



ISDM (INDEPENDENT SKILL DEVELOPMENT MISSION)



Introduction to Visual Effects (VFX) & Compositing



CHAPTER 1: UNDERSTANDING VISUAL EFFECTS (VFX)

1.1 What is Visual Effects (VFX)?

Visual Effects (VFX) is the process of **creating, enhancing, or manipulating visual elements** in post-production to achieve results that cannot be captured through normal filming. These effects can include **CGI (Computer-Generated Imagery), green screen compositing, digital matte painting, and motion tracking**.

✓ VFX enables filmmakers to create environments, creatures, or scenes that are too dangerous, expensive, or impossible to shoot in real life.

1.2 Importance of VFX in Modern Media

✓ **Enhances storytelling** – Allows filmmakers to bring **fantastical worlds and ideas to life**.

✓ **Cost-effective alternative** – Reduces the need for expensive physical sets and locations.

✓ **Allows for seamless integration** – Merges live-action footage with **CG elements** to create realistic visuals.

- ✓ **Used across industries** – Found in films, video games, advertising, and virtual reality experiences.

📌 Example:

The **Marvel Cinematic Universe (MCU)** heavily relies on **VFX** for its superhero battles, CGI characters (Hulk, Thanos), and futuristic environments.

💡 Conclusion:

VFX is an essential tool for **filmmakers, game developers, and digital artists** to create compelling and immersive experiences.

📌 CHAPTER 2: HISTORY & EVOLUTION OF VFX

2.1 Early VFX Techniques (1890s - 1950s)

- ✓ **Georges Méliès** pioneered early VFX with *A Trip to the Moon* (1902) using **stop-motion** and **jump cuts**.
- ✓ **Miniatures & Practical Effects** – Films like *King Kong* (1933) used **models** and **stop-motion animation**.
- ✓ **Matte Painting** – Artists painted backgrounds on glass to create the illusion of vast landscapes.

2.2 The Golden Age of VFX (1960s - 1990s)

- ✓ **Motion Control Cameras** – Used in *Star Wars* (1977) for **realistic spaceship battles**.
- ✓ **Optical Compositing** – Merging multiple film elements for *Blade Runner* (1982) and *Indiana Jones* (1981).
- ✓ **Animatronics & Puppetry** – Used for realistic creatures in *Jurassic Park* (1993) and *E.T.* (1982).

2.3 Digital Revolution & CGI (2000s - Present)

- ✓ **Fully CGI Characters** – *Gollum in The Lord of the Rings (2001-2003)* used motion capture technology.
- ✓ **Deep Learning & AI in VFX** – AI-powered face-swapping (Deepfake) is revolutionizing character transformations.
- ✓ **Virtual Production** – *The Mandalorian (2019)* used LED screens and real-time rendering instead of green screens.

📌 Example:

Films like *Avatar (2009)* & *Avengers: Endgame (2019)* used cutting-edge CGI and motion capture to create realistic, immersive worlds.

💡 Conclusion:

VFX has evolved from **basic camera tricks to complex CGI-based photorealistic imagery**, making modern filmmaking limitless.

📌 CHAPTER 3: TYPES OF VISUAL EFFECTS (VFX)

3.1 CGI (Computer-Generated Imagery)

- ✓ The use of **3D computer graphics** to create environments, characters, and effects.
- ✓ Used in **movies, video games, and VR experiences**.
- ✓ Examples: The dragons in *Game of Thrones*, digital animals in *The Jungle Book (2016)*.

3.2 Compositing & Green Screen (Chroma Keying)

- ✓ Combining multiple layers of footage into a **single seamless frame**.
- ✓ Uses **green screens** to replace backgrounds.
- ✓ Example: **Weather forecasts use chroma key to replace the background with animated maps**.

3.3 Motion Tracking & Rotoscoping

- ✓ **Motion tracking** follows **object movement in video** for adding CG elements.
- ✓ **Rotoscoping** isolates subjects for compositing (removing objects, adding visual effects).
- ✓ Used in films like *Doctor Strange* (2016) for **reality-bending sequences**.

3.4 Matte Painting & Digital Set Extensions

- ✓ Painting realistic backgrounds that blend seamlessly with live-action footage.
- ✓ Example: *The Lord of the Rings* (2001) used **matte paintings** for **fantasy landscapes**.

3.5 Simulated Effects (Fire, Water, Explosions, Smoke)

- ✓ Used to **create realistic natural elements**.
- ✓ Software like **Houdini, Blender, and Maya** is used for dynamic simulations.
- ✓ Example: *Inception* (2010) used **simulated water and physics-based effects**.

 **Conclusion:**

Modern VFX relies on **multiple techniques working together** to create stunning visuals for films, TV, and gaming.

CHAPTER 4: INTRODUCTION TO COMPOSITING

4.1 What is Compositing?

Compositing is the process of **combining multiple visual elements** (CGI, green screen, live-action) into a final, cohesive scene.

4.2 Popular Compositing Software

- ✓ **Adobe After Effects** – Best for motion graphics and VFX compositing.
- ✓ **Nuke** – Used in Hollywood films for advanced node-based compositing.
- ✓ **Fusion (Blackmagic Design)** – A powerful VFX tool for 3D compositing.

4.3 Techniques in Compositing

- ✓ **Chroma Keying (Green Screen Removal)**
- ✓ **Color Matching & Grading** to blend CGI elements with real footage.
- ✓ **Motion Blur & Depth of Field** for realism.

📌 Example:

In *The Matrix* (1999), the famous bullet-time effect was created using compositing and motion tracking.

💡 Conclusion:

Compositing merges different elements seamlessly, creating the illusion of a unified scene.

📌 CHAPTER 5: VFX WORKFLOW – FROM CONCEPT TO FINAL RENDER

5.1 VFX Pipeline in Film & Video Production

- ✓ **Pre-Production:** Planning storyboards, previs (pre-visualization), and concept art.
- ✓ **Production:** Shooting green screen footage & capturing motion

data.

✓ **Post-Production:**

- Compositing CGI with live footage.
- Adding special effects, color grading, and final rendering.

5.2 Real-World Workflow Example

✓ **Pre-visualization** – Creating a rough CG version of a scene before shooting.

✓ **On-set Production** – Capturing green screen footage & motion tracking.

✓ **Post-Processing** – Compositing final VFX layers into the film.

📌 **Example:**

The film *Gravity* (2013) used **previs, green screen, and CG compositing** to create the illusion of space.

💡 **Conclusion:**

A structured VFX workflow ensures **high-quality visuals and realistic integration of CGI into live-action**.

📌 **CHAPTER 6: FUTURE OF VFX & COMPOSITING**

6.1 AI & Machine Learning in VFX

- ✓ AI-based face replacement & deepfake technology.
- ✓ Smart rotoscoping & object removal using AI.

6.2 Real-Time Rendering & Virtual Production

- ✓ LED Screens & Unreal Engine used in *The Mandalorian* (2019).
- ✓ Game engines replacing traditional CGI workflows for interactive filmmaking.

6.3 Virtual Reality (VR) & Augmented Reality (AR) in VFX

- ✓ VR & AR allow **interactive environments in movies and games.**
- ✓ Used in **gaming, training simulations, and immersive storytelling.**

 **Example:**

The **MetaHuman Creator by Unreal Engine** allows filmmakers to generate ultra-realistic CGI humans.

 **Conclusion:**

The future of VFX will be dominated by **AI, real-time rendering, and immersive storytelling.**

 **FINAL TAKEAWAYS**

- ✓ VFX enhances **storytelling through CGI, motion tracking, and compositing.**
- ✓ Modern **VFX techniques include green screen, 3D modeling, and simulations.**
- ✓ Compositing merges **CGI & live-action footage for seamless integration.**
- ✓ The future of VFX is shifting towards **AI, real-time rendering, and VR-based content.**

Green Screen (Chroma Keying) & Background Replacement

CHAPTER 1: INTRODUCTION TO GREEN SCREEN TECHNOLOGY

1.1 What is Green Screen (Chroma Keying)?

Green screen, also known as **chroma keying**, is a **visual effects (VFX) technique** used to remove a specific color from a video and replace it with another background. It is commonly used in **film production, live streaming, weather broadcasts, and gaming**.

- ✓ "Chroma" means color, and "keying" refers to removing a specific color.
- ✓ It allows editors to **replace the background with another video, image, or CGI**.
- ✓ **Green** is typically used because it is **the least likely color to match human skin tones**.

Example Use Cases:

- **Movies & TV** → Actors perform in front of a green screen, and digital backgrounds (CGI) are added later.
- **News & Weather Forecasts** → Presenters appear in front of animated maps.
- **Gaming & Streaming** → YouTubers use green screens for facecam overlays.

Conclusion:

Green screen technology enables **seamless background removal**, making it a key tool for **VFX and professional video production**.

📌 CHAPTER 2: HOW CHROMA KEYING WORKS

2.1 Step-by-Step Process of Chroma Keying

- ✓ **Step 1: Shooting the Video** → Record a subject in front of a green screen with proper lighting.
- ✓ **Step 2: Selecting the Chroma Key Color** → Identify the color (typically green or blue) to be removed.
- ✓ **Step 3: Removing the Background** → Use editing software (Adobe Premiere Pro, After Effects, DaVinci Resolve) to key out the color.
- ✓ **Step 4: Adding a New Background** → Replace the green screen with a video, image, or CGI environment.
- ✓ **Step 5: Adjusting Edges & Shadows** → Fine-tune the edges to make the effect look realistic.

📌 Example:

In *Avengers: Endgame*, actors performed in front of a green screen, and entire futuristic landscapes were added using CGI.

💡 Conclusion:

By understanding how chroma keying works, editors can create high-quality background replacements with precision.

📌 CHAPTER 3: SETTING UP A GREEN SCREEN SHOOT

3.1 Choosing the Right Green Screen

- ✓ **Fabric or Collapsible Screens** – Best for portable and low-budget setups.
- ✓ **Painted Green Walls** – Ideal for professional studio setups.
- ✓ **Pop-Up Green Screens** – Used for gaming and live streaming.

3.2 Essential Equipment for Green Screen Shooting

- ✓ **Camera** – A DSLR, mirrorless, or high-quality webcam for sharp video.
- ✓ **Lighting Setup** – Even lighting ensures **smooth background removal**.
- ✓ **Backdrop Stand or Frame** – Holds the green screen in place.

📌 **Example Lighting Setup for Chroma Keying:**

- ✓ **Key Light** – Brightest light, placed at **45-degree angle** to the subject.
- ✓ **Fill Light** – Softer light to **reduce shadows on the subject's face**.
- ✓ **Backlight** – Separates the subject from the green screen to **avoid color spill**.

💡 **Conclusion:**

A well-lit green screen ensures smooth keying and better background integration.

📌 **CHAPTER 4: COMMON CHROMA KEYING MISTAKES & HOW TO AVOID THEM**

4.1 Color Spill (Green Reflection on Subject's Skin & Clothes)

- ✓ **Cause:** Green light reflecting onto the subject.
- ✓ **Solution:** Increase **distance between the subject and the green screen** & use proper lighting.

4.2 Shadows on the Green Screen

- ✓ **Cause:** Uneven lighting creates **dark spots** that are hard to key out.
- ✓ **Solution:** Use multiple soft lights to evenly light the backdrop.

4.3 Using Low-Quality Video Compression

- ✓ **Cause:** Low-resolution footage creates **pixelation around the subject.**
- ✓ **Solution:** Record in **4K or high-bitrate 1080p** for better edge detection.

📌 **Example:**

If a video has shadows on the green screen, it will leave **ghosting or artifacts when replacing the background.**

💡 **Conclusion:**

Avoiding these mistakes leads to **cleaner keying and more professional-looking videos.**

📌 **CHAPTER 5: SOFTWARE FOR CHROMA KEYING & BACKGROUND REPLACEMENT**

5.1 Popular Chroma Keying Software

Software	Best For	Features
Adobe Premiere Pro	Professional video editing	Advanced keying effects, edge refinement
Adobe After Effects	VFX & compositing	High-end chroma keying & motion tracking
DaVinci Resolve	Color grading & keying	AI-based background removal
Final Cut Pro X	Mac users	Built-in chroma key tools

Software	Best For	Features
OBS Studio	Live streaming	Real-time green screen removal

5.2 Using Adobe Premiere Pro for Chroma Keying

📌 Step-by-Step Guide:

- ✓ **Step 1:** Import footage into Adobe Premiere Pro.
- ✓ **Step 2:** Apply **Ultra Key effect** from the Effects panel.
- ✓ **Step 3:** Select the **Eyedropper Tool** and click on the green area.
- ✓ **Step 4:** Adjust **Transparency, Highlight, and Shadows** for a clean key.
- ✓ **Step 5:** Add a **background video or image** underneath the keyed footage.

📌 Example:

A **weather reporter stands in front of a green screen**, and an animated weather map is inserted behind them using Adobe Premiere Pro.

💡 Conclusion:

Choosing the right software allows for **faster, more accurate chroma keying with high-quality results**.

📌 CHAPTER 6: ADVANCED CHROMA KEYING TECHNIQUES

6.1 Multi-Keying (Using Multiple Color Keys)

- ✓ When a single **green screen** doesn't cover all shadows, multi-keying removes different shades of green separately.

6.2 Rotoscoping (Manual Keying for Difficult Shots)

- ✓ Used when **chroma keying doesn't work perfectly** (e.g., green objects in the scene).
- ✓ Editors **manually mask out the subject frame-by-frame**.

6.3 Motion Tracking & Keying for Moving Shots

- ✓ If the subject **moves a lot**, motion tracking ensures the **background moves realistically**.
- ✓ After Effects and DaVinci Resolve allow **camera tracking for complex compositing**.

📌 **Example:**

In *The Mandalorian*, Virtual Production LED screens replaced green screens, making real-time 3D backgrounds move with the camera.

💡 **Conclusion:**

Advanced keying techniques help in **achieving realistic VFX for film, gaming, and live broadcasting**.

📌 **CHAPTER 7: FUTURE OF CHROMA KEYING & AI BACKGROUND REMOVAL**

- ✓ **AI-Powered Green Screen Removal** – Tools like Adobe Sensei & Runway ML automate chroma keying **without a green screen**.
- ✓ **Virtual Sets & LED Walls** – Instead of green screens, LED screens display **real-time CGI environments**.
- ✓ **Real-Time Background Replacement for Live Streaming** – AI-driven tools remove backgrounds **without needing physical green screens**.

📌 **Example:**

Zoom & Microsoft Teams use **AI chroma keying to replace backgrounds during video calls without requiring green screens**.

Conclusion:

The future of chroma keying will be **AI-driven, allowing faster, more realistic background replacements in real time.**

FINAL TAKEAWAYS

- Green screen (chroma keying) allows for realistic background replacement in videos.
- Proper lighting setup ensures better chroma key results.
- Software like Premiere Pro, After Effects, and DaVinci Resolve provide professional-level keying.
- AI is revolutionizing chroma keying with real-time background removal.

2D Motion Tracking & Object Removal

CHAPTER 1: INTRODUCTION TO 2D MOTION TRACKING

1.1 What is 2D Motion Tracking?

2D Motion Tracking is a technique used in video editing and post-production that allows **tracking the movement of an object in a 2D plane** within a video. This data can then be used to **attach graphics, replace objects, stabilize footage, or add effects that follow the motion of the tracked object.**

1.2 Importance of 2D Motion Tracking in Video Editing

- ✓ **Seamless Special Effects** – Adds text, graphics, or animations that follow an object's movement.
- ✓ **Camera Stabilization** – Helps correct shaky footage by tracking a steady reference point.
- ✓ **Augmented Reality (AR) Integration** – Attaches 2D objects to real-world movements.
- ✓ **VFX Compositing** – Used to blend CGI elements into live-action footage.

Example Use Case:

A sports broadcaster adds **real-time player statistics** onto a moving soccer player using **motion tracking** to follow their movement across the field.

Conclusion:

Motion tracking **enhances storytelling** by making graphics and effects **interact naturally with real-world footage**.

📌 CHAPTER 2: TYPES OF 2D MOTION TRACKING

2.1 Single-Point Tracking

- ✓ Tracks **one point** in a scene (e.g., a person's hand or a moving car).
- ✓ Ideal for **attaching simple elements** like text, logos, or small graphics.

📌 Example:

Tracking an actor's face to add a **face blur effect** in a documentary.

2.2 Multi-Point Tracking (Corner Pin Tracking)

- ✓ Tracks **multiple points** to adjust for perspective changes.
- ✓ Used in **screen replacements** (e.g., inserting new content into a TV screen).

📌 Example:

Replacing a **billboard advertisement** in a cityscape with a new digital ad.

2.3 Planar Tracking

- ✓ Tracks an **entire flat surface** rather than just a point.
- ✓ Used for **wall projections, posters, and screen replacements**.

📌 Example:

Tracking a **magazine cover** to replace it with a moving animation.

2.4 Stabilization Tracking

- ✓ Used to **smooth shaky footage** by stabilizing camera motion.
- ✓ Helps in creating **cinematic, professional-quality videos**.

Example:

Stabilizing a **handheld vlog shot** to make it look smoother and more professional.

Conclusion:

Choosing the **right type of motion tracking** depends on **what you need to attach, replace, or stabilize in the footage**.

CHAPTER 3: 2D MOTION TRACKING IN ADOBE AFTER EFFECTS

3.1 Setting Up Motion Tracking in After Effects

- ✓ Open **After Effects** and **import footage** into the timeline.
- ✓ Go to **Window > Tracker Panel** to open the motion tracking tools.
- ✓ Select the **clip to track** and click **Track Motion**.

3.2 Performing a Single-Point Motion Track

Step-by-Step Guide:

- Select a high-contrast point on the object you want to track.
- Adjust the **tracking box size** to capture movement accurately.
- Click **Analyze Forward** to track motion through the timeline.
- Apply tracking data to a **Null Object** to attach text, graphics, or effects.

3.3 Performing Multi-Point (Corner Pin) Tracking

📌 Step-by-Step Guide:

- 1 Select **Track Motion** and enable **Perspective Corner Pin**.
 - 2 Choose **four points** around the area to track (e.g., a TV screen).
 - 3 Apply the tracking data to a **new video or image** to replace the screen content.
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3.4 Planar Tracking with Mocha AE

Mocha AE is a **powerful tracking tool** integrated into After Effects.

📌 Step-by-Step Guide:

- 1 Select your footage and go to **Effect > Mocha AE**.
- 2 In the Mocha interface, draw a shape around the surface to track.
- 3 Track the object and **export tracking data**.
- 4 Apply the data to a **new layer in After Effects** to integrate new graphics.

💡 Conclusion:

After Effects offers multiple tracking tools to **attach effects, replace objects, and enhance visuals seamlessly**.

📌 CHAPTER 4: OBJECT REMOVAL TECHNIQUES IN VIDEO EDITING

4.1 What is Object Removal?

Object Removal is a post-production technique used to **erase unwanted objects or people from video footage** while maintaining a natural background.

4.2 When is Object Removal Used?

- ✓ Removing boom mics, crew members, or unwanted objects from a scene.
- ✓ Cleaning up distracting elements in corporate videos.
- ✓ Enhancing visual storytelling by making scenes look cleaner.

 **Example:**

In a movie scene, an editor removes a coffee cup mistakenly left on a medieval film set.

 **CHAPTER 5: OBJECT REMOVAL USING ADOBE AFTER EFFECTS & PREMIERE PRO**

5.1 Object Removal with Content-Aware Fill (After Effects)

Adobe After Effects provides AI-powered Content-Aware Fill to remove unwanted objects automatically.

 **Step-by-Step Guide:**

- ❑ Select the **video layer** and use the **Pen Tool** to create a mask around the object.
- ❑ Go to **Edit > Content-Aware Fill** and select "Fill Method: Object Removal".
- ❑ Click **Generate Fill Layer** to remove the object and fill the background seamlessly.
- ✓ Works best with **static backgrounds and moving objects**.

5.2 Object Removal with Clone Stamp Tool (After Effects)

- ✓ Used for manual retouching of smaller objects.

📌 Step-by-Step Guide:

- ☒ Select the **Clone Stamp Tool** (Alt + Click to sample an area).
- ☒ Paint over the unwanted object to **blend the background naturally**.
- ☒ Adjust **feathering and opacity** to smooth out the transition.
- ✓ Works best for **small object removals** like dust, scratches, or minor distractions.

5.3 Object Removal in Adobe Premiere Pro Using Masks & Blending

📌 Step-by-Step Guide:

- ☒ Duplicate the **video layer** in the timeline.
- ☒ Apply the **Mask Tool (Opacity Section)** on the duplicated layer.
- ☒ Move the mask to cover the unwanted object.
- ☒ Feather the edges and adjust the blending for a seamless effect.
- ✓ Best for removing **small distractions without complex tracking**.

💡 Conclusion:

Adobe tools offer multiple techniques for removing unwanted objects, from **AI-powered Content-Aware Fill** to **manual clone stamping**.

📌 CHAPTER 6: OBJECT REMOVAL USING ADVANCED TOOLS (MOCHA PRO, DAVINCI RESOLVE, NUKE)

6.1 Mocha Pro for Advanced Object Removal

- ✓ Mocha Pro's **Remove Module** helps in complex object removals.
- ✓ Uses **planar tracking** to reconstruct missing areas realistically.

📌 Step-by-Step Guide:

- ☒ Open Mocha Pro and **track the background behind the object.**
- ☒ Select the object and apply the **Remove Module.**
- ☒ Mocha generates a **clean plate** by filling in missing details.
- ✓ Used in **Hollywood films** for professional-grade removals.

6.2 Object Removal in DaVinci Resolve

- ✓ DaVinci Resolve's **Fusion tool** allows object removal with cloning and patching.
- ✓ Uses **tracker-based cloning** for seamless blending.

📌 Example:

Removing a **moving vehicle** from a drone shot using **tracking & patching techniques**.

💡 Conclusion:

For high-end professional VFX work, advanced software like **Mocha Pro** and **DaVinci Resolve** provide precise object removal capabilities.

📌 FINAL TAKEAWAYS

- ✓ 2D Motion Tracking is essential for attaching graphics, stabilizing footage, and adding VFX.
- ✓ Adobe After Effects, Mocha AE, and DaVinci Resolve offer powerful tracking tools.
- ✓ Object Removal techniques help in cleaning up footage and creating seamless edits.

- ✓ Advanced tools like Mocha Pro and AI-powered Content-Aware Fill make complex removals easier.

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Using Blender for Basic 3D Compositing in 2D Edits

CHAPTER 1: INTRODUCTION TO 3D COMPOSITING IN 2D EDITS

1.1 What is 3D Compositing?

3D compositing is the process of **integrating 3D elements (models, animations, lighting effects, etc.) into a 2D video** to create realistic visual effects and depth. In Blender, **3D compositing allows editors to merge CGI elements with real-world footage**, making it ideal for film, advertisements, motion graphics, and game cinematics.

1.2 Why Use Blender for 3D Compositing?

Blender is a **powerful, open-source 3D software** that offers advanced compositing features without requiring expensive licenses.

- ✓ **Realistic 3D Integration** – Match real-world footage with CGI elements.
- ✓ **Node-Based Compositing System** – Allows **precise control over blending effects**.
- ✓ **Motion Tracking** – Helps align 3D models with camera movements in live footage.
- ✓ **Green Screen (Chroma Keying)** – Easily replace backgrounds in 2D edits.
- ✓ **Lighting & Shadows Matching** – Enhances realism in 3D composited scenes.

Example Use Case:

A filmmaker wants to **add a futuristic holographic display** into a

live-action scene. Using Blender's **3D compositing tools**, they integrate **a glowing 3D object into a real-world background** while matching camera movement.

Conclusion:

3D compositing in Blender **bridges the gap between reality and CGI**, making video edits more dynamic and visually engaging.

CHAPTER 2: SETTING UP BLENDER FOR 3D COMPOSITING

2.1 Downloading & Installing Blender

- ✓ Download Blender from the official website: [Blender.org](https://www.blender.org)
- ✓ Install the latest version compatible with your OS (Windows, macOS, Linux).

2.2 Understanding the Blender Interface for Compositing

Blender's interface consists of:

- ✓ **3D Viewport** – Displays the scene and objects.
- ✓ **Shader Editor & Compositing Nodes** – Used for node-based compositing.
- ✓ **Timeline & Sequencer** – Controls animations and video sequences.
- ✓ **Properties Panel** – Adjusts render settings, lighting, and materials.

Example Workflow:

A video editor imports a **2D film scene** into Blender, then adds a **3D spaceship flying in the background**, seamlessly integrating CGI with real-world footage.

Conclusion:

Familiarizing yourself with Blender's layout **improves workflow efficiency** when compositing 3D elements in 2D edits.

CHAPTER 3: IMPORTING 2D FOOTAGE INTO BLENDER

3.1 Preparing the Video for Blender

- ✓ Convert video to **MP4 or PNG Sequence** for better compatibility.
- ✓ Ensure video **matches Blender's frame rate (24, 30, or 60 FPS)**.
- ✓ **Stabilize shaky footage** using a video editor before importing.

3.2 Importing Video into Blender's Video Sequence Editor (VSE)

- 1 Open Blender and switch to **Video Editing Workspace**.
- 2 Go to **Add > Movie Clip**, then import the video file.
- 3 Adjust the timeline to match the **video's duration**.

Example Use Case:

A **news broadcaster** wants to add a **floating 3D news banner to a live interview**. By importing the interview footage into Blender, they can **layer the animated 3D graphics seamlessly**.

Conclusion:

Properly importing and preparing 2D video clips ensures **smooth integration** of 3D elements.

CHAPTER 4: MATCHING 3D OBJECTS TO 2D FOOTAGE

4.1 Motion Tracking in Blender

✓ **Why?** To synchronize 3D objects with camera movement in the 2D footage.

✓ **How?** Use Blender's Motion Tracking tools:

1 Switch to **Motion Tracking Workspace**.

2 Load the video and create **tracking points** on high-contrast areas.

3 Click **Solve Camera Motion** to create a **virtual 3D camera**.

4 Apply the motion data to **match 3D objects with real-world camera movements**.

4.2 Aligning Lighting & Shadows for Realism

✓ Use **HDRI environment maps** to match real-world lighting.

✓ Add **shadow-casting lights** for realistic object interaction.

✓ Adjust **render properties** for better blending with 2D footage.

📌 **Example Use Case:**

A VFX artist adds a **3D monster to a street scene**, ensuring it moves realistically by matching the **camera angles and lighting** of the original video.

💡 **Conclusion:**

Precise motion tracking and lighting **enhance the realism of 3D compositing** in 2D footage.

CHAPTER 5: NODE-BASED COMPOSITING IN BLENDER

5.1 Understanding Blender's Compositing Nodes

Blender's **node-based system** allows **precise control** over blending 3D objects into video footage.

✓ **Render Layers** – Separate 3D elements from the background.

✓ **Alpha Over Node** – Overlay 3D objects on 2D video.

✓ **Color Correction Nodes** – Adjust brightness, contrast, and saturation.

✓ **Blur & Glow Effects** – Add depth & realism to 3D elements.

5.2 Steps to Use the Compositing Nodes

- 1 Open the **Compositing Workspace** and enable **Use Nodes**.
- 2 Connect **Render Layers Node** to the **Composite Node**.
- 3 Add an **Alpha Over Node** to merge **3D objects with 2D video**.
- 4 Fine-tune with **Color Balance & Blur Nodes** for a realistic look.

➡ Example Use Case:

A video editor creates a **futuristic cityscape** by layering **3D holographic billboards** into real-world drone footage.

💡 Conclusion:

Node-based compositing provides **greater flexibility and control** for **seamlessly blending CGI with live-action video**.

CHAPTER 6: EXPORTING & INTEGRATING 3D COMPOSITED VIDEOS

6.1 Rendering the Final Output

- ✓ Set the render engine to **Cycles or Eevee** for better output quality.
- ✓ Configure the resolution, frame rate, and encoding settings.
- ✓ Export as **MP4 or PNG Sequence** for further post-production in Premiere Pro.

6.2 Integrating 3D Elements in Premiere Pro & After Effects

- ✓ Import rendered 3D footage into a **2D editing timeline**.
- ✓ Use **opacity & blending modes** to fine-tune the integration.
- ✓ Add **motion blur & color grading** for final polishing.

📌 Example Use Case:

A YouTube content creator adds a 3D animated logo intro into a vlog, ensuring smooth transitions and high-quality rendering.

💡 Conclusion:

Exporting in the right format and integrating with 2D editors ensures high-quality final output.

📌 CHAPTER 7: ADVANCED TECHNIQUES & FUTURE TRENDS

7.1 Advanced Compositing Techniques

- ✓ **3D Camera Mapping** – Projects 2D images onto 3D geometry for a realistic effect.
- ✓ **Volumetric Lighting & Shadows** – Adds realistic fog, mist, and light beams.
- ✓ **Green Screen Keying with 3D Objects** – Enhances virtual backgrounds.

7.2 Future Trends in 3D Compositing

- ✓ **AI-Assisted Compositing** – Tools like Runway ML automate CGI integration.
- ✓ **Real-Time Compositing** – Using game engines like Unreal Engine for instant 3D rendering.
- ✓ **VR & 360-Degree Video Editing** – Expanding interactive experiences.

📌 Example Use Case:

Hollywood movies now use **real-time 3D compositing** for films like *The Mandalorian* (2020), where entire virtual backgrounds are created using **game-engine technology**.

Conclusion:

The future of video editing **merges AI, real-time rendering, and immersive experiences**, making 3D compositing **more powerful and accessible**.

FINAL TAKEAWAYS

- Blender provides powerful 3D compositing tools for 2D edits.
- Motion tracking & lighting adjustments are key to realistic integration.
- Node-based compositing allows precise control over blending CGI with video.
- Future trends include AI automation and real-time 3D compositing for next-gen filmmaking.

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Introduction to Rotoscoping & Masking for Special Effects

CHAPTER 1: UNDERSTANDING ROTOSCOPING & MASKING

1.1 What is Rotoscoping?

Rotoscoping is a **frame-by-frame animation technique** used in video editing to **manually trace over motion picture footage**. It is commonly used in:

- ✓ Removing objects and characters from a scene.
- ✓ Creating visual effects (VFX) like glowing lightsabers or energy fields.
- ✓ Replacing green screens when chroma keying is not an option.

Example Use Case:

In films like *Avengers: Endgame*, rotoscoping was used to isolate actors for **CGI-heavy battle scenes**.

Conclusion:

Rotoscoping is **essential for creating seamless visual effects** and compositing real-world footage with CGI elements.

1.2 What is Masking in Video Editing?

Masking is a **technique used to hide, reveal, or modify specific parts of a video frame**. It is commonly used in:

- ✓ Blurring faces or censoring parts of a video.
- ✓ Creating complex transitions and effects.
- ✓ Replacing elements in a scene without affecting the background.

❖ Example Use Case:

Masking is often used to create the **invisibility cloak effect** seen in movies like *Harry Potter*.

💡 Conclusion:

Both **rotoscoping** and **masking** are fundamental techniques in professional video editing & VFX production.

❖ CHAPTER 2: HISTORY & EVOLUTION OF ROTOSCOPING

2.1 Early Rotoscoping Techniques (1915 – 1950s)

- ✓ Invented by Max Fleischer in 1915 for animated films like *Gulliver's Travels* (1939).
- ✓ Artists traced live-action footage **frame-by-frame** to create realistic animations.

2.2 Rotoscoping in Film & VFX (1970s – 1990s)

- ✓ **Star Wars (1977)** – Rotoscoping was used to create **lightsaber** effects.
- ✓ **Tron (1982)** – One of the first movies to blend **live-action** and **digital animation** using rotoscoping.

2.3 Digital Rotoscoping (2000s – Present)

- ✓ Modern software like **Adobe After Effects, Nuke, and Mocha Pro** replaced manual tracing.
- ✓ AI-assisted rotoscoping tools allow **faster and more accurate masking**.
- ✓ Used extensively in **Marvel, DC, and sci-fi movies** for **CGI compositing**.

💡 Conclusion:

From hand-traced animations to AI-powered tools, rotoscoping has evolved into a key technique in modern VFX production.

📌 CHAPTER 3: TOOLS & SOFTWARE FOR ROTOSCOPING & MASKING

3.1 Industry-Standard Rotoscoping & Masking Software

- ✓ **Adobe After Effects (Roto Brush & Mocha AE)** – Best for motion graphics & film compositing.
- ✓ **Nuke (Roto & RotoPaint Nodes)** – Used in professional VFX and Hollywood productions.
- ✓ **SilhouetteFX** – Advanced rotoscoping software for high-quality visual effects.
- ✓ **Blender & DaVinci Resolve** – Free tools that support rotoscoping & masking.

3.2 Choosing the Right Software for Your Project

Software	Best For
After Effects	Motion graphics, VFX, basic rotoscoping
Nuke	High-end Hollywood VFX, professional compositing
Mocha Pro	Advanced tracking and rotoscoping
DaVinci Resolve	Free VFX & color grading

💡 Conclusion:

The choice of software depends on the complexity of the

project—After Effects for general use, **Nuke & Mocha** for high-end VFX work.

➡ CHAPTER 4: STEP-BY-STEP GUIDE TO ROTOSCOPING

4.1 Setting Up Rotoscoping in After Effects

- ✓ **Step 1:** Import video footage into **Adobe After Effects**.
- ✓ **Step 2:** Select the **Roto Brush Tool** from the toolbar.
- ✓ **Step 3:** Paint over the subject you want to isolate.
- ✓ **Step 4:** Adjust the selection using the **Refine Edge Tool**.
- ✓ **Step 5:** Animate the roto mask frame-by-frame to follow the subject.
- ✓ **Step 6:** Apply the mask and export the isolated object.

➡ Example:

- Extracting an actor from a scene to **replace the background with a CGI environment**.

💡 Conclusion:

Mastering the **Roto Brush Tool & manual keyframing** ensures **accurate rotoscoping results**.

➡ CHAPTER 5: STEP-BY-STEP GUIDE TO MASKING

5.1 Creating a Mask in After Effects

- ✓ **Step 1:** Import video footage into After Effects.
- ✓ **Step 2:** Select the **Pen Tool** and draw around the object you want to mask.
- ✓ **Step 3:** Feather the edges to create a smooth blend.

✓ **Step 4:** Apply motion tracking to adjust the mask dynamically.

✓ **Step 5:** Export or composite the masked video with new elements.

📌 Example:

- Using masking to **create a clone effect in a music video**.

💡 Conclusion:

Masking allows editors to **manipulate video elements seamlessly**, making it an essential tool in **creative filmmaking**.

📌 CHAPTER 6: ADVANCED ROTOSCOPING & MASKING TECHNIQUES

6.1 Motion Tracking & Rotoscoping

- ✓ **Combining rotoscoping with motion tracking** ensures the subject stays isolated even in moving shots.
- ✓ Used for replacing actors in stunts, de-aging effects, and face swapping.

📌 Example:

Deepfake technology uses **motion tracking + rotoscoping** to create realistic face replacements.

6.2 Using AI-Powered Rotoscoping

- ✓ Modern AI tools like **Runway ML & Adobe Sensei** automate rotoscoping, reducing manual effort.
- ✓ AI-based **automatic object selection** helps with **fast mask creation**.

📌 **Example:**

AI-powered tools can **automatically detect & remove backgrounds in real-time** without a green screen.

💡 **Conclusion:**

AI-assisted rotoscoping speeds up production, allowing **faster post-production workflows**.

📌 **CHAPTER 7: COMMON ROTOSCOPING & MASKING CHALLENGES & SOLUTIONS**

7.1 Edge Flickering & Hard Mask Lines

✓ **Solution:** Increase feathering & refine edges to avoid unnatural cuts.

7.2 Masking Hair & Transparent Objects

✓ **Solution:** Use the **Refine Edge Tool** or Mocha Pro's **edge tracking features**.

7.3 Handling Fast Movements in Rotoscoping

✓ **Solution:** Use **motion blur & frame interpolation** to create smooth results.

📌 **Example:**

Rotoscoping was used in *Harry Potter* movies for **invisibility cloak effects**, where fine details like **hair movement** had to be manually adjusted.

💡 **Conclusion:**

Fine-tuning the rotoscoping process **reduces errors and improves the final quality of the VFX**.

📍 FINAL TAKEAWAYS

- ✓ Rotoscoping & Masking are essential techniques for VFX & motion graphics.
- ✓ Modern software & AI tools have made rotoscoping easier & more efficient.
- ✓ Advanced techniques like motion tracking & AI-powered selection allow for seamless compositing.
- ✓ Learning manual & automated rotoscoping methods gives editors greater control over visual effects.

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ASSIGNMENT 1:

⌚ EDIT A GREEN SCREEN VIDEO WITH A
CUSTOM BACKGROUND.

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◆ SOLUTION: EDIT A GREEN SCREEN VIDEO WITH A CUSTOM BACKGROUND

🎯 Objective:

The goal of this assignment is to **remove the green screen (chroma key)** from a video and replace it with a custom background using professional video editing software like **Adobe Premiere Pro, Final Cut Pro, or DaVinci Resolve**.

By following this step-by-step guide, you will learn **chroma keying, background replacement, and color correction** for seamless integration.

◆ STEP 1: Set Up Your Editing Software

1.1 Choose Your Editing Software

You can use any of the following video editing tools that support **chroma keying (green screen removal)**:

- ✓ **Adobe Premiere Pro** (Industry standard for video editing).
- ✓ **Final Cut Pro X** (For Mac users).
- ✓ **DaVinci Resolve** (Best for color grading & compositing).
- ✓ **Filmora, iMovie, or CapCut** (Beginner-friendly options).

📌 **Example:** This guide will focus on **Adobe Premiere Pro**, but the steps are similar for other software.

1.2 Create a New Project

- Open **Adobe Premiere Pro**.
- Click on **New Project** → Name it "**Green Screen Editing**".
- Set the **Video Resolution** (e.g., **1920x1080, 30 FPS**).

- Click **OK** to open the workspace.

 **Conclusion:**

Setting up a project correctly ensures **smooth editing and high-quality output**.

◆ **STEP 2: Import Your Green Screen Footage & Background**

2.1 Import Media Files

- Open the **Project Panel**.
- Click **File → Import** → Select your green screen video & custom background image/video.
- Drag the imported files into the **Timeline Panel**.

 **Example:**

✓ If you recorded a person presenting with a green screen background, you can replace it with a city skyline, office setup, or animated background.

 **Conclusion:**

Properly importing and organizing media files **saves time and improves workflow efficiency**.

◆ **STEP 3: Place Footage on the Timeline**

3.1 Arrange the Green Screen Clip and Background

- Drag the **green screen video** to **Video Track 2 (V2)** in the Timeline.
- Drag the **custom background** to **Video Track 1 (V1)**.
- Align both clips to start at the same time.

👉 Why?

- ✓ The green screen video should be placed **above** the background so that the chroma key effect can reveal the background.

💡 Conclusion:

Layering clips correctly ensures **proper background replacement**.

◆ STEP 4: Apply the Chroma Key Effect (Green Screen Removal)

4.1 Use the Ultra Key Effect in Premiere Pro

- Open the **Effects Panel**.
- Search for **Ultra Key**.
- Drag and drop **Ultra Key** onto the green screen video (V2).

4.2 Remove the Green Screen

- Open the **Effect Controls Panel**.
- Click the **Eyedropper Tool** under **Key Color**.
- Click on the green background in the **Preview Window**.
- The green screen should now be removed.

👉 Example:

- ✓ If any green remains, adjust the **Matte Generation settings**:

- **Choke & Soften** → Adjust for smoother edges.
- **Spill Suppression** → Removes green tints on the subject.
- **Transparency** → Controls how much of the background is removed.

Conclusion:

Chroma keying **isolates the subject** and makes the background **transparent**.

◆ STEP 5: Adjust & Refine the Keying Effect

5.1 Fine-Tune the Chroma Key for a Clean Cut

- ✓ Increase **Pedestal** if parts of the background remain.
- ✓ Reduce **Shadow & Highlight levels** to clean up edges.
- ✓ Use **Garbage Matte** to crop unwanted areas.

Example:

- ✓ If the edges around the subject look too sharp, add **Feathering** to blend them smoothly.

Conclusion:

Fine-tuning ensures a **professional and natural look** for the final video.

◆ STEP 6: Resize & Position the Subject on the Background

6.1 Adjust the Scale & Position

- Select the **Green Screen Clip (V2)**.
- Open **Effect Controls → Motion**.
- Adjust **Scale** to fit the subject into the frame.
- Use **Position** to align the subject correctly with the background.

📌 **Example:**

- ✓ If the subject is giving a presentation, **position them on one side of the screen** so there is space for text/graphics.

💡 **Conclusion:**

Adjusting scale and position helps **blend the subject naturally** into the new background.

◆ **STEP 7: Add Shadows, Color Correction & Lighting Adjustments**

7.1 Add a Drop Shadow for Depth

- ✓ Go to **Effects Panel → Drop Shadow**.
- ✓ Drag and drop the effect onto the **green screen video**.
- ✓ Adjust **Opacity, Direction & Softness** to create a realistic shadow.

7.2 Match Color Grading with Background

- Open **Lumetri Color Panel**.
- Adjust **Contrast, Saturation & White Balance** to match the lighting.
- Use **Curves or Color Wheels** to blend the subject with the background.

📌 **Example:**

- ✓ If the background is **darker**, decrease brightness on the subject.
- ✓ If the subject looks too sharp, **apply a slight blur** to blend better.

💡 **Conclusion:**

Proper lighting and color correction make the **final video look more natural and professional**.

◆ STEP 8: Add Background Music & Sound Effects

8.1 Import & Add Background Audio

- Go to **File → Import** and select a background music track.
- Drag it to the **Audio Track (A1)** on the timeline.

8.2 Adjust Audio Levels

- ✓ Reduce background music volume (-20dB) if there is dialogue.
- ✓ Apply **Fade-In & Fade-Out** for smooth transitions.

📌 Example:

- ✓ If editing a **news-style video**, add a subtle background track for professionalism.

💡 Conclusion:

Sound design enhances the **viewing experience and professionalism**.

◆ STEP 9: Export & Save the Final Video

9.1 Set Up the Export Settings

- ✓ Click **File → Export → Media**.
- ✓ Choose **H.264 (MP4 format)** for best quality.
- ✓ Set resolution **1920x1080 (Full HD)**.
- ✓ Click **Export** and save the file.

9.2 Optimize for Different Platforms

- ✓ **YouTube & Social Media:** MP4, 1080p, 30 FPS.
- ✓ **TV & Professional Use:** ProRes or DNxHD format.

📌 **Example:**

- ✓ If the video is for **TikTok**, export in **vertical format (1080x1920)**.

💡 **Conclusion:**

Proper export settings ensure **high-quality playback on all platforms**.

📌 **FINAL TAKEAWAYS**

- ✓ Imported and organized the **green screen video & custom background**.
- ✓ Applied **Ultra Key** to remove the green screen.
- ✓ Fine-tuned keying settings to **remove edges & improve blending**.
- ✓ Adjusted **lighting, shadows, and color grading** for realism.
- ✓ Added **background music & sound effects**.
- ✓ Exported the final video for **professional use**.

📌 ⚡ **ASSIGNMENT 2:**
🎯 **CREATE A SHORT VFX SEQUENCE**
USING MOTION TRACKING.

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🔧 ✨ SOLUTION: CREATING A SHORT VFX SEQUENCE USING MOTION TRACKING

🎯 Objective:

The goal of this assignment is to create a **short VFX sequence using motion tracking**. Motion tracking allows you to **attach effects, graphics, text, or objects to a moving subject** in a video. It is commonly used in **movies, gaming, advertising, and visual storytelling**.

◆ STEP 1: Understanding Motion Tracking

1.1 What is Motion Tracking?

- ✓ Motion tracking is a **visual effects (VFX) technique** that follows the movement of an object in a video and applies effects accordingly.
- ✓ It allows for **realistic integration of digital elements** into live-action footage.

1.2 Common Uses of Motion Tracking

- ✓ **Adding text/graphics to moving objects** (e.g., news banners following a car).
- ✓ **Replacing screens (screen replacement)** (e.g., changing TV or mobile screen content).
- ✓ **Animating objects onto real footage** (e.g., adding a sci-fi HUD to a moving character).

📌 Example:

In *Iron Man*, motion tracking is used to **attach the helmet's digital HUD onto Tony Stark's movements in real time**.

 **Conclusion:**

Motion tracking is essential for **seamless visual effects and enhancing realism in VFX sequences.**

◆ **STEP 2: Choosing the Right Software for Motion Tracking**

2.1 Best Software for Motion Tracking

Software	Best For	Features
Adobe After Effects	Professional motion tracking	2D & 3D tracking, built-in Mocha AE
Blender	Open-source 3D motion tracking	3D camera tracking, object integration
DaVinci Resolve	Color grading + tracking	Advanced tracking tools for VFX
HitFilm Express	Beginner-friendly VFX	Motion tracking + effects library

 **Example:**

- **After Effects** is the industry standard for adding **VFX elements** to moving footage.
- **Blender** is best for integrating **3D objects** into real-world footage.

 **Conclusion:**

Selecting the right software depends on **whether you need 2D or 3D tracking for your VFX project.**

◆ STEP 3: Recording Footage for Motion Tracking

3.1 Tips for Capturing Good Footage

- ✓ **Use a Tripod for Stability** – Reduces unnecessary camera shake.
- ✓ **Ensure Good Lighting** – Helps tracking software detect objects easily.
- ✓ **Choose a High-Contrast Object to Track** – Motion tracking works best when the target contrasts with the background.
- ✓ **Use Markers for Better Tracking** – If needed, place **tracking markers (stickers, tape, or dots)** on the object.

📌 Example:

If you want to **replace a billboard ad in a video**, record **clear, high-resolution footage with stable movement**.

💡 Conclusion:

High-quality, **well-lit, and stable footage** improves **motion tracking accuracy**.

◆ STEP 4: Motion Tracking in Adobe After Effects

4.1 Import and Prepare the Video

📌 Steps:

- 1 Open **Adobe After Effects** and create a **new composition**.
- 2 Import your video footage into the **timeline**.
- 3 Select the video layer and open the **Tracker Panel (Window → Tracker)**.

4.2 Applying Motion Tracking

📌 Steps:

- ✓ **Step 1:** Click "Track Motion" in the Tracker Panel.

- ✓ **Step 2:** Move the **tracking point** to the object you want to track.
- ✓ **Step 3:** Adjust the **bounding box** to ensure accuracy.
- ✓ **Step 4:** Click **Analyze Forward** to track motion across the clip.

4.3 Attaching Text or Effects to the Tracked Object

📌 Steps:

- ✓ **Step 1:** Create a new **Null Object** (Layer → New → Null Object).
- ✓ **Step 2:** Link the Null Object to the motion-tracked data.
- ✓ **Step 3:** Attach any **text, images, or effects** to the Null Object.
- ✓ **Step 4:** Play the video and **fine-tune keyframes** for a smoother effect.

📌 Example:

Attach a **floating name tag** to a moving person, ensuring the text follows them **smoothly and realistically**.

💡 Conclusion:

Motion tracking allows for **precise object tracking and seamless integration of VFX elements into real footage**.

◆ STEP 5: Advanced Motion Tracking – 3D Camera Tracking in Blender

5.1 Setting Up 3D Tracking

📌 Steps:

- ✓ **Step 1:** Open Blender and select the **Motion Tracking workspace**.
- ✓ **Step 2:** Import video footage and select **Tracking Markers**.
- ✓ **Step 3:** Click "Track Forward" to analyze object movement.

5.2 Placing 3D Objects in a Scene

- ✓ **Step 1:** Solve the camera motion to create a **3D camera perspective**.
- ✓ **Step 2:** Add a **3D object or effect** to match the real-world movement.
- ✓ **Step 3:** Render the final video with the **3D object seamlessly integrated**.

📌 **Example:**

Add a **3D spaceship flying through a city** using Blender's camera tracking.

💡 **Conclusion:**

3D motion tracking is ideal for **realistic CGI integration in movies and gaming**.

- ◆ **STEP 6: Refining & Exporting the Final VFX Sequence**

6.1 Adjusting the Motion Tracking for Realism

- ✓ **Apply Motion Blur** – Makes effects look **natural and integrated**.
- ✓ **Color Match Effects with Scene** – Adjust contrast, brightness, and shadows.
- ✓ **Fine-Tune Keyframes** – Ensure smooth tracking throughout the sequence.

📌 **Example:**

If adding a digital screen to a TV, ensure the **screen reflects the lighting and angles of the original shot**.

6.2 Exporting the Final Video

📌 **Best Settings for Different Platforms:**

Platform	Recommended Format	Resolution	Bitrate
YouTube	MP4 (H.264)	1080p / 4K	8–12 Mbps
Instagram & TikTok	MP4 (H.264)	1080x1920 (Vertical)	5–8 Mbps
Film & TV	MOV (ProRes)	4K UHD	High-bitrate

📌 **Export Settings in Adobe Premiere Pro:**

- ✓ Format: H.264 (MP4)
- ✓ Resolution: 1920x1080 (or higher)
- ✓ Bitrate Encoding: CBR 12 Mbps for high-quality video

💡 **Conclusion:**

Proper export settings ensure high-quality playback across different platforms.

📌 **FINAL TAKEAWAYS**

- ✓ Motion tracking allows for seamless integration of VFX elements into live footage.
- ✓ Adobe After Effects & Blender offer powerful tracking tools for 2D and 3D effects.
- ✓ Proper lighting & stabilization ensure smooth motion tracking.
- ✓ Final exports should match platform-specific settings for best results.