GALGOTIAS UNIVERSITY

SCHOOL OF COMPUTING SCIENCE AND ENGINEERING

Program: B.Tech

Course Code: BTCS2401

Course Name: Computer Graphics

Teacher :Ms. Nidhi

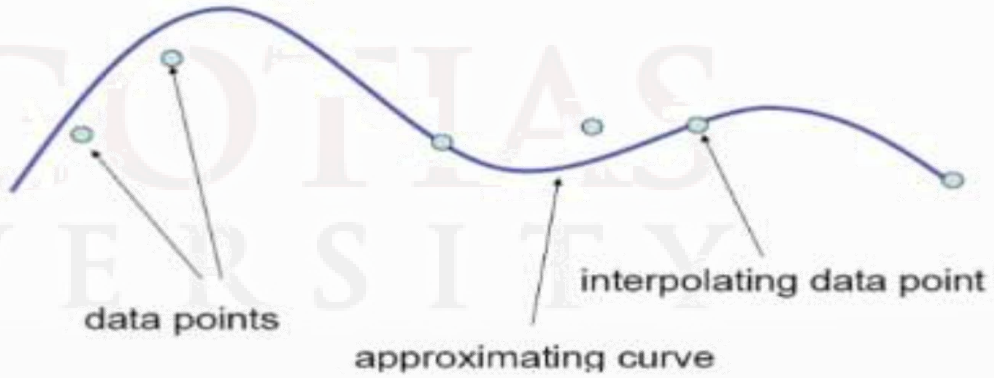
Content:-

- Ellipsoid
- Blobby objects

Curves and Surfaces

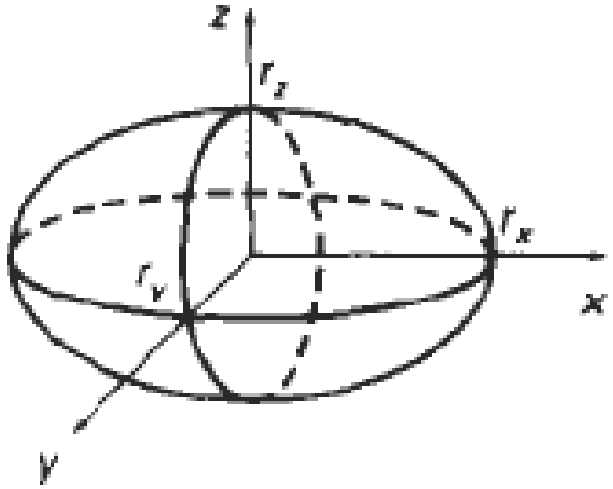
• Displays of three dimensional curved lines and surfaces can be generated from an input set of mathematical functions defining the objects or from a set of users specified data points.

• When functions are specified, a package can project the defining equations for a curve to the display plane and plot pixel positions along the path of the projected function.

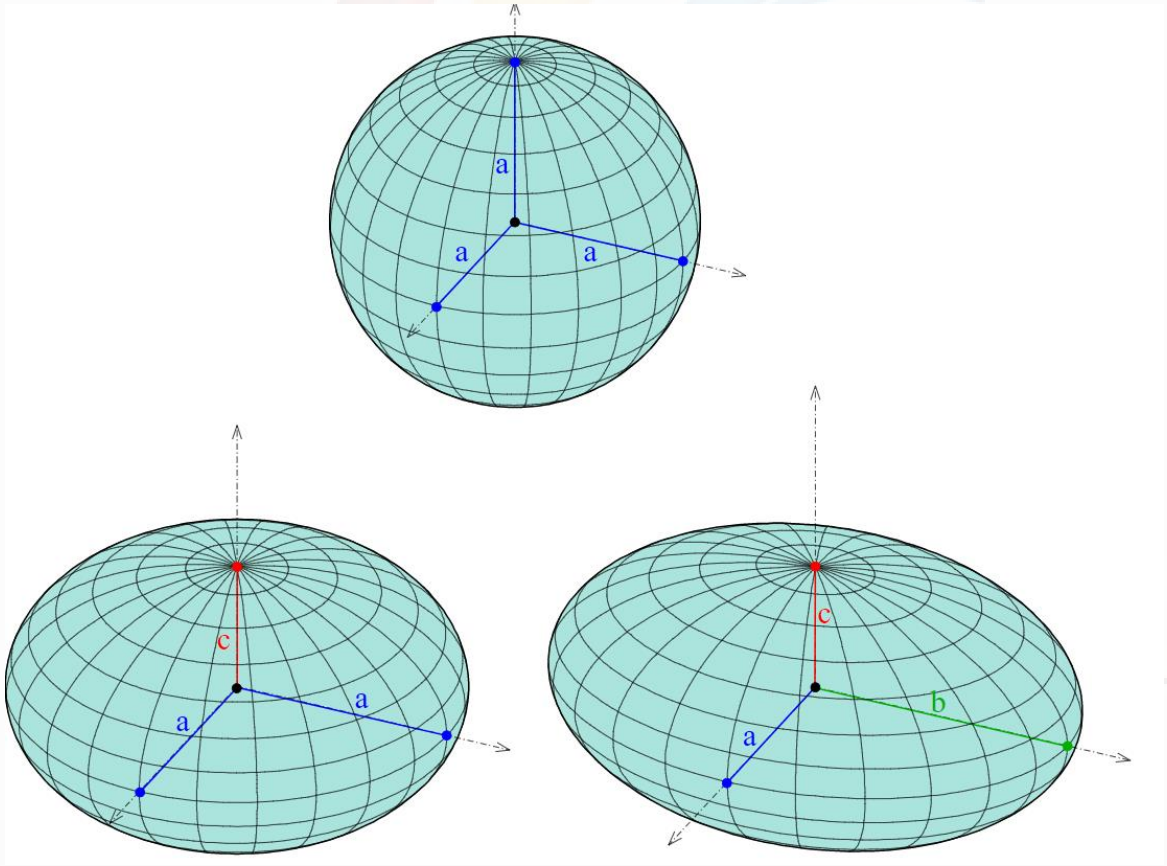


Ellipsoid

- An ellipsoidal surface can be described as an extension of a spherical surface, where the radii in three mutually perpendicular directions can have different values.



Ellipsoid



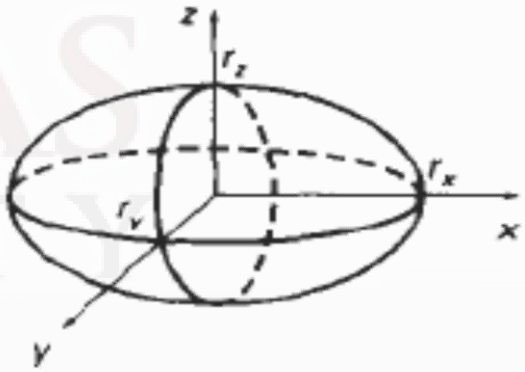
Ellipsoid - Parametric representation

And a parametric representation for the ellipsoid in terms of the latitude angle ϕ and the longitude angle θ in Fig. 10-8 is

$$x = r_x \cos\phi \cos\theta, \qquad -\pi/2 \le \phi \le \pi/2$$

$$y = r_y \cos\phi \sin\theta, \qquad -\pi \le \theta \le \pi \tag{10-10}$$

$$z = r_z \sin\phi$$



Blobby objects

- Some objects do not maintain a fixed shape
- They change their surface characteristics in certain motions
- These objects are referred to as blobby objects, since their shapes show a certain degree of fluidity
- Examples in this class of objects include

1. water droplets
2. melting objects
3. muscle shapes in the human body.

Figure 10-14
Molecular bonding. As two molecules move away from each other, the surface shapes stretch, snap, and finally contract into spheres.

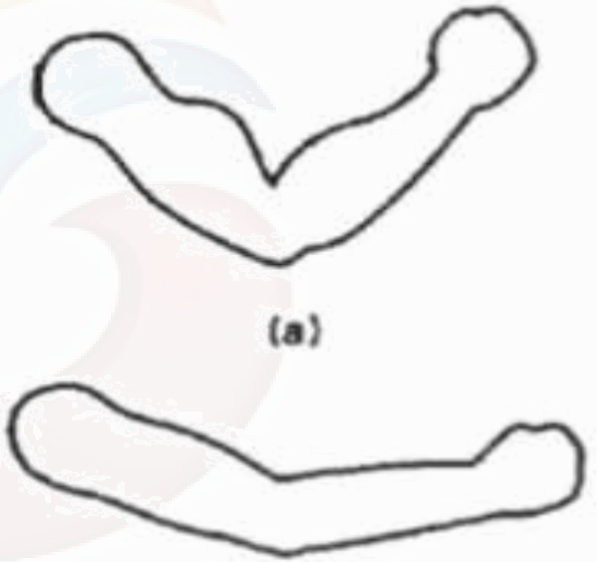
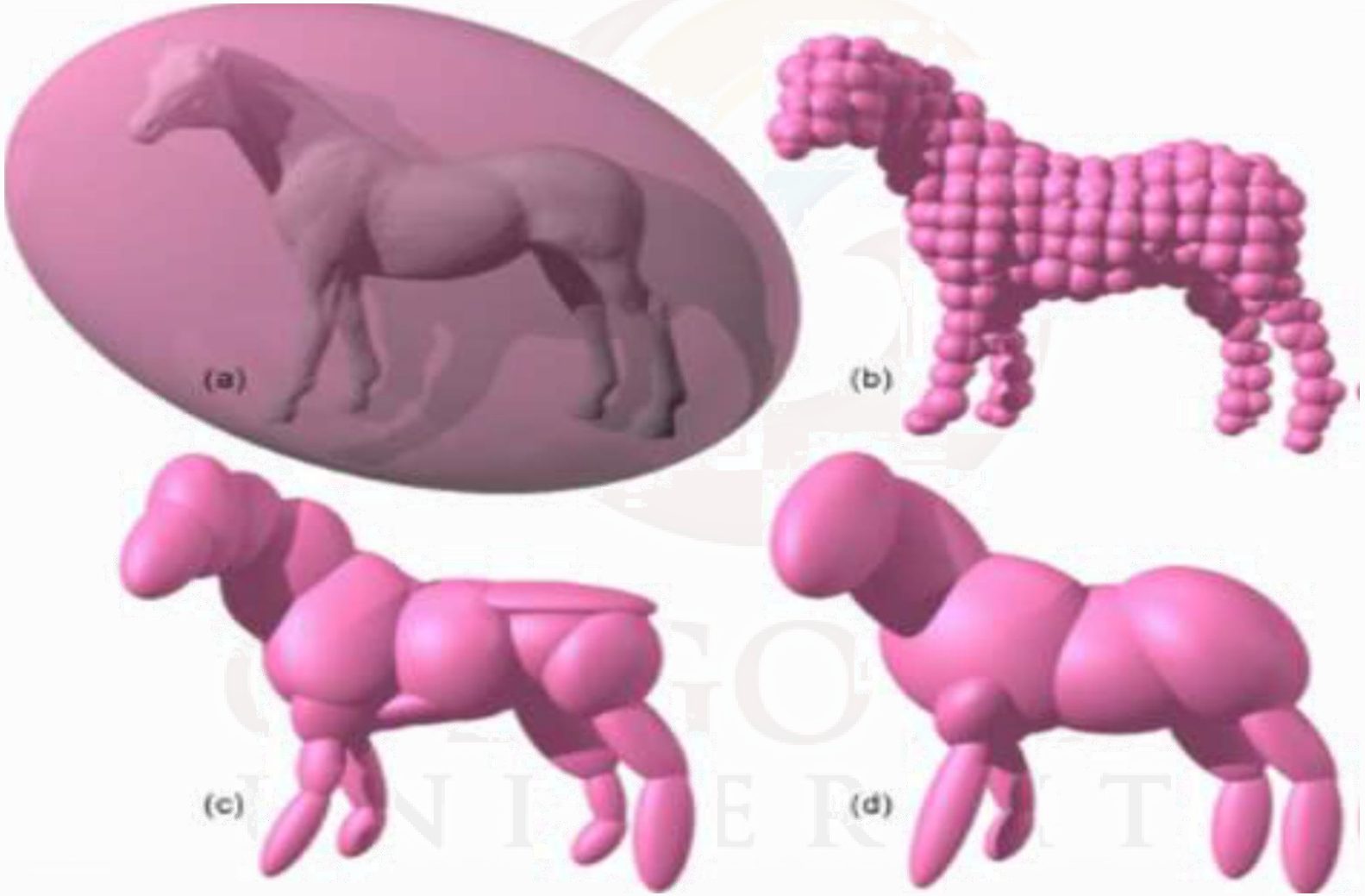


Figure 10-15
Blobby muscle shapes in a human arm.


(a)
(b)
(c)
(d)

Blobby objects

- Several models have been developed for representing blobby objects as distribution functions over a region of space.
- Combinations of Gaussian density functions, or "bumps“ (Fig 10.16)

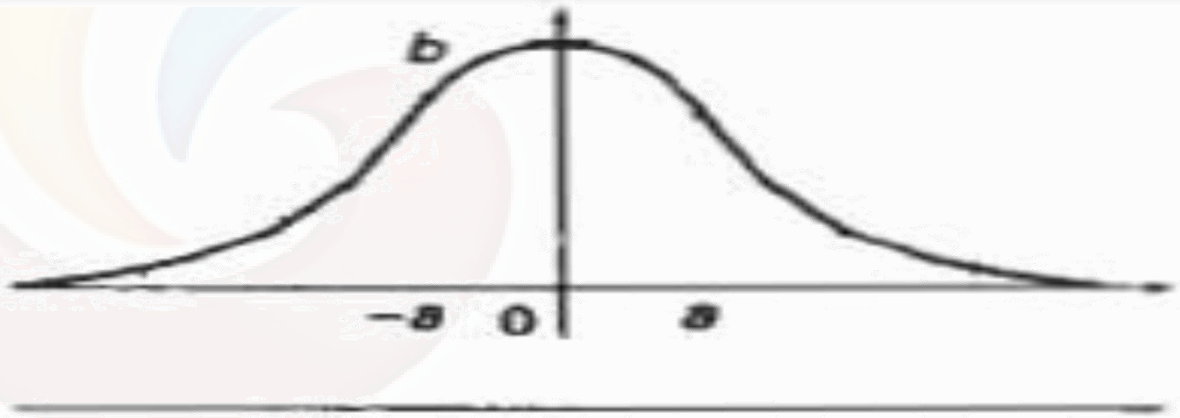


Figure 10-16
A three-dimensional Gaussian bump centered at position 0, with height b and standard deviation a.

A surface function is then defined as

$$f(x, y, z) = \sum_k b_k e^{-a_k r_k^2} - T = 0$$

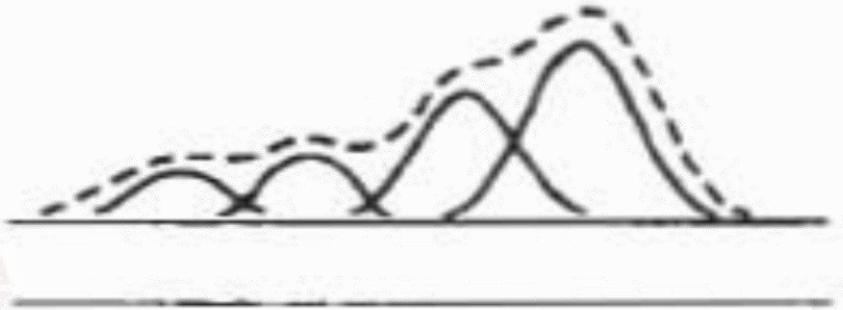


Figure 10-17
A composite blobby object formed with four Gaussian bumps.

where $r_k^2 = \sqrt{x_k^2 + y_k^2 + z_k^2}$, parameter T is some specified threshold, and parameters a and b are used to adjust the amount of blobbiness of the individual objects. Negative values for parameter b can be used to produce dents instead of bumps.

References:-

- http://www.faadooengineers.com/online-study/post/cse/computer-graphics/8/blobby-objects
- http://mcasjcet.weebly.com/uploads/4/4/7/9/4479347/computer_graphics_third_module_first.pdf
- https://www.scribd.com/document/462232395/83948846-Blobby-Objects-2-pdf
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Thank You