Basics of Computer Animation

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Animation – Basics

- Animation means giving life to any object in computer graphics.
- It has the power of injecting energy and emotions into the most seemingly inanimate objects.
- Computer-assisted animation and computer-generated animation are two categories of computer animation.
- It can be presented via film or video.
- The basic idea behind animation is to play back the recorded images at the rates fast enough to fool the human eye into interpreting them as continuous motion.
- Animation can make a series of dead images come alive.
- Animation can be used in many areas like entertainment, computer aided-design, scientific visualization, training, education, e-commerce, and computer art.

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- Animation includes all the visual changes on the screen of display devices such as:
  a) Change of shape
  b) Change in size
  c) Change in color
  d) Change in structure
  e) Change in angle

Animation – Applications

- **Education and Training:** Animation is used in school, colleges and training centers for education purpose. Flight simulators for aircraft are also animation based.
- **Entertainment:** Animation methods are now commonly used in making motion pictures, music videos and television shows, etc.
- **Computer Aided Design (CAD):** One of the best applications of computer animation is Computer Aided Design and is generally referred to as CAD. One of the earlier applications of CAD was automobile designing. But now almost all types of designing are done by using CAD application, and without animation, all these work can't be possible.
- **Advertising:** This is one of the significant applications of computer animation. The most important advantage of an animated advertisement is that it takes very less space and capture people attention.
- **Presentation:** Animated Presentation is the most effective way to represent an idea. It is used to describe financial, statistical, mathematical, scientific & economic data.

Animation – Techniques

- **Frame by Frame:** Earlier, in traditional method, animation was done by hands because of the absence of the computer-aided drawing facilities. And, these traditional method required a lot of effort for even making a short video because of the fact that every second of animation requires 24 frames to process.
- **Procedural:** In Procedural method, set of rules are used to animate the objects. Animator defines or specify the initial rules and procedure to process and later runs simulations. Many of the times rules or procedure are based on real worlds physical rule which are shown by mathematical equations.
- **Key Framing:** A key frame in computer animation is a frame where we define changes in an animation. According to key framing, a storyboard requirement is must as the animator/artist draws the major frames (frames in which major/important changes can be made later) of animation from it. In key framing, character's or object's key position are the must and need to be defined by the animator, because the missing frames are filled in those key position via computer automatically.

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- **Behavioral:** According to this method/technique, to a certain extent the character or object specifies/determines it's own actions which helps / allows the character to improve later, and in turn, it frees the animator in determining each and every details of the character's motion.
- **Motion Capture:** This method of animation uses the live action/motion footage of a living human character which is recorded to the computer via video cameras and markers and later, that action or motion is used/applied to animate the character which gives the real feel to the viewers as if the real human character has been animated. Motion Capture is quite famous among the animators because of the fact that the human action or motion can be captured with relative ease.
- **Dynamics:** In this method, simulations are used in order to produce a quite different sequence while maintaining the physical reality. Physics' laws are used in simulations to create the motion of pictures/characters. High level of interactivity can be achieved in this method, via the use of real-time simulations, where a real person performs the action or motions of a simulated character.

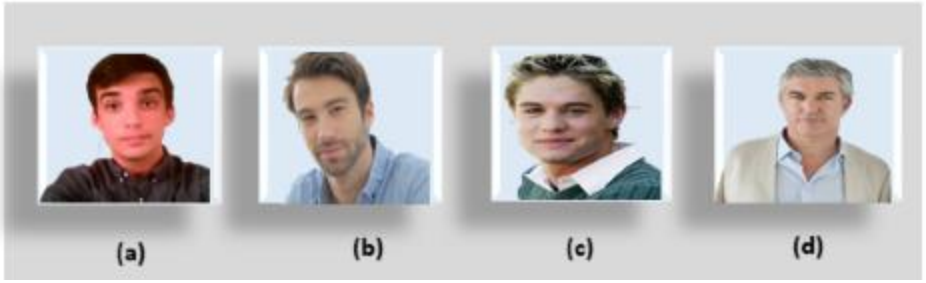
Animation – Functions

- **Morphing:** Morphing is an animation function which is used to transform object shape from one form to another is called Morphing. It is one of the most complicated transformations. This function is commonly used in movies, cartoons, advertisement, and computer games.

For Example:

1.Human Face is converted into animal face as shown in fig:

2. Face of Young person is converted into aged person as shown in fig:



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- **The process of Morphing involves three steps:**
- In the first step, one initial image and other final image are added to morphing application as shown in fig: Ist & 4th object consider as key frames.
- The second step involves the selection of key points on both the images for a smooth transition between two images as shown in 2nd object.
- In the third step, the key point of the first image transforms to a corresponding key point of the second image as shown in 3rd object of the figure.

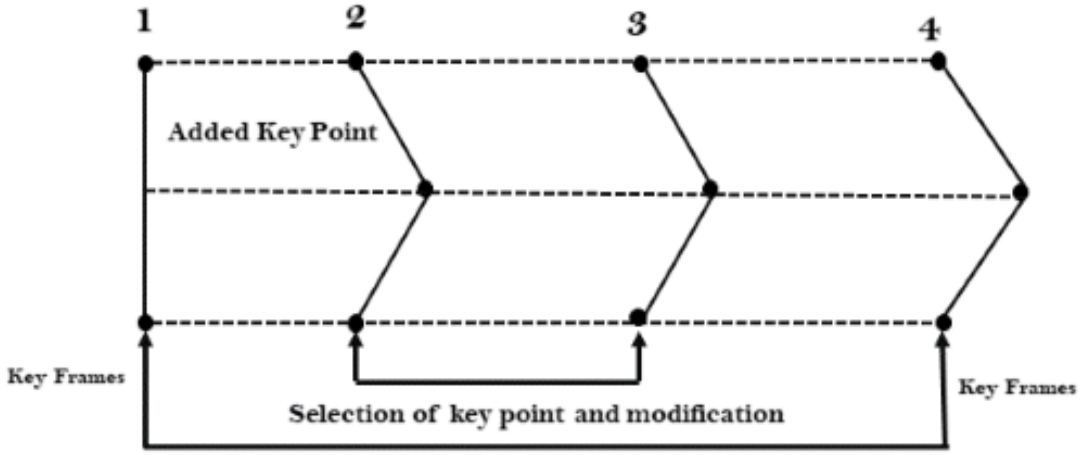

Fig: Process of Morphing

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- **Wrapping:** Wrapping function is similar to morphing function. It distorts only the initial images so that it matches with final images and no fade occurs in this function.
- **Tweening:** Tweening is the short form of 'inbetweening.' Tweening is the process of generating intermediate frames between the initial & last final images. This function is popular in the film industry.
- **Panning:** Usually Panning refers to rotation of the camera in horizontal Plane. In computer graphics, Panning relates to the movement of fixed size window across the window object in a scene. In which direction the fixed sized window moves, the object appears to move in the opposite direction. If the window moves in a backward direction, then the object appear to move in the forward direction and the window moves in forward direction then the object appear to move in a backward direction.

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- **Zooming:** In zooming, the window is fixed an object and change its size, the object also appear to change in size. When the window is made smaller about a fixed center, the object comes inside the window appear more enlarged. This feature is known as **Zooming In**. When we increase the size of the window about the fixed center, the object comes inside the window appear small. This feature is known as **Zooming Out**.
- **Fractals:** Fractal Function is used to generate a complex picture by using Iteration. Iteration means the repetition of a single formula again & again with slightly different value based on the previous iteration result. These results are displayed on the screen in the form of the display picture.

Thank You ☺