A BRIEF REVIEW ON VISUAL EFFECTS IN CINEMA

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ABSTRACT: This paper explores the innovation of visual effects and computer-generated imagery in cinema. It defines visual effects and introduces techniques like 3D computer graphics, motion capture, match moving, chroma key, rotoscoping, matte painting, and digital compositing. The paper describes historical evolution of visual effects, citing iconic films like Gupi Gayen Bagha Bayen, Avengers Endgame, Transformers known for pioneering visual effects. It also examines the techniques used in creating visual effects in dual character, movements, facial expressions, crowd generation with autonomous agents, and digital duplicates. In conclusion, the paper discusses emerging trends and future possibilities in the field of visual effects.

KEYWORDS: Visual effects, CGI, 3D animation, Compositing

INTRODUCTION: Let's go on a journey into the realm of visual effects (VFX). What exactly are visual effects? Visual effects (VFX) refer to the enhancement of imagery in films, television, and other media. These digital techniques are used to create stunning visuals, modify or create environments, characters, and objects, and bring to life imaginative and realistic elements that cannot be achieved during filming. VFX play a big role in enhancing storytelling, adding realism to scenes.

But why are VFX essential in the world of filmmaking? And why do we actually use them for? To understand these questions, we will explore the techniques used to craft what can be described as "digital magic". Visual effects are essential in movies to bring imagination to life, enhance storytelling, making beautiful shots. They enable filmmakers to create otherworldly landscapes, mythical creatures, spectacular action sequences, and immersive environments that would be impossible or expensive to achieve practically. VFX elevate the cinematic experience, making it more visually stunning and emotionally engaging.

REVIEW OF LITERATURE:

Visual Effects: VFX stands for "Visual Effects." It is a broad term used to describe the process of creating and manipulating visual elements in films, television shows and other forms of visual media. VFX involves the use of computer-generated imagery (CGI), digital compositing,

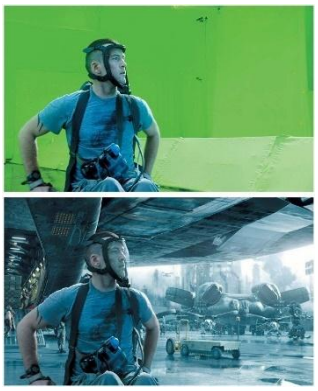
and various software tools to achieve a wide range of visual effects that would be difficult or impossible to capture in-camera. Visual effects can be used to create realistic or fantastical scenes, enhance environments, and manipulate objects or characters within a frame. Some common examples of VFX include:

1. Special Effects: Creating explosions, fire, smoke, and other dramatic elements that would be dangerous or impractical to film in real life.

2. Character and Creature Animation: Bringing characters, animals, or creatures to life through computer-generated animation.

3. 3D Modelling and Rendering: Creating 3D objects, characters, or environments that seamlessly integrate with live-action footage.

4. Digital Set Extensions: Expanding or altering real-world sets and locations to fit the creative vision of a project.



VFX before and after, Photo Credit: filmlifestyle.com/how-does-green-screen-work/

VFX plays a important role in modern filmmaking, allowing filmmakers to tell stories and create visual experience that is impossible to make practically.

Computer Generated Imagery (CGI): Computer-generated imagery is Computer generated graphics is very famous and popular he used technique for creating visual effects. The CGI term is used for every artificial imagery created for movies and real shots. This is made by computer graphics. That means only background elements background scenarios and the characters which are moving and any kind of interaction with the character and ground is made by CGI. These elements can be 3D or 2D. Nowadays CGI is mostly used for 3rd dimensional editing. Filmmakers uses this on their practical shots to improve their storytelling for example adding crowd to an actually empty movie set. These things also needed to make any correction of movie for example add cloth to actor or face replacement of stunt actor.

The technology behind CGI Is evolving with advance hardware and software and techniques, enabling to make realistic and complex visual effects in movies and other media like tv shows. This technology has revolutionized the film industry allowing filmmakers to create breathtaking imaginary worlds, characters and experience that were previously only imaginable.

3D Graphics: While talking about the 3D graphics technology used in VFX, you might have been thinking that it is used to create things which cannot be depicted during shooting original

scenes. Yes it is correct that 3D graphics is the graphics created with the help of computer graphics where we can create 3D model which does not really exits or create scenes which is not possible actually like a scene of War in Avengers Endgame and and Dinosaurs in Jurassic Park series. In this 3D graphics, artists just put the model in original physics-based system through which the model is stimulated and for the scenes the 3D graphics software does all required calculations for makings the model and the scene perfect just creating it like an original scene.

There are few more points in the category of CGI graphic designing. Creating a 3D object in movies is definitely difficult thing. But modern technology and computers has enabled the filmmakers to create objects in 3D space. Simply explained the 3D graphic design is used to create things that does not really exist or cannot make those things practically. The technology of 3D graphics in cinema has evolved significantly over the years, here are some key aspects of 3D graphic designing technology,

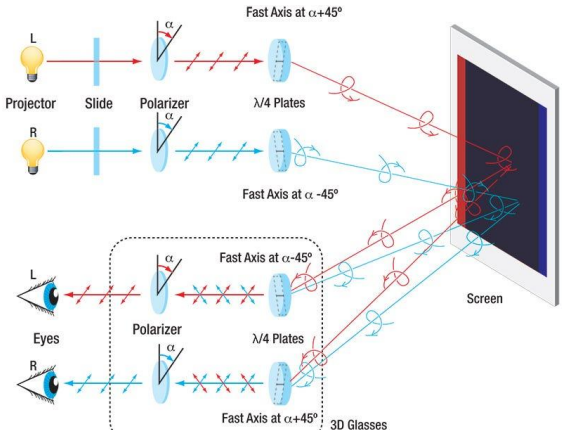
1. 3D Filming: Normal traditional 2D film capture a single perspective of a scene. In 3D camera stereoscopic filming is used to capture two slightly offset perspective like our eyes see the world. This creates illusion of depth and allows for 3 D viewing using special glasses.
2. 3D Cameras: specialised 3D cameras are used to capture stereoscopic images. These cameras have two lenses to capture the left eye and right eye view simultaneously. Over the years 3D camera technology has improved becoming more compact and capable of capturing higher resolutions. These cameras are very expensive. Films like Avatar, Endgame are shooted in these cameras.

3D camera, Photo credit: cdn.openpr.com/Q/1/Q11776030_g.jpg

3. 3D Animation: 3D graphics technology relies on powerful computers to render and anaemic 3D scenes. Animation software allows for the creation of life like creatures and environments, and rendering technology stimulates the introduction of light and material for realistic visual. Some of the famous 3D rendering software are blender, maya, unity.


3D rendering, Photo Credit: https://dreamfarmstudios.com/blog/getting-to-know-3d-texturing-in-animation-production/

4. 3D Glasses: While going to movie theatre viewers wear specialised 3D glasses that filters the images projected on the screen. These glasses ensure that each eye see the correct perspective creating the 3D effect. These are two main types of 3D glasses 1 is polarised and another is active shutter glasses. In polarised glasses to projector display images with different polarisation, these two images are captured with different perspective, and the glasses have lenses with complementary polarisation for each eye. This way each eye sees a different perspective creating a 3D effect.



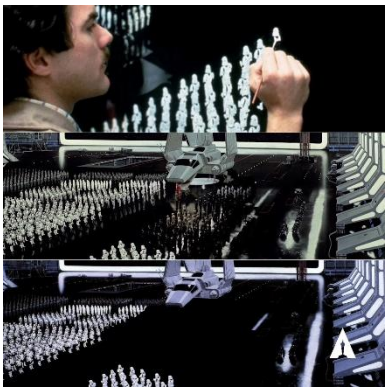
Science behind 3D glasses, Photo credit: https://miro.medium.com/v2/resize:fit:828/format:webp/1*rbaruokarLmlWWWae4jlBw.jpeg

Motion Capture: Motion capture is related very much related with the 3D graphics where the 3D models created by the computer software is given expressions like a living character with the help of actors acting with the motion capture suit which captures their facial expressions and their body movements to impliment it to the 3D model. Like in the Avatar movie series the characters are created with the help of 3D graphics and then the actors play their roles and with the help of motion capture, the 3D models get the emotions and facial expressions of the actors acting in the scenes.

Matte Painting: Matte painting is an incredibly powerful type of VFX that can be used to create a realistic and believable environment with limited resources. A skilled artist can create a believable scene from just a few pieces of artwork and some digital manipulation. Matte painting is a visual effects (VFX) technique that uses art and live action to create the illusion of a setting that would be too expensive, inconvenient, or impossible to film live. It's used in films, TV shows, and video games.

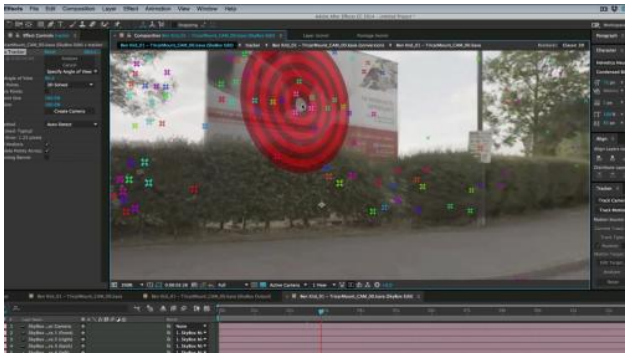
Matte painting combines: Artwork, Digital manipulation, Texturization, Lighting, Backgrounds. Matte paintings were originally used in photography. They have evolved from painted glass panels to entire 3D digital worlds.

Christopher Evans did digital matte painting for the Star Wars film that includes the sequence of spaceship hanger in the imperial march. This technique offers an incredible degree of versatility and scalability, making it a great choice for creating unique visuals with limited resources. It can be used to create anything from large-scale environments and sweeping landscapes to complex characters or even abstract pieces of artwork. Additionally, matte paintings are infinitely scalable, meaning they can be adapted easily to fit any size screen or environment, from small smartphone displays all the way up to IMAX theatres. With the combination of its unmatched visual fidelity and flexible scalability, matte painting is one of the most powerful tools in any filmmaker's toolbox.



Christopher Evans Working On 'Return of the Jedi'. Photo credit: twitter.com/TheAcademy/status/1552759608413913088

Matchmoving: Match moving, a pivotal process in visual effects (VFX), involves tracking and replicating the movement of a real-world object (such as human, animal) and camera to seamlessly integrate computer-generated imagery (CGI) or other elements into live-action footage. Camera tracking is the starting point of all that beautiful VFX CGI magic. it's where the real world and the digital touch meets for the very first time. Without it you've basically got some renders randomly plastered over your footage with none of the movement matching. Simply, put camera tracking is the process of recreating your real-world camera in your 3D software. start this process you'll generally want a few things. Obviously, you're going to need some original footage which is referred to as the plate to make things easy for yourself. Next step is to track 2D points on the footage. A tracking point keep anything from a rock on the ground to a tracking marker on a green screen. The key is that the point is small high contrast and stays in the same position throughout the shot. It may be required to track separate points for the foreground, mid ground and background for the tracking software to get a complete picture of your 'camera's position'. Relative to its environment once the points are tracked that data is used to calculate a motion path for the camera to follow. With this technique 3D models

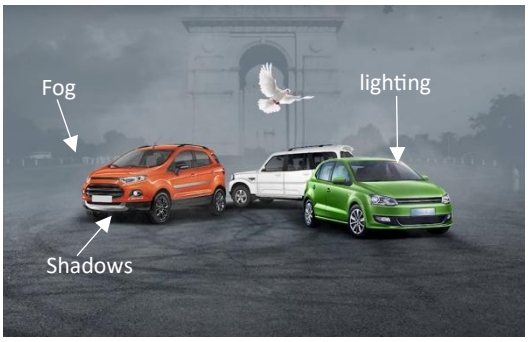


Camera tracking. Photo credit: https://www.mettle.com/how-to-3d-camera-track-360-footage-in-after-effects-skybox-studio/

will look like they actually exist in the footage provided that the model doesn't look bad in the textures shading and lighting etcetera.

With this camera dual acting is made very easy. the actor can act the first time and the camera can record its movement, and the next time the camera can move in that same path and the actor again (in another character) can act. And the third time the background is captured in the same path of the camera. After those shots are captured the three layers are composited into one single layer and the result is like, the same actor acting in two different characters in a scene.

Digital Compositing: Digital compositing is a post-production technique in which visual effects and elements from separate sources are combined to create a final image or video sequence. This is commonly used in film television graphic design and advertisement compositing in bulbs layering and blending images adjusting colours and adding various effects to achieve a cohesive and visual appealing result. It plays a crucial role in creating everything from movie special effects to advertisement and digital art. In simple words compositing is like taking different types of ingredients in a cooking. And to make the taste properly, you have to add some masla into it. If you do not composite images properly the images would look like they exist in separate different places. In that figure we are placing something on top of something but making it look like it is part of the same atmosphere.



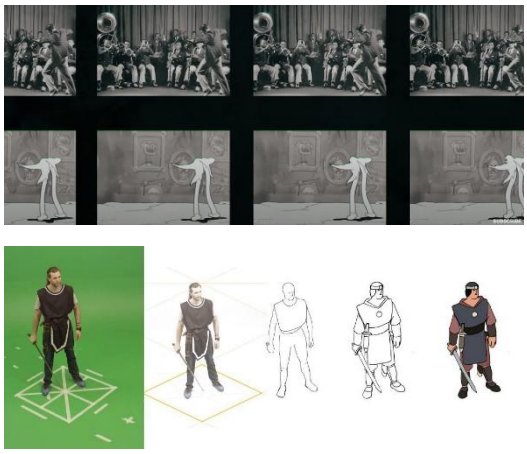
Digital Compositing. Photo credit: www.youtube.com/@KibaKibiOfficial

Chroma key: Chroma key often referred to as green screen or blue screen, it is a visual effects technique used in filmmaking and video production. It involves replacing a specific colour (usually green or blue) with another image or background during post production. By shooting a subject against solid coloured backdrop it becomes easy to digitally remove that colour and replace it with a different background, creating illusion that the subject is in a different location or environment. This technique is widely used in movies, tv


Chroma key before and after. P.C.: https://fxhome.com/wp-content/uploads/2020/12/Cyberpunk-VFX-social-00000420.jpg

shows, news channel and other video production, to place actors in various settings without physically being there.

Rotoscopy: Rotoscoping is an animation technique that involves tracing over live-action footage frame by frame. It was invented in 1915 by animator Max Fleischer. The technique allows animators to create realistic characters with fluid, life-like motions. It is often used in animation to create characters that move like real people, or to add special effects to live-action footage. But the problem was Rotoscoping was a time-consuming process because they had to do it manually by their hand. But modern rotoscoping technology has made the process much faster and easier than it was in the past. Today, rotoscoping is typically done using specialized software on a computer (e.g. Adobe after effects). This software allows animators to trace over live-action footage frame by frame, and it provides a variety of tools to help them speed up the process and create more realistic results.



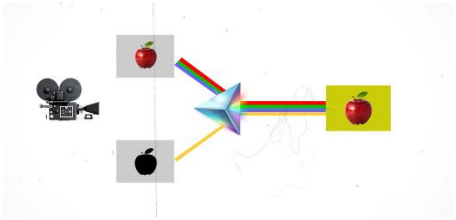
Rotoscoping, P.C.- Google images

Brief History of Visual effects: In 1857, OSCAR REJLANDER pioneered the art of special effects photography by skilfully combining different sections of 32 negatives into a single composite image, effectively creating a combination print. Later, in 1895, Alfred Clark is credited with crafting one of the earliest motion picture special effects. During the filming of a sequence depicting the beheading of Mary, Queen of Scots, Clark directed an actor to approach the execution block while wearing Mary's costume. As the executioner raised the axe above his head, Clark ingeniously halted the camera, directed all the actors to freeze, and seamlessly replaced the actor playing Mary with a dummy. He then resumed filming, allowing the executioner to bring the axe down, ultimately severing the dummy's head. Techniques such as these would go on to define the landscape of special effects production for the following century.

According to Georges Méliès, 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 transform into a hearse, pedestrians to suddenly change their direction, and men to magically transform into women. Inspired by this accidental discovery, the director of the THEATRE ROBERT HOUDIN

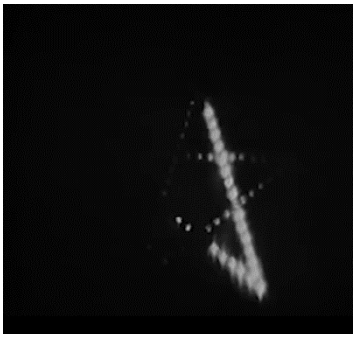
embarked on the journey to develop a series of over 500 short films. This creative journey spanned from 1896 to 1913, during which he pioneered various cinematic techniques, including multiple exposures, time-lapse photography, dissolves, and hand-painted color, fundamentally shaping the early art of filmmaking.

Some brilliant special effects techniques were used in Bengali Oscar winning director Satyajit Ray's film "Gupi Gayen O Bagha Bayen" (1969). There is a sequence called "Bhuter Nach" means "The dance of the ghost". In that shot he wanted to show something unusual is happening. So, he wanted a clean black silhouette cut out. But in that time, there was no green screen. So, he used sodium vapour and prism to separate the background and the object, and then placed another background behind the object.



Separating background by sodium vapour. PC. www.youtube.com/@KibaKibiOfficial

After that there is a special effect which is done practically. To make the star pattern animation he used Chandan Nagar like lighting. Here a rotating drum Is used. There were some divisions inside that drum.When the drum rotates it touches certain points and those certain lights turn on. in this way sequential turning on and turning off of lights happens. That's how he achieved this effect.



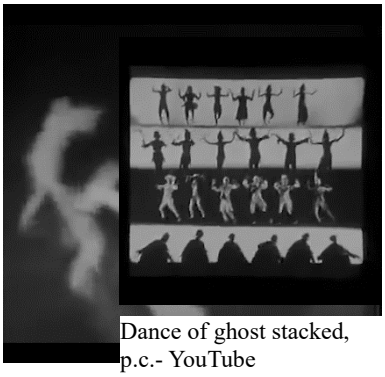
The star pattern, P.C.- Youtube

Then comes some psychiatric sequences. In this sequence he used all sorts of techniques so that the sequence looks like unsettling to the audience. He used white background with dark costume dancers. And in some shots he inverted the colour. In that sequence there is some distortion effect, to achieve this effect he used 3 techniques. The first one is he used warped glass between the camera and the dancers, And then he rotated that glass so that the shot would look like warped. And secondly when the pace of the song changes he used fire fumes to achieve the distortion effect but with little bit more distorted. And the 3rd technique is he used a glass and put some water flow over the glass

Dance of ghost, Pc- Youtube

and then he captured the sequence through that glass, That's how he achieved the distortion effect.

The distortion effect, PC- YouTube



Dance of ghost stacked, p.c.- YouTube

The sequence ends with the Dancing of the ghost stacked one over another. He did this with reels. In that time there is no one thought about post processing, But he did those special effects with some new techniques but unfortunately the detailed information about how he achieved all those effects is not available.

The history of visual effects (VFX) spans from the early days of cinema to the modern digital age:

The Rise of CGI (2000s - Present): CGI became an integral part of filmmaking, enabling filmmakers to create incredibly realistic and otherworldly visuals. The "Lord of the Rings" and "Avatar" are notable examples of films that pushed the boundaries of digital VFX.Motion Capture and Performance Capture is the development of motion capture technology, seen in films like "The Lord of the Rings" and "Avatar," allowed for the creation of lifelike characters and creatures by capturing the movements and expressions of actors.

Today, visual effects continue to evolve, with advancements in technology providing filmmakers with ever-expanding creative possibilities, from realistic digital characters to mind-bending visual spectacles.

Some major Examples of VFX used in movie scenes:

Crowds

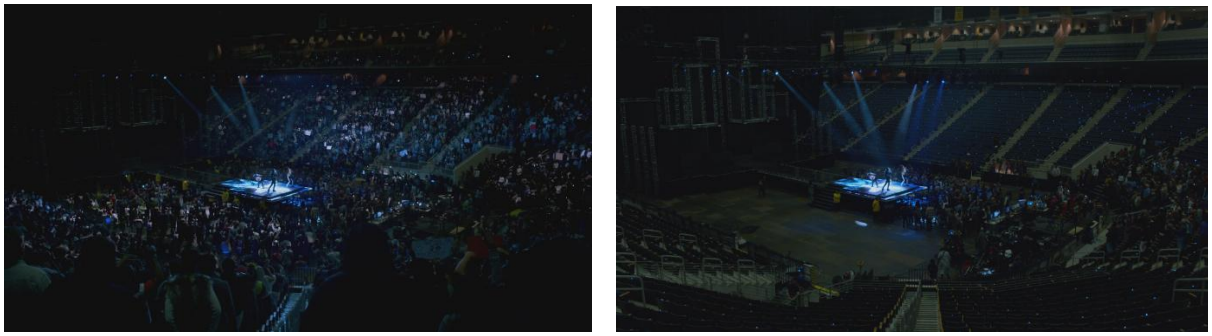
VFX is also used to create the crowd tiling to generate fake crowds from a small group of people present in the actual scene. We can just copy the small group then just accommodate the crowd as per required with some small changes so that the artificial crowds generated

matches with the scenes. This type of VFX technology is also used in video games. These crowds have almost the same expression and movement as acted by the small group of people acting in the actual scenes. Here are some methods for creating crowds in VFX:

Crowd replication: Filming a group of people in one spot, moving them, and then filming again until the scene is filled.

Computer generated people: Using software like massive or Gollum to create people.

ActionVFX cloud collections: Using high-quality footage of real people that can be customized for compositing.



Crowd generating. After and before. P.C.- https://fusefx.com/our-services/crowds/

Digital Duplicates

Digital Duplicates in VFX technology is used to create Double roles in a movie. It is done with the help of mapping and photographic references. Like in the movie of Krrish, Hrithik Roshan has dual role as a super hero and as a scientist. For creating the scenes, two separate scenes are joined in a single scene with the help of VFX technology. Sometimes a dummy in taken in the scene to copy the main actor and then his facial expression is replaced with the original actor with the help of VFX technology, this is also called Digital Duplicates as the actor doesn't need to play his dual role in two separate scenes and then combine it to one scene.

CONCLUSION:

What we can expect in the next few years? The VFX technology is widely used in the current movies and from this trend we expect that the trend will also rise as this technology is fully inspired from the video games in which a lot of 3D graphical character and scenes in used . Along with this, the VFX in used extremely in superheroes movies like Avengers series, DC movie series etc., in science fiction movies like Inception, Intestellar, etc. along wit other movies in a variying scale of usage of this technology as this technology gives another level of

shape to the movies which the spectators will definitely enjoy watching. This technology is constantly improving so we can expect new systems and programs will give better visual experience. So the Visual Effect technology has a brigth and rising future in the film industry.

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