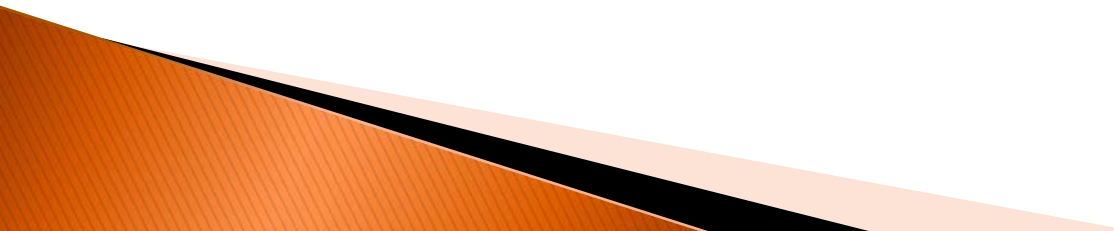


CSE 3200 Micro-Computer Graphics Animation

Presenter: Girendra Persaud
University of Guyana

Outline

- ▶ What is Animation?
 - ▶ Animation Explained
 - ▶ The Frame Buffer Issue
 - ▶ Systems We Can Animate
 - ▶ Kinematics
 - ▶ Dynamics
 - ▶ Questions?
- 

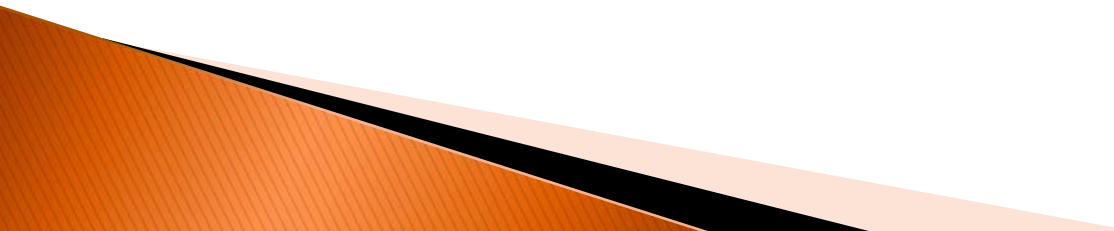
What is Animation?

- ▶ Animation is a type of optical illusion. It involves the appearance of motion caused by displaying still images one after another.

◦ <http://www.wisegeek.com/what-is-animation.htm>

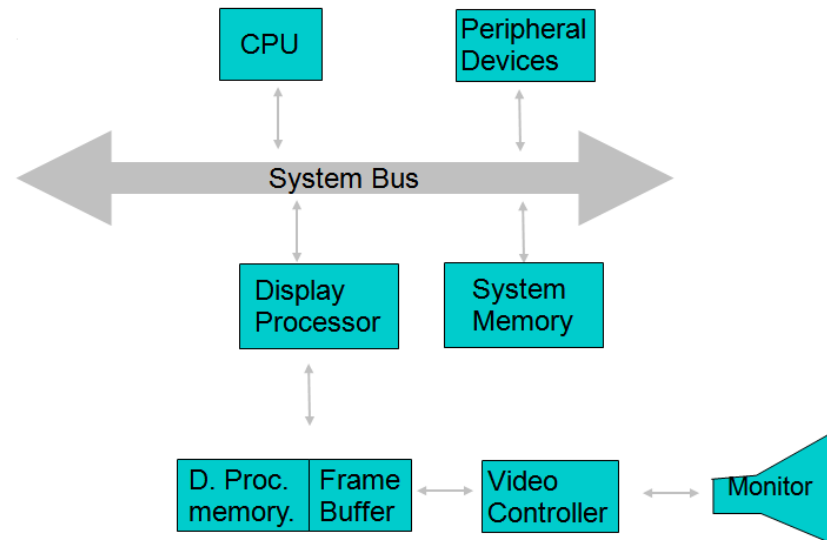
- ▶ Animation is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement. It is an optical illusion of motion due to the phenomenon of persistence of vision, and can be created and demonstrated in a number of ways.

◦ <http://en.wikipedia.org/wiki/Animation>

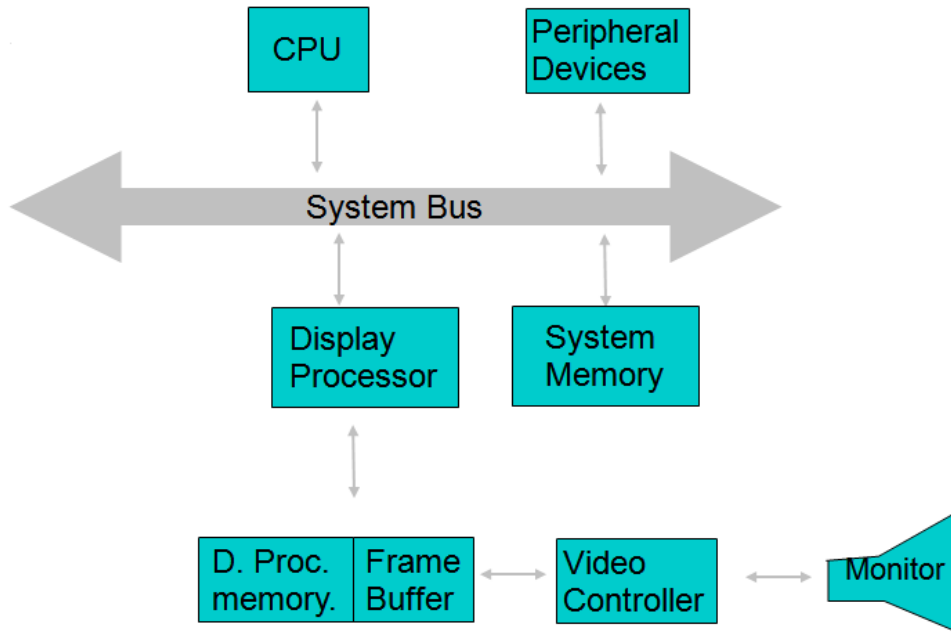


Animation Explained

- ▶ Flip Art
- ▶ A sequence of frames
- ▶ Discuss – how in CG?

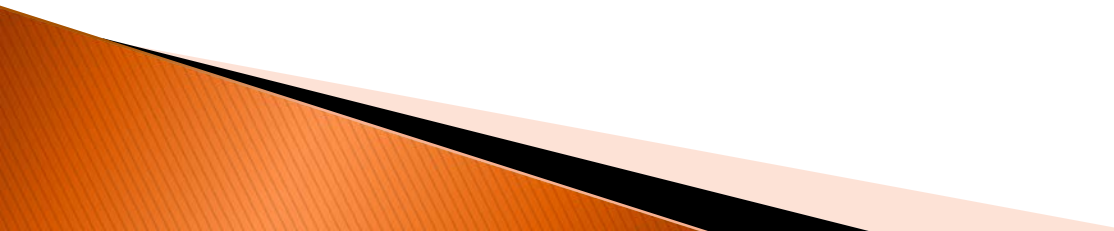


The Frame Buffer Issue



- ▶ Solved:
- ▶ `glutInitDisplayMode(GLUT_RGB | GLUT_DOUBLE)`

Systems We Can Animate

- ▶ **Particle Systems**
 - ▶ **Rigid Bodies**
 - ▶ **Articulated Rigid Bodies**
 - ▶ **Flexible Objects**
 - ▶ **Camera Viewpoint**
 - ▶ **Other Specialized Phenomena**
- 

Particle Systems

- ▶ A **particle system** is a technique in game physics, motion graphics, and computer graphics that uses a large number of very small sprites, 3D models, or other graphic objects to simulate certain kinds of "fuzzy" phenomena, which are otherwise very hard to reproduce with conventional rendering techniques – usually highly chaotic systems, natural phenomena, or processes caused by chemical reactions. – https://en.wikipedia.org/wiki/Particle_system

Particle Systems

- ▶ **Term:** modeling techniques, rendering techniques, animation
- ▶ object made up of particles
 - Position
 - Velocity (speed and direction)
 - Color
 - Lifetime
 - Age
 - Shape
 - Size
 - Transparency
- ▶ Flocking birds, tree (leaves), dust ball, explosion, smoke, large crowd etc.

Particle systems



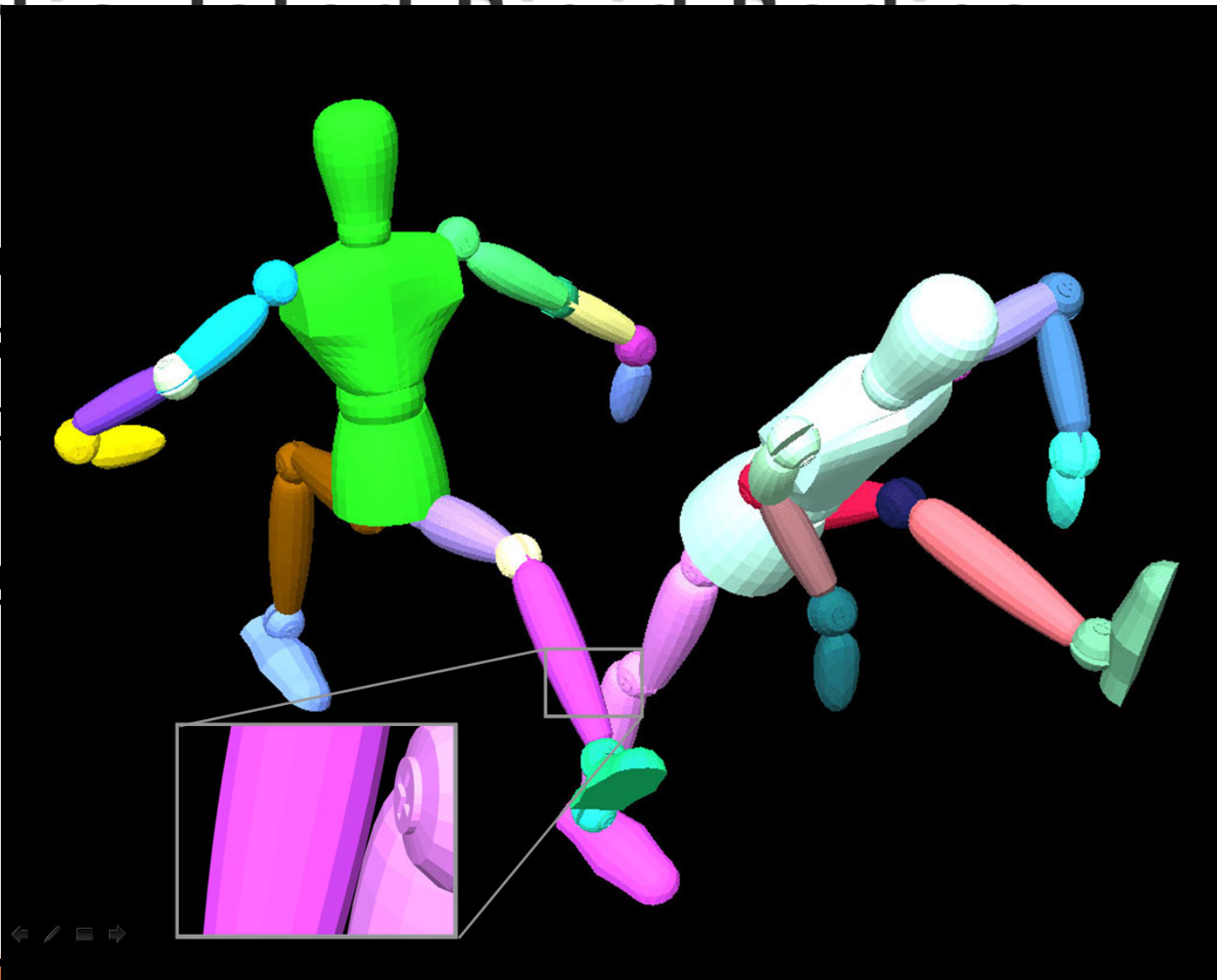
Rigid Bodies

- ▶ The shape remains constant
- ▶ But orientation can change
- ▶ Eg:



Artificial Intelligence

- ▶ T
- co
- ▶ E
- ▶ Jo
- (j
- ▶ E



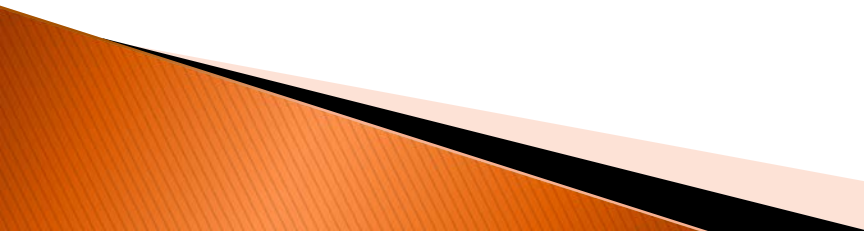
Flexible Objects

- ▶ Any material with fluidity
- ▶ Varying levels
- ▶ Eg. Rope, cloth, wire etc....

Camera Viewpoint

- ▶ You can animate the movement of a camera in a scene or around a model
- ▶ You can
 - Pan – left/right
 - Tilt – up/down
 - Zoom – in/out
 - Move – translate

Kinematic & CG 3D Animation

- ▶ Quantities associated with the motion of objects:
 - Displacement – movement
 - Velocity – speed
 - Acceleration – rate of increase of speed
 - Time – duration
 - ▶ Equations that calculates the preceding phenomena
 - ▶ Excludes consideration of the object's mass
- 

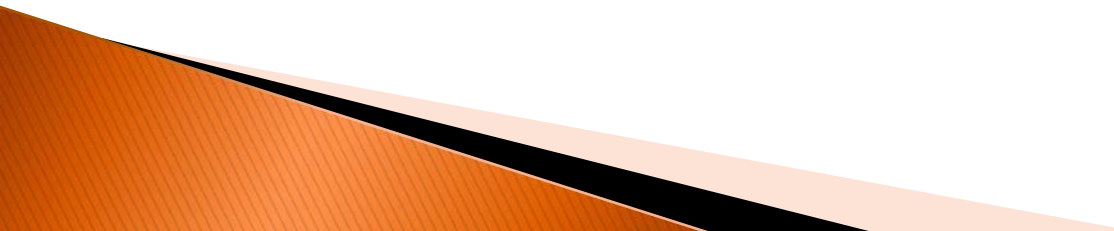
Forward & Inverse Kinematic

- ▶ Forward Kinematic deals with calculating the position of a given movable part of an articulated model based on the position of the other parts in the model at a given time.
 - It takes into consideration freedom of movements the part in relation to joints and limits
- ▶ Inverse Kinematics is synonymous with what is known as motion planning

Dynamics

- ▶ Inverse dynamics
 - Calculation the internal forces from movement of know external forces (positions, velocities, and accelerations)
- ▶ Forward dynamics
 - Calculating acceleration from a given forces
- ▶ AI Application

Summary

- ▶ What is Animation?
 - ▶ Animation Explained
 - ▶ The Frame Buffer Issue
 - ▶ Systems We Can Animate
 - ▶ Kinematics
 - ▶ Dynamics
- 

Questions?

References

- ▶ Kinematic:

<http://www.physicsclassroom.com/class/1dkin/u1l6a.cfm>

- ▶ Particle Systems: W. T. Reeves, "Approximate and Probabilistic Algorithms for Shading and Rendering Structured Particle Systems", *Computer Graphics*, vol. 19, no. 3, pp 313–322, 1985.

- ▶ Inverse/Forward Dynamics:

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1693250/>