according to taste. For instance, H/W might be related to the golden ratio.

Figure 3.52b) shows an idealized version of second most famous arch shape, the pointed or "equilateral" arch, often seen in cathedrals. Here two arcs of radius R = 2W meet directly above the center. (Through what angle does each arc sweep?)

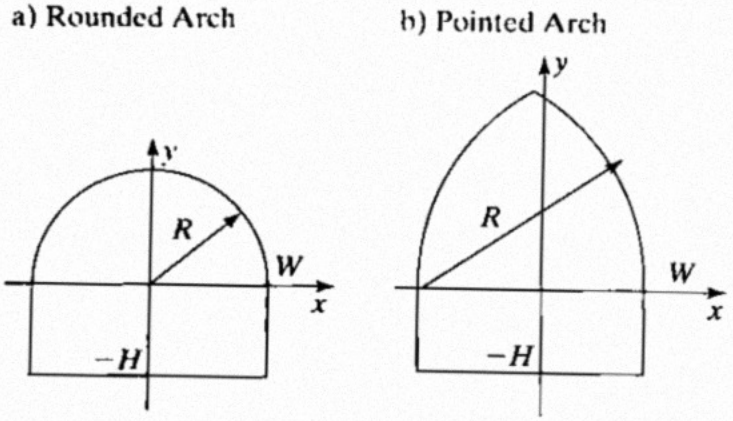

Figure 3.52

The ogee (or "keel") arch is shown in Figure 3.53. This arch was introduced about A.D. 1300 and was popular in architectural structures throughout the late Middle Ages. Circles of radius fR rest on top of a rounded arch of radius R for some fraction f. This fixes the position of the two circles. (What are the coordinates of point C?) On each side two arcs blend together to form a smooth pointed top. It is interesting to work out the parameters of the various arcs in terms of W and f.

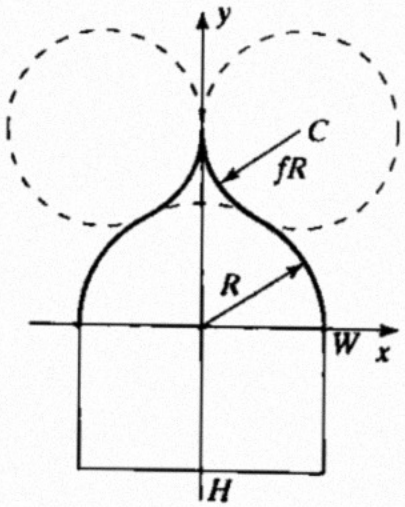

Figure 3.53

Develop routines that can draw each of the arch types described above. Also write an application that draws an interesting collection of such arches in a castle, mosque, or bridge of your design.