# Unit 6

Computer Animation

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Computer Animation

- **Animation** is the process of making the illusion of motion and change by means of the rapid display of a sequence of static images that minimally differ from each other. The illusion—as in motion pictures in general—is thought to rely on the phenomenon. Animators are artists who specialize in the creation of animation.

- Animation is the creation of the "illusion of movement" using a series of still images.

- A collection of static image joined together and shown consecutively so that appear to move.

- [The word animation is derived from "animate" which means "to give life to". Thus animation refers to making something alive]
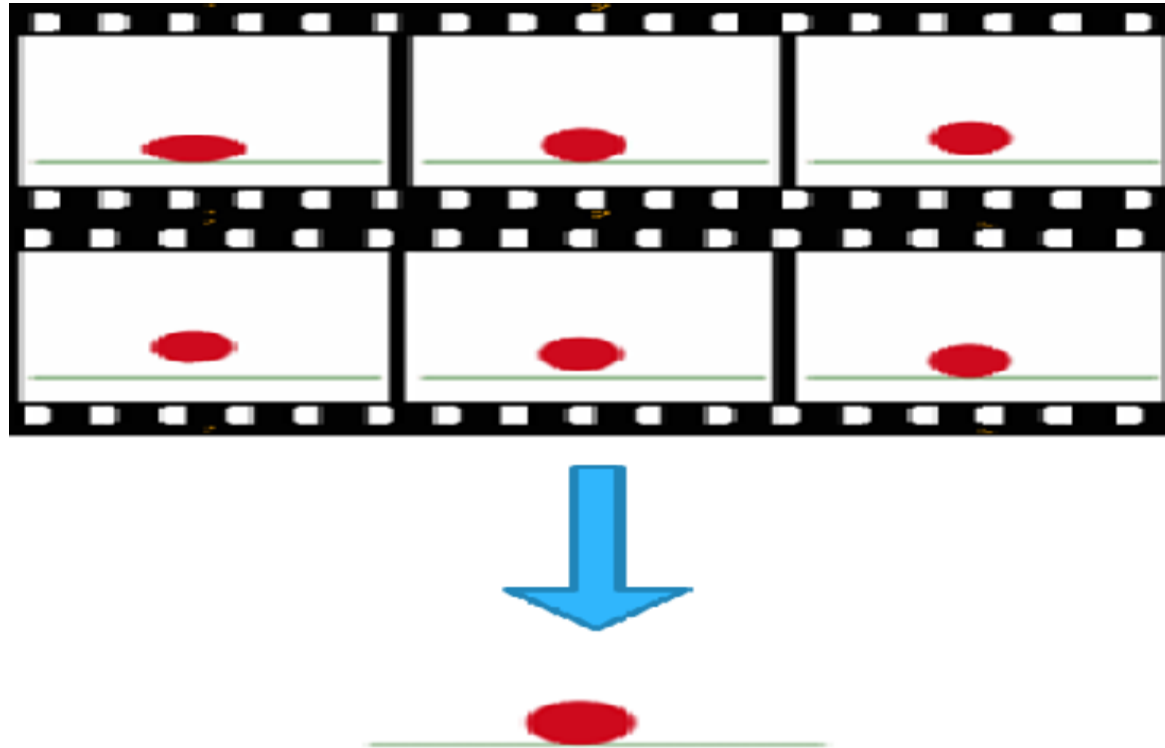
- Animation creation methods include the traditional animation creation method and those involving stop motion animation of two and three-dimensional objects, paper cutouts, puppets and clay figures. Images are displayed in a rapid succession, usually 24, 25, 30, or 60 frames per second.

Types of Computer Animation

- Traditional animation or Hand Drawn Animation or Frame by frame Animation or cel Animation

- Stop Motion Animation

- Computer animation

Hand Drawn Animation

- Done by an artist who draws each character and movement individually

- Very time consuming to have to draw, then color, then photograph each picture

- Draw pictures first, then color them on celluloid, then they pictures and animate them

- Very expensive due to hours of labor involved

- Examples: older Disney Movies i.e. Bambi, Fox and Hound, Cinderella etc.

Turtle animation drawings
(Mickey's Three Musketeers)
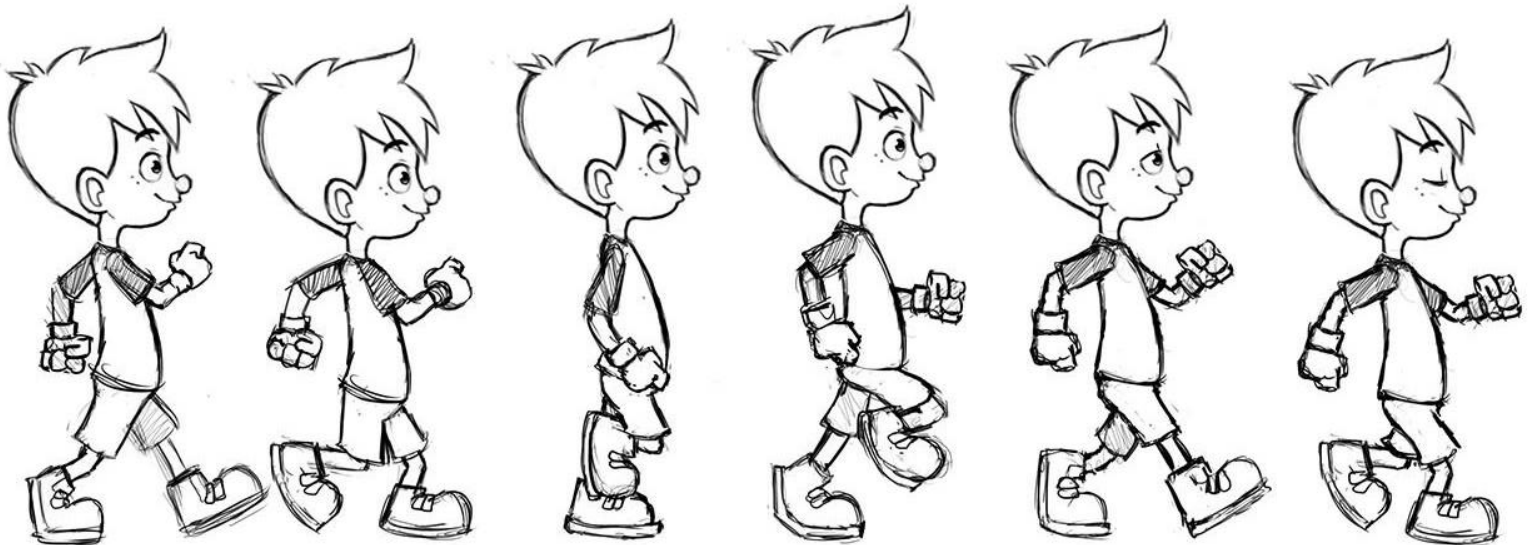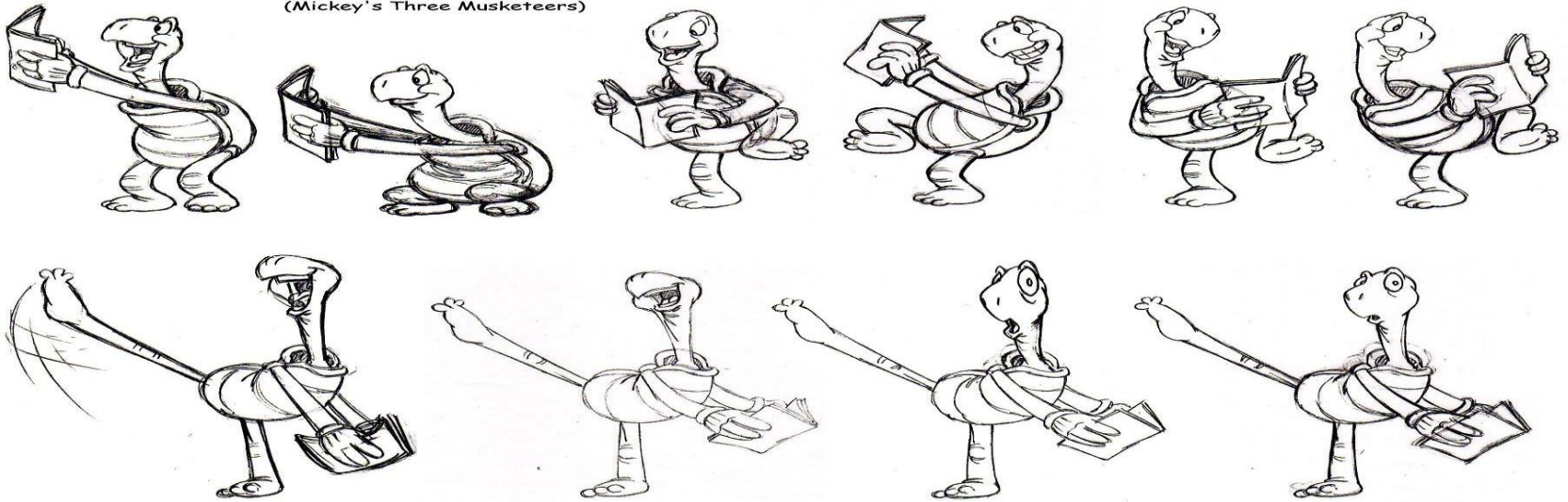
Stop Motion Animation

- Can be done by virtually anyone, with no extensive training
- Does not take that much time relative to the other 2 methods
- Uses jointed figures or clay figures that can be moved to make motions
- Take still pictures of the individual movements, then use relatively inexpensive computer software to animate
- We use Movie Maker Software to complete our animations
- Not very expensive because all you need is a digital camera and the software comes with windows XP operating system
- Examples: star wars, robot chicken, old Rudolph the red Nosed Reindeer.

Computer animation

- All characters and movements are generated using computer animation software
- Can also be very time consuming as they can get very complicated in movements and effects
- All characters are fully animated with no still pictures
- Can be very expensive because of the complexity of the stunts and animation being done
- Huge budgets because the animation sequences more complicated these days eg. The war scenes in Lord of the Rings etc.
- Examples: Toy story , finding Nemo, Matrix, Lord of the Rings

Computer animation

- Computer Animation is of two types
- viz. 2D animation & 3D animation

Basic steps of Animation

1. Shooting reference video
2. Key posing
3. Blocking
4. Splining
5. Smoothing
6. Adding life

1. Shooting Reference Video

- This is a very important and **overlooked** step. It's weird how people really think they know what certain actions look like and how long they take, but in reality they are often wrong.

- Physical actions is something you **need to analyze** before animating, especially if you're a beginner.

- You have a shot of a guy throwing a baseball? Better YouTube some reference video of pitchers throwing balls. Don't assume you know what an action looks like just because you've seen it before. Looking at an action as an **animator** is completely different than looking at it as a regular viewer.

2. Posing

- After shooting a reference, it's time to create the key poses of the shot.

- These poses are called key poses because they are the most important poses of the shot. These are the poses that convey the story of the shot. We better make sure we **get those poses right**, because we're going to build on those for the rest of the process.

3. Blocking

- Once we're happy with our key poses, we start **breaking down** the movement from each pose to the next by adding '*in between*' (also known as breakdown poses or passing poses). These are the poses that connect the key poses.

- We keep adding more poses until the movement looks as good as it could, while still staying in **stepped mode** (stepped mode is when you don't allow interpolation between poses, which results in a very choppy/blocky motion).

4. Splining

- Splining is a 3D animation term. It's the process in which you convert the interpolation of the keys from stepped to spline. In other words – you make the computer connect the movement between each of your poses, and that makes the movement **look smoother.**

- The problem is that the computer doesn't do a very good job at interpolating. It only works with what it has. That's why the better the blocking is – the better the splined version is going to look.

5. Smoothing and offset

- Now that all of our keys are on spline mode, we have to work on them. We need to clean up all the curves and make sure the movement looks smooth.

- It's also a good idea to **offset** some of the actions so it doesn't look so **'stop and start'**, as if the character is doing all the motion at once. By the end of this step your shot should look pretty solid and almost finished.

6. Adding Life

- This step is the a lot of fun. We've already finished with the grunt work of animating and it's time to add the fun stuff. In this step we add **small imperfections** that bring life to the character. Maybe an extra blink or a mouth twitch here and there. The difference between the last 2 steps is small but very noticeable.

Key Frame

- In animation , a **key frame** (or **keyframe**) is a drawing or shot that defines the starting and ending points of a smooth transition.
- These are called *frames* because their position in time is measured in frames on a strip of film or on a digital video editing timeline.
- A sequence of key frames defines which movement the viewer will see, whereas the position of the key frames on the film, video, or animation defines the timing of the movement.
- Because only two or three key frames over the span of a second do not create the illusion of movement, the remaining frames are filled with "inbetweens".
- In this technique, a storyboard is laid out and then the artists draw the major frames of the animation. Major frames are the ones in which prominent changes take place. They are the key points of animation.
- Keyframing requires that the animator specifies critical or key positions for the objects. The computer then automatically fills in the missing frames by smoothly interpolating between those positions.

Key Frame

Keyframes are important frames during which an object changes its size, direction, shape or other properties. The computer then figures out all the in-between frames and saves an extreme amount of time for the animator. The following illustrations depict the frames drawn by user and the frames generated by computer.
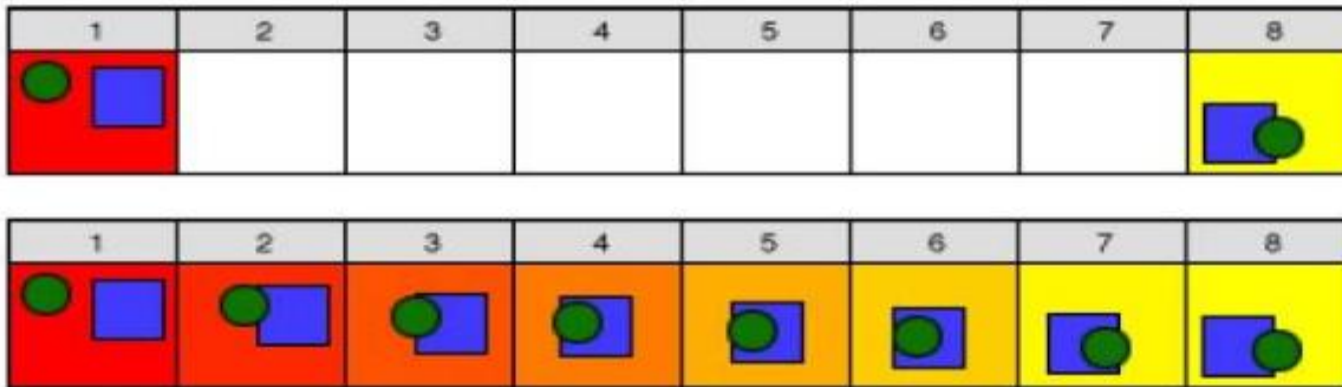
Procedural Animation

- In a procedural animation, the objects are animated by a procedure – a set of rules – not by keyframing. The animator specifies rules and initial conditions and runs simulation. Rules are often based on physical rules of the real world expressed by mathematical equations

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

Visual effects (VFX) & Special effects (SFX)

- **Visual effects (VFX)** is a digital process that uses post-production software to create and manipulate images seen on screen, while special effects (SFX) utilizes practical and mechanical effects performed on set and captured in camera.
- **Special effects (SFX)** can include explosions, pyrotechnics, rain, snow, and miniatures, just to name a few. By contrast, visual effects rely heavily on computer graphics and animation software to create the intended illusion or effect. Ultimately, visual effects can be combined with and used to enhance special effects in order to achieve a more realistic look for an entire production.
- The aim of both special effects (SFX) and visual effects (VFX) is to create something that looks real and believable within the context of the story being told.

Morphing

•   It is derived from the word metamorphosis, which means the transformation shape, appearance of one thing into another. The transformation of object shapes from one form to another is called morphing.

•   Also it can be defined as:

• Transition from one object to another.

• Process of transforming one image into another.

Continued…

- Morphing is a familiar technology to produce special effects in image or videos. Morphing is common in entertainment industry.
- Morphing is widely used in movies, animation games etc. In addition to the usage of entertainment industry, morphing can be used in computer based trainings, electronic book illustrations, presentations, education purposes etc.
- Animation industry looking for advanced technology to produce special effects on their movies. Increasing customers of animation industry does not satisfy with the movies with simple animation.
- Here comes the significance of morphing.
- Morphing is done by coupling image warping with color interpolation.
- Morphing is the process in which the source image is gradually distorted and vanished while producing the target image. So earlier images in the sequence are similar to source image and last images are similar to target image. Middle image of the sequence is the average of the source image and the target image.

The process of Morphing involves three steps:
1. 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.
2. 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.
3. 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.
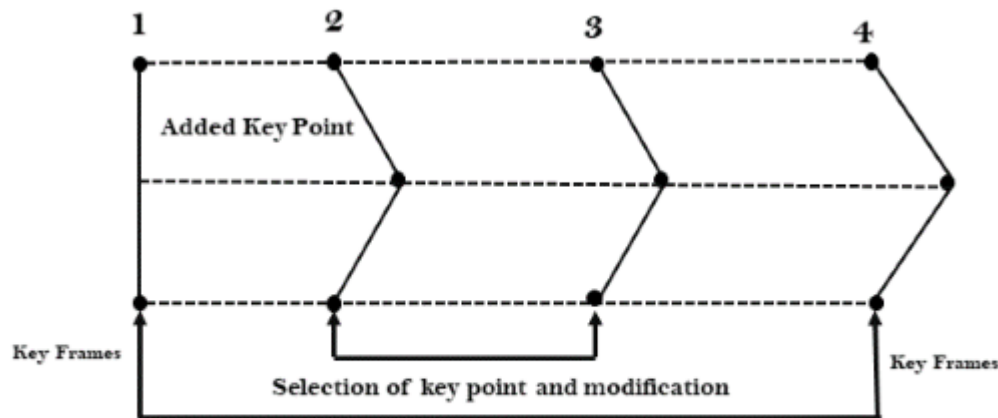

Fig: Process of Morphing

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.

    - Image warping is the process of digitally manipulating an image such that any shapes portrayed in the image have been significantly distorted.
    - Warping may be used for correcting image distortion as well as for creative purposes (e.g., morphing).
    - The same techniques are equally applicable to video.

Image warping example

Virtual reality (VR)

- **Virtual reality** (**VR**) implies a complete immersion experience that shuts out the physical world.

- Examples of **Virtual reality** experiences include 3 D Movie,7D movies

Augmented reality (AR)

- **Augmented reality** (AR) adds digital elements to a live view often by using the camera on a smartphone.

- Examples of **augmented reality** experiences include Snapchat lenses and the game Pokemon Go.

Thank you