A SEMINAR REPORT

ON

SPECIAL EFFECTS

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I, Mr**. Priyabrata Patnaik** bearing REGD NO. **0601289088** convey my heartiest thanks and gratitude to our coordinator Prof. Satyaranjan Biswal for encouraging and supporting me throughout this seminar presentation activity on the topic **"Special Effects".**

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CERTIFICATE

This is to certify that the seminar entitled "**Special Effects**" done by Mr. Priyabrata patnaik, bearing Regd No: 0601289088 is an authentic work carried out by him at Trident Academy of Technology (TAT), Bhubaneswar under my guidance. The matter embodied in this project work has not been submitted earlier for the award of any degree to the best of my knowledge and belief.

Guide Teacher **Co-Ordinator** **Head of Department**

(Lect.Rahul Ranjan) (Satyaranjan Biswal)

SPECIAL EFFECTS

INTRODUCTION

- Special effects **Special effects** (abbreviated **SPFX** or **SFX**) are used in the film , television and entertainment industry to realize scenes, such as space travels, that cannot be achieved by live action or normal means.

The illusions used in the film, television, theater, or entertainment industries to simulate the imagined events in a story are traditionally called **special effects** (often abbreviated as **SFX**, **SPFX**, or simply**FX**).

Special effects are traditionally divided into the categories of **optical effects** and **mechanical effects**. With the emergence of digital film-making tools a greater distinction between special effects and visual effects has been recognized, with "visual effects" referring to digital post-production and "special effects" referring to on-set mechanical effects and in-camera optical effects.

Optical effects (also called photographic effects), are techniques in which images or film frames are created photographically, either "in-camera" using multiple exposure, mattes, or the Schüfftan process, or in post-production processes using an optical printer. An optical effect might be used to place actors or sets against a different background.

Mechanical effects (also called practical or physical effects), are usually accomplished during the live-action shooting. This includes the use of mechanized props, scenery, scale models, pyrotechnics and Atmospheric Effects: creating physical wind, rain, fog, snow, clouds etc. Making a car appear to drive by itself, or blowing up a building are examples of mechanical effects. Mechanical effects are often incorporated into set design and makeup. For example, a set may be built with break-away doors or walls to enhance a fight scene, or prosthetic makeup can be used to make an actor look like a monster.

Since the 1990s, **computer generated imagery** (CGI) has come to the forefront of special effects technologies. CGI gives film-makers greater control, and allows many effects to be

accomplished more safely and convincingly – and even, as technology marches on, at lower costs. As a result, many optical and mechanical effects techniques have been superseded by CGI.

Categories of Special Effects

- Special effects are traditionally divided into two types. The first type is **optical effects** (also called visual or photographic effects), which rely on manipulation of a photographed image. A good example of an optical effect would be a scene in STAR TREK depicting the USS ENTERPRISE flying through space.

- The second type is **mechanical effects** (also called practical or physical effects), which are accomplished during the live-action shooting. These include mechanized props, scenery, and pyrotechnique . Examples include the ejector seat of James Bond's Aston Martin, R2D2 in the Star wars films, or the zero-gravity effects employed in 2001:a space odessy

Development history

- In 1867, **Oscar G. Rejlander** created the world's first "trick photograph" by combining different regions of 32 other photographs into a single image. In 1895, **Patrick Clark** created what is commonly accepted as the first-ever special effect on film

- In 1896, french magician **George Melies** accidentally discovered the "**stop trick**." According to Melies, his camera jammed while filming a street scene in Paris. When he screened the film, he found that the "stop trick" had caused a truck to turn into a horse, pedestrians to change direction, and men turn into women.

- By 1995, films such as Toy Story underscored that the distinction between live-action films and animated films was no longer clear. Images could be created in a computer using the techniques of animated cartoons. It is now possible to create any image entirely inside a computer and have it look completely realistic to an audience.

SPECIAL EFFECTS ANIMATIONS

- special effects animation is a specialization of the traditional animation and computer animation processes.
- Special effects animation is also common in live- action films to create certain images that cannot be traditionally filmed. In that respect, special effects animation is more commonplace than character animation, since special effects of many different types and varieties have been used in film for a century.

Visual special effects techniques

 Aerial image effects, Audio-Animatronic models, Bluescreen, Computer-generated imagery, Digital compositing, Dolly zoom, In-camera effects, Match moving, Matte painting, Miniature effects, Morphing, Motion control photography, Optical effects , Optical printing, Practical effects, Prosthetic makeup effects, Rotoscoping, Stop motion, Schüfftan process, Travelling matte, Virtual cinematography , Wire removal

AUDIO EFFECTS

- The art of adding audio effects to a film is done through either foley, or pre-recorded sound effects.
- Foley is acting out the scene in a recording studio with the necessary props, such as doors, umbrellas, shoes, or whatever the characters in the scene are doing. If a person was walking across concrete, the foley artist would probably put the shoes on his hands and tap them on concrete, while watching a screen to make sure he is doing it in sync with the character.

VISUAL SPECIAL EFFECTS TECHNIQUE

COMPUTER GENERATED IMAGERY

- **Computer-generated imagery** (**CGI**) is the application of the field of computer graphics to special effects. CGI is used in films, television programmes and commercials, and in printed media. Video games most often use real-time computer graphics , but may also include pre-rendered “cutscenes” and intro movies that would be typical CGI applications. These are referred to as FMV.

- CGI is used for visual effects because the quality is often higher and effects are more controllable than other more physically based processes, such as constructing miniatures for effects shots or hiring extras for crowd scenes, and because it allows the creation of images that would not be feasible using any other technology.

- **Computer-generated imagery**[1] (**CGI**) is the application of the field of computer graphics or, more specifically, 3D computer graphics to special effects in films, television programs, commercials,simulators and simulation generally, and printed media. Video games usually use real-time computer graphics (rarely referred to as CGI)[*citation needed*], but may also include pre-rendered "cut scenes" and intro movies (or FMVs--full motion videos) that would be typical CGI applications.

- CGI is used for visual effects because computer generated effects are more controllable than other more physically based processes, such as constructing miniatures for effects shots or hiring extrasfor crowd scenes, and because it allows the creation of images that would not be feasible using any other technology. It can also allow a single graphic artist to produce such content without the use of actors, expensive set pieces, or props.

- 3D computer graphics software is used to make computer-generated imagery for movies, etc. Recent availability of CGI software and increased computer speeds have allowed individual artists and small companies to produce professional grade films, games, and fine art from their home computers. This has brought about an Internet subculture with its own set of global celebrities, clichés, and technical vocabulary.

- Simulators, particularly flight simulators, and simulation generally, make extensive use of CGI techniques for representing the outside world.[2]

Rotoscoping

Rotoscoping is an animation technique in which animators trace over live-action film movement, frame by frame, for use in animated films Originally, pre-recorded live-action film images were projected onto a frosted glass panel and re-drawn by an animator. This projection equipment is called a rotoscope, although this device has been replaced by computers in recent years. In the visual effects industry, the term rotoscoping refers to the technique of manually creating a matte for an element on a live-action plate so it may be composited over another background.

Rotoscope output can have slight deviations from the true line that differ from frame to frame, which when animated cause the animated line to shake unnaturally, or "boil". Avoiding boiling requires considerable skill in the person performing the tracing, though causing the "boil" intentionally is a stylistic technique sometimes used to emphasize the surreal quality of rotoscoping, as in the music video *Take on Me*.

Rotoscoping (often abbreviated as "roto") has often been used as a tool for visual effects in live-actionmovies. By tracing an object, a silhouette (called a matte) is created that can be used to extract that object from a scene for use on a different background. While blue and green screen techniques have made the process of layering subjects in scenes easier, rotoscoping still plays a large role in the production of visual effects imagery. Rotoscoping in the digital domain is often aided by motion tracking and onion-skinning software. Rotoscoping is often used in the preparation of garbage mattesfor other matte-pulling processes.

Rotoscoping has also been used to allow a special visual effect (such as a glow, for example) to be guided by the matte or rotoscoped line. One classic use of traditional rotoscoping was in the original three *Star Wars* films, where it was used to create the glowing lightsaber effect, by

creating a matte based on sticks held by the actors. To achieve this, editors traced a line over each frame with the prop, then enlarged each line and added the glow.

Morphing

Morphing is a special effect in motion pictures and animations that changes (or morphs) one image into another through a seamless transition. Most often it is used to depict one person turning into another through technological means or as part of a fantasy or surreal sequence. Traditionally such a depiction would be achieved through cross-fading techniques on film. Since the early 1990s, this has been replaced by computer software to create more realistic transitions.

Later morphing techniques

Later, more sophisticated cross-fading techniques were employed that vignetted different parts of one image to the other gradually instead of transitioning the entire image at once. This style of morphing was perhaps most famously employed in the video that former 10cc membersKevin Godley and Lol Creme (performing as Godley & Creme) produced in 1985 for their song *Cry*. It comprised a series of black and white close-up shots of faces of many different people that gradually faded from one to the next. In a strict sense, this had little to do with modern-day computer generated morphing effects, since it was merely a dissolve using fully analog equipment.

Modern morphing

In the early 1990s computer techniques that often produced more convincing results began to be widely used. These involved distorting one image at the same time that it faded into another through marking corresponding points and vectors on the "before" and "after" images used in the morph. For example, one would morph one face into another by marking key points on the first face, such as the contour of the nose or location of an eye, and mark where these same points

existed on the second face. The computer would then distort the first face to have the shape of the second face at the same time that it faded the two faces.

Examples of morphing

Though the 1986 movie *The Golden Child* implemented very crude morphing effects from animal to human and back, the first movie to employ detailed morphing was *Willow*, in 1988. A similar process was used a year later in *Indiana Jones and the Last Crusade* to create Walter Donovan's gruesome demise. Both effects were created by Industrial Light and Magic using grid warping techniques developed by Tom Brighamand Doug Smythe (AMPAS).[1]

The cover for Queen's 1989 album *The Miracle*, featured the technique to morph the four band members' faces into one gestalt image. In 1991, morphing appeared notably in the Michael Jackson music video *Black Or White* and in the movies *Terminator 2: Judgment Day* and *Star Trek VI: The Undiscovered Country*. The first application for personal computers to offer morphing was Gryphon Software Morph on the Macintosh. Other early morphing systems included ImageMaster, MorphPlus and CineMorph, all of which premiered for the Commodore Amiga in 1992. Other programs became widely available within a year, and for a time the effect became common to the point of cliché. For high-end use,Elastic Reality (based on MorphPlus) saw its first feature film use in *In The Line of Fire* (1993) and was used frequently as a plot device inQuantum Leap (work performed by the Post Group). At VisionArt Ted Fay used Elastic Reality to morph Odo for *Star Trek: Deep Space Nine*. Elastic Reality was later purchased by Avid, having already become the de facto system of choice, used in many hundreds of films. The technology behind Elastic Reality earned two Academy Awards in 1996 for Scientific and Technical Achievement going to Garth Dickie and Perry Kivolowitz. The effect is technically called a "spatially-warped cross-dissolve". The first social network designed for user-generated morph examples to be posted online was Galleries by Morpheus (morphing software).

In Taiwan, Aderans, a hair loss solutions provider, did a TV commercial featuring a morphing sequence in which people with lush, thick hair morph into one another, reminiscent of the end sequence of the Black or White video.

Morphing in the future

Morphing softwares continue to advance today and many programs can automatically morph images that correspond closely enough with relatively little instruction from the user. This has led to the use of morphing techniques to create convincing slow-motion effects where none existed in the original film or video footage by morphing between each individual frame using optical flow technology. Morphing has also appeared as a transition technique between one scene and another in television shows, even if the contents of the two images are entirely unrelated. The software in this case attempts to find corresponding points between the images and distort one into the other as they crossfade. In effect morphing has replaced the use of crossfading as a transition in some television shows, though crossfading was originally used to produce morphing effects.

Morphing is used far more heavily today than ever before. In years past, effects were obvious, which led to their overuse. Now, morphing effects are most often designed to be invisible.

Compositing

Compositing is the combining of visual elements from separate sources into single images, often to create the illusion that all those elements are parts of the same scene. Live-action shooting for compositing is variously called “blue screen,” “green screen,” “chroma key,” and other names. Today, most, though not all compositing, is achieved through digital image manipulation. Pre-digital compositing techniques, however, go back as far as the trick films of Georges Méliès in the late 19th century; and some are still in use.

Basic procedure

All compositing involves the replacement of selected parts of an image with other material, usually, but not always, from another image. In the digital method of compositing, software commands designate a narrowly defined color as the part of an image to be replaced. Then every pixel within the designated color range is replaced by the software with a pixel from another

image, aligned to appear as part of the original. For example, a TV weather person is recorded in front of a plain blue or green screen, while compositing software replaces only the designated blue or green color with weather maps.

Typical applications

In TV studio practice, blue or green screens may back news readers so that stories can be composited behind them, before being switched to full-screen display. In other cases, presenters may be completely within compositing backgrounds that are replaced with entire "virtual sets" executed in computer graphics programs. In sophisticated installations, subjects, cameras, or both can move about freely while the computer-generated environment changes in real time to maintain correct relationships between the cameras, subjects, and virtual "backgrounds."

Virtual sets are also used in motion pictures, some of which are photographed entirely in blue or green screen environments; for example, Sky Captain and the World of Tomorrow. More commonly, composited backgrounds are combined with sets – both full-size and models – and vehicles, furniture, and other physical objects that enhance the "reality" of the composited visuals. "Sets" of almost unlimited size can be created digitally because compositing software can take the blue or green color at the edges of a backing screen and extend it to fill the rest of the frame outside it. That way, subjects recorded in modest areas can be placed in large virtual vistas. Most common of all, perhaps, are set extensions: digital additions to actual performing environments. In the film, Gladiator, for example, the arena and first tier seats of the Roman Coliseum were actually built, while the upper galleries (complete with moving spectators) were computer graphics, composited onto the image above the physical set. For motion pictures originally recorded on film, high-quality video conversions called "digital intermediates" are created to enable compositing and the other operations of computerized post production. Digital compositing is a form of matting, one of four basic compositing methods. The others are physical compositing, multiple exposure, and background projection.

Physical compositing

In physical compositing the separate parts of the image are placed together in the photographic frame and recorded in a single exposure. The components are aligned so that they give the

appearance of a single image. The most common physical compositing elements are partial models and glass paintings.

Partial models are typically used as set extensions such as ceilings or the upper stories of buildings. The model, built to match the actual set but on a much smaller scale, is hung in front of the camera, aligned so that it appears to be part of the set. Models are often quite large because they must be placed far enough from the camera so that both they and the set far beyond them are in sharp focus. [1]

Glass shots are made by positioning a large pane of glass so that it fills the camera frame, and is far enough away to be held in focus along with the background visible through it. The entire scene is painted on the glass, except for the area revealing the background where action is to take place. This area is left clear. Photographed through the glass, the live action is composited with the painted area. A typical glass shot is the approach to Ashley Wilkes' plantation in Gone with the Wind. The plantation and fields are all painted, while the road and the moving figures on it are photographed through the glass area left clear.

A variant uses the opposite technique: most of the area is clear, except for individual elements (photo cutouts or paintings) affixed to the glass. For example, a ranch house could be added to an empty valley by placing an appropriately scaled and positioned picture of it between the valley and the camera.

Multiple exposure

An in-camera multiple exposure is made by recording on only one part of each film frame, rewinding the film to exactly the same start point, exposing a second part, and repeating the process as needed. The resulting negative is a composite of all the individual exposures. (By contrast, a "double exposure" records multiple images on the entire frame area, so that all are partially visible through one another.) Exposing one section at a time is made possible by enclosing the camera lens (or the whole camera) in a light-tight box fitted with maskable openings, each one corresponding to one of the action areas. Only one opening is revealed per exposure, to record just the action positioned in front of it.

Multiple exposure is difficult because the action in each recording must match that of the others; so multiple exposure composites typically contain only two or three elements. However, in the 1921 film The Playhouse, Buster Keaton used multiple exposures to appear simultaneously as nine different actors on a stage, perfectly synchronizing all nine performances.

Background projection

Background projection throws the background image on a screen behind the subjects in the foreground while the camera makes a composite by photographing both at once. The foreground elements conceal the parts of the background image behind them. Sometimes, the background is projected from the front, reflecting off the screen but not the foreground subjects because the screen is made of highly directional, exceptionally reflective material. (The prehistoric opening of 2001: A Space Odyssey uses front projection.) However, rear projection has been a far more common technique.

In rear projection, background images (called “plates” whether they are still pictures or moving) are photographed first. For example a camera car may drive along streets or roads while photographing the changing scene behind it. In the studio, the resulting “background plate” is loaded into a projector with the film "flopped" (reversed), because it will be projected onto (and through) the back of a translucent screen. A car containing the performers is aligned in front of the screen so that the scenery appears through its rear and/or side windows. A camera in front of the car records both the foreground action and the projected scenery, as the performers pretend to drive.

Like multiple exposure, rear projection is technically difficult. The projector and camera motors must be synchronized to avoid flicker and perfectly aligned behind and before the screen. The foreground must be lit to prevent light spill onto the screen behind it. (For night driving scenes, the foreground lights are usually varied as the car “moves” along.) The projector must use a very strong light source so that the projected background is as bright as the foreground. Color filming presents additional difficulties, but can be quite convincing, as in the famouscrop duster sequence in Alfred Hitchcock’s North by Northwest. Because of its complexity, rear projection has been largely replaced by digital compositing with, for example, the car positioned in front of a blue or green screen.

Practical effect

A **practical special effect** is one in which a prop object appears to work in a situation where it obviously could not (such as a ringing telephone on stage). No trick photography or post-production editing is involved. This type of effect is normally found in live theatre.

In film, the term practical effects is also used to denote those effects that are produced on-set, without the aid of computer generated imagery. "Special effects" is also usually considered to be

equivalent to practical effects, whereas "visual effects" usually denotes those effects created in post-production through photographic printing or produced with the aid of a computer.

Many of the staples of action movies are practical effects. Gunfire, bullet wounds, rain, wind, fire and explosions can all be produced on a movie set by someone skilled in practical effects.

SOFTWARES UTILIZED

Autodesk Maya is a software application used for 3D animation, 3D modeling, simulation, visual effects, rendering, matchmoving, and compositing. It is developed in Toronto byAutodesk's Media and Entertainment Division (formerly Alias).

Maya is used in the film and TV industry, as well as for computer and video games, architectural visualisation and design.

The product is named after Maya, the Sanskrit term for illusion.

Modeling

An example render of a Maya scene.

NURBS, polygons and subdivision surfaces are available in Maya.

Polygons are a widely used model medium due to its relative stability and functionality. Polygons are also the visualization bridge between NURBS and SubDivs. NURBS are used for their ready-smooth appearance and respond well to deformations in the Dynamics Workbench. SubDivs resemble a combination of both NURBS and polygons, but they are actually just a smoothed mesh.[6] They are ready-smooth and can be manipulated like polygons, resulting in a

model of many objects including hands, faces, and other multi-topological constructions. Maya hair tools cannot be applied to subdivision polygons.

Dynamics and Simulation

Maya features a particle system for handling masses like steam and water drops. Dynamic fields allow adding gravity, wind and vortexes, allowing for effects such as blowing leaves or even tornadoes. Special tools give artists the ability to brush and style particles like hair and fur. This module is a direct evolution of Wavefront Dynamation.

An artist may create rigid body geometric objects which collide automatically without explicit animation, as well as soft body objects which can ripple and bend, like flags and cloth.

Maya effects are built-in programs that make it easy for users to create complex animation effects such as smoke, fire and realistic water effects, with many options and attributes for tuning the results.

In version 8.5 a powerful cloth simulator called "nCloth" was added, allowing users to simulate cloth with control over aspects such as self-collision and interpenetration. The cloth objects can be modified to behave as rigid or soft bodies.

In version 2009, "nParticles" were added, offering a new particle simulation system (based around the same system running 'nCloth'), in addition to the original particle system available in Maya. This addition was similar to the inclusion of "nCloth" alongside "Maya Cloth", insofar as it did not take the place of any existing dynamic tools, despite being newer.

Autodesk 3ds Max, formerly **3D Studio MAX**, is a modeling, animation and rendering package developed by Autodesk Media and Entertainment. It has modeling capabilities, a flexible plugin architecture and is able to be used on the Microsoft Windows platform. It can be used by video game developers, TV commercial studios and architectural visualization studios. It is also used for movie effects and movie pre-visualization.

In addition to its modeling and animation tools, the latest version of 3ds Max also features advanced shaders (such as ambient occlusion and subsurface scattering), dynamic simulation, particle systems, radiosity, normal map creation and rendering, global illumination, an intuitive and fully-customizable user interface, and its own scripting language.[1]

NURBS or non-uniform rational B-spline

A more advanced alternative to polygons, it gives a smoothed out surface that eliminates the straight edges of a polygon model. NURBS is a mathematically exact representation of freeform surfaces like those used for car bodies and ship hulls, which can be exactly reproduced at any resolution whenever needed. With NURBS, a smooth sphere can be created with only one face.

The non-uniform property of NURBS brings up an important point. Because they are generated mathematically, NURBS objects have a parameter space in addition to the 3D geometric space in which they are displayed. Specifically, an array of values called knots specifies the extent of influence of each control vertex (CV) on the curve or surface. Knots are invisible in 3D space and you can't manipulate them directly, but occasionally their behavior affects the visible appearance of the NURBS object. This topic mentions those situations. Parameter space is one-dimensional for curves, which have only a single U dimension topologically, even though they exist geometrically in 3D space. Surfaces have two dimensions in parameter space, called U and V.[*citation needed*]

NURBS curves and surfaces have the important properties of not changing under the standard geometric affine transformations (Transforms), or under perspective projections. The CVs have local control of the object: moving a CV or changing its weight does not affect any part of the object beyond the neighboring CVs. (You can override this property by using the Soft Selection controls.) Also, the control lattice that connects CVs surrounds the surface. This is known as the convex hull property.

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