SNS COLLEGE OF ENGINEERING

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Department of Information Technology & Artificial Intelligence & Data Science

Course Name – COMPUTER GRAPHICS

III Year / V Semester

Unit 5 – ANIMATIONS

RASTER ANIMATIONS

- On raster scan systems we can generate real time animation in limited applications using raster operations.
- A simple method for translation in the xy plane is to transfer a rectangular blocks of pixels through arbitrary angles using anti-aliasing procedures.
- To rotate a block of pixels we need to determine the percent of area coverage for those pixels that overlap the rotated block.
- Sequences of raster operations can be executed to produce real time animation of either two-dimensional or three-dimensional objects, as long as we restrict the animation to motions in the projection plane.
- Then no viewing or visible surface algorithms need be invoked.
- Color table transformations also produce animation.
- Just by changing the intensity values of pixels to on and off, we can produce animation on raster systems.

KEY FRAME SYSTEMS

- Generate set of in-betweens from specification of two key frames
- Motion paths can be given with kinematic or dynamic descriptions
- Cels
- Animation paths—interpolation
- Morphing(transforming shape from one form to another form).
- Linear Interpolation
- Simulating Accelerations

MOTION SPECIFICATION

- There are several ways in which the motions of objects can be specified in an animation system.
- We can define motion in very explicit terms or We can use more abstract or more general approaches. Ways for defining motion of objects are:
  - Direct motion specification
  - Goal-directed systems
  - Kinematics, Inverse kinematics and dynamics, Inverse Dynamics

DIRECT MOTION SPECIFICATION : -

- The most straightforward method for defining a motion sequence is direct specification of the motion paremeters.
- Here, We explicitly give the rotation angles and translation vectors.
- Then the geometric transformation matrices are applied to transform co-ordinate positions.
- Alternatively, We could use an approximating equation to specify certain kinds of motions.
- These methods can be used for simple user programmed animation sequencs.

GOAL-DIRECTED SYSTEMS:

- At the opposite extreme, We can specify the motions that are to take place in general terms that abstractly describe the actions. these systems are referred to as goal directed because they determine specific motion parameters given the goals of the animation.
- For example, We could specify that we want an object to "walk " or to "run" to a particular destination. Or We could state that we want an object to "pick up " some other specified object.
- The inpute directive are then interpreted in term of component motions that will accomplish the selected task.
- Human motion, for instance, can be defined as a heirarchical structure of sub motion for the toros, limbs,and so forth.

KINEMATICS AND DYNAMICS : -

- We can also construct animation sequences using kinematic or dynemic descriptions.
- With a kinematic description, we specify the animation by giving motion parameters position, velocity, and acceleration) without reference to the forces that cause the motion. for constant velocity (zero acceleration), we designate the motions of rigid bodies in a scene by giving an initial position and velocity vector for each objects.
- An alternate apporach is to use inverse kinematics. Here, we specify the initial and final positions of objects at specified times and the motion parameters are computed by the system .
- For example, assuming zero acceleration , we can determine the constant velocity that will accomplish the movement of an object from the initial position to the final position.

- Dynamic descriptions on the other hand, require the specification of the forces that produce the velocities and acceleration.
- Descriptions of object behavior under the are generally referred to as a physically based modeling.
- Example of forces affecting object motion include electromagnetic, gravitational, friction, and other mechanical forces.
- Object motion are obtained from the forces equations describing physical laws, such as newton's law of motion for gravitational and friction processes, euler or navier-stokes equations describing fluid flow, and maxwell 's equations for electromagnetic forces.
- For example, the general form os newton's second law for a particle of mass m is
- $F = d(mv)/dt$

- with F as the force vector, and v as the velocity vector. If mass is constant, we solve the equation F=ma, where a is the acceleration vector.
- otherwise, mass is a function of time, as in relativistic motions of space vehicles that consume measurable amounts of fuel per unit time. We can also use inverse dynamics to obtain the forces, given the initial and final positions of objects and the type of motion.

1. https://youtu.be/NZbrdCAsYqU?feature=shared
2. https://youtu.be/K6neZi-g6lM?si=hIUOsA2bLRhvNGrH
3. https://youtu.be/eZ9XoyQ6b1U?si=9KomI5uKP8Qbydc9