

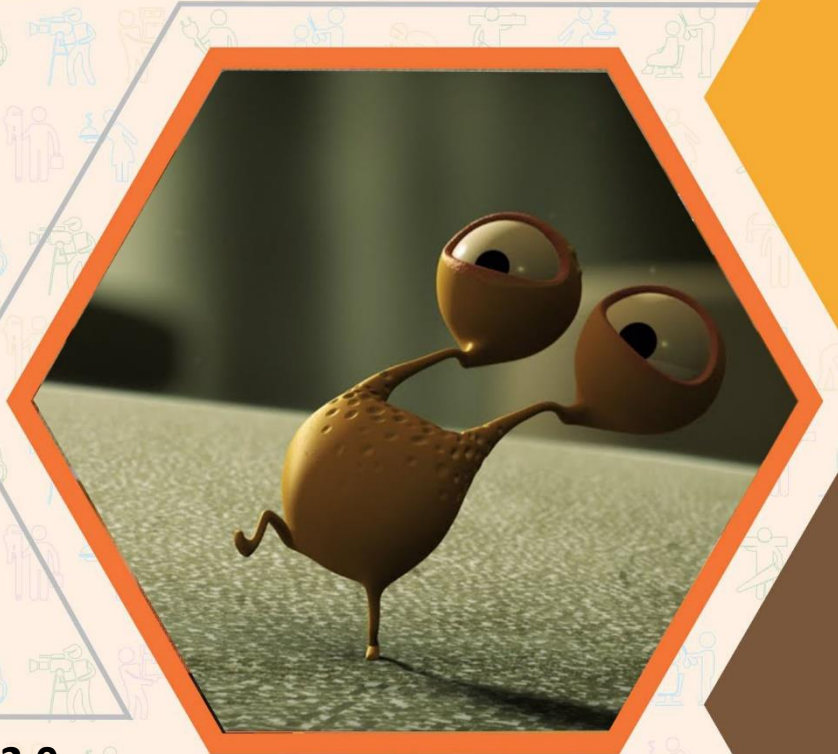
Participant Handbook

Sector
MEDIA AND ENTERTAINMENT

Sub-Sector
**Film, Television,
Animation, Advertising**

Occupation
Compositor

Reference ID: **MES/ Q 3505, Version 2.0**
NSQF Level 4



Compositor

This book is sponsored by Media and Entertainment

Sector Skill Council Contact Details:

Address: 522-524, 5th Floor, DLF Tower-A, Jasola District Centre, New Delhi – 110025

Email: info@mescindia.org

Phone: +91 11 49048335 | 49048336

Under Creative Commons License: CC-BY -SA

Attribution-ShareAlike: CC BY-SA



This license lets others remix, tweak, and build upon your work even for commercial purposes, as long as they credit you and license their new creations under the identical terms. This license is often compared to “copyleft” free and open-source software licenses. All new works based on yours will carry the same license, so any derivatives will also allow commercial use. This is the license used by Wikipedia and is recommended for materials that would benefit from incorporating content from Wikipedia and similarly licensed projects.

Disclaimer

The information contained herein has been obtained from sources reliable to Media and Entertainment. Media and Entertainment disclaims all warranties to the accuracy, completeness or adequacy of such information. Media and Entertainment shall have no liability for errors, omissions, or inadequacies, in the information contained herein, or for interpretations thereof. Every effort has been made to trace the owners of the copyright material included in the book. The publishers would be grateful for any omissions brought to their notice for acknowledgements in future editions of the book. No entity in Media and Entertainment shall be responsible for any loss whatsoever, sustained by any person who relies on this material. The material in this publication is copyrighted. No parts of this publication may be reproduced, stored or distributed in any form or by any means either on paper or electronic media, unless authorized by the Media and Entertainment.





Shri Narendra Modi

Prime Minister of India

“

Skilling is building a better India.
If we have to move India towards
development then Skill Development
should be our mission.

”



Certificate

COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

MEDIA AND ENTERTAINMENT SKILLS COUNCIL

for the

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: **'Compositor'** QP No. **'MES/Q 3505 NSQF Level 4'**

Date of Issuance:

Valid up to: **January 25, 2027**

* Valid up to the next review date of the Qualification Pack
Valid up to date mentioned above (whichever is earlier)

Authorised Signatory
(Media and entertainment skills council)

Acknowledgements

Media & Entertainment Skills Council (MESCC) would like to express its gratitude to all the individuals and institutions who contributed in different ways towards the preparation of this “Participant Manual”. Without their contribution it could not have been completed. Special thanks are extended to those who collaborated in the preparation of its different modules. Sincere appreciation is also extended to all who provided peer review for these modules.

The preparation of this manual would not have been possible without the Media and Entertainment Industry’s support. Industry feedback has been extremely encouraging from inception to conclusion and it is with their input that we have tried to bridge the skill gaps existing today in the Industry.

This participant manual is dedicated to the aspiring youth who desire to achieve special skills which will be a lifelong asset for their future endeavors.

About this Book

This Participant Handbook is designed to enable training for the Compositor Qualification Pack (QP) with Ref. ID MES/ Q 3505. There are 4 National Occupational Standards (NOS) under this qualification pack. Each National Occupational (NOS) is covered across 7 Units in this book.

Key Learning Objectives for every NOS mark the beginning of the Unit for that NOS. In Table of Contents, you will find the module names with their corresponding NOS code. The symbols used in this book are described below.

Symbols Used



Key Learning
Outcomes



Steps



Time



Tips



Notes



Unit
Objectives



Exercise

Table of Contents

S.No.	Modules and Units	Page No.
1.	Introduction	1
	UNIT 1.1: Introduction to Media & Entertainment	3
	UNIT 1.2: Duties and Responsibilities of Compositor	10
2.	Planning Workflow (MES/N3501)	15
	UNIT 2.1: Post-Production Processes	17
	UNIT 2.2: Post-Production Processes Planning and Cost Estimation	27
3.	Managing Equipment and Material (MES/N3502)	32
	UNIT 3.1: Tools and Equipment for Compositing	34
	UNIT 3.2: Preparing Data for Compositing	42
4.	Compositing (MES/N3507)	59
	UNIT 4.1: Fundamentals of Compositing	61
	UNIT 4.2: Performing Compositing	68
5.	Health and Safety Compliance at Workplace (MES/N0104)	85
	UNIT 5.1: Maintain Workplace Health and Safety	87
6.	Soft Skills and Communication Skills	98
	Unit 6.1 - Introduction to the Soft Skills	100
	Unit 6.2 - Effective Communication	102
	Unit 6.3 - Grooming and Hygiene	106
	Unit 6.4 - Interpersonal Skill Development	116
	Unit 6.5 - Social Interaction	127
	Unit 6.6 - Group Interaction	131
	Unit 6.7 - Time Management	134
	Unit 6.8 - Resume Preparation	137
	Unit 6.9 - Interview Preparation	142



7.	Employability & Entrepreneurship Skills	146
	Unit 7.1 – Personal Strengths & Value Systems	150
	Unit 7.2 – Digital Literacy: A Recap	167
	Unit 7.3 – Money Matters	172
	Unit 7.4 – Preparing for Employment & Self Employment	181
	Unit 7.5 – Understanding Entrepreneurship	190
	Unit 7.6 – Preparing to be an Entrepreneur	209



Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
**National
Skill Development
Corporation**

Transforming the skill landscape



Media & Entertainment Skills Council

1. Introduction

Unit 1.1 - Introduction to the Media and Entertainment

Unit 1.2 –Duties and Responsibilities of a Composer



Key Learning Outcomes



At the end of this module, you will be able to:

1. Explain the key features of the Media and Entertainment sector
2. Discuss various processes and products of Media & Entertainment sector
3. Learn about the role of Composer in industry.
4. Identify the minimum requirement to become a certified Composer.
5. Describe the work area of Composer.
6. Find the opportunities available for Composer.

UNIT 1.1: Introduction to Media & Entertainment

Unit Objectives

At the end of this unit, you will be able to:

1. Describe the media and entertainment industry in India
2. Describe the growth expected in the media & entertainment industry
3. Explain the various products and processes of the industry
4. Identify some keywords used in the industry

1.1.1 Media and Entertainment Sector in India

The Indian media and entertainment (M&E) sector is one of the biggest in the world. It is placed as 14th largest in the world. This sector is 1.7% of Indian GDP and expected to be 2.2% of GDP with INR 4.5 lakh crores in 2022. The sector employs 9.3% of the workforce of our country and we are expecting it to be 17% till the end of 2017

From 2014 to 2018 Media and Entertainment sector has grown by approximately 11 percent CAGR which makes Media and Entertainment sector INR 1.43 trillion industry. It is estimated that Indian Media and Entertainment market will flourish to CAGR of 13.1% in FY 18-23 reaching at INR 2.66 trillion. The industrial performance of M&E sector is given in next figure.

Overall industry size (INR billion)	FY14	FY15	FY16	FY17	FY18	Growth in FY18 over FY17
TV	433.7	489.9	551.7	595.3	651.9	9.5%
Print	248.2	268.4	288.4	308.4	318.9	3.4%
Films	126.4	126.9	137.1	145.0	158.9	9.6%
Digital advertising	32.5	47.0	64.9	86.2	116.3	35.0%
Animation and VFX	41.0	46.5	53.2	62.3	73.9	18.6%
Gaming	20.3	24.3	27.6	32.4	43.8	35.1%
OOH	19.9	22.3	25.5	28.6	32.0	11.9%
Radio	17.2	19.8	22.7	24.0	25.9	7.9%
Music	8.5	10.2	11.2	12.6	14.4	14.7%
Total	947.6	1,066.1	1,182.3	1,294.7	1,436.0	10.9%

Source: KPMG in India analysis, 2018 based on primary and secondary research

Figure 1.1. 1 Revenue of M&E Industry

In 2018, digital advertising business grew 35% as compared to 2017. Another high growth sub-sector is Gaming which grew by 35.1% in FY 2018 as compared to FY 2017. The projected growth of industry for FY 2018 to 2023 is given in next figure.

Overall industry size (INR billion)	FY19	FY20	FY21	FY22	FY23	FY18-23 CAGR%
TV	746.4	855.3	959.1	1,066.6	1,179.6	12.6%
Print	338.5	357.8	378.6	400.8	424.9	5.9%
Films	171.7	185.4	199.3	213.9	228.8	7.6%
Digital advertising	154.7	202.6	263.4	339.8	435.0	30.2%
Animation and VFX	86.7	100.9	116.8	133.5	151.8	15.5%
Gaming	55.4	70.9	84.7	103.3	118.8	22.1%
OOH	35.7	38.6	42.0	45.7	49.7	9.2%
Radio	28.3	31.8	34.8	38.8	42.1	10.2%
Music	16.6	19.1	22.1	25.6	29.6	15.5%
Total	1,633.9	1,862.5	2,100.7	2,368.0	2,660.2	13.1%

Figure 1.1. 2 Projected growth of M&E Sector

India is one of the largest broadcasters in the world with approximately 800 TV channels, 242 FM channels and more than 100 community radio networks working at present. Bollywood, the Indian film industry is the largest producer of films around the globe with 400 production and corporate houses involved.

The Government of India keeps on pushing the Media and Entertainment industry by launching various schemes such as digitizing the cable TV to fill greater institutional funding, raising the Foreign investment from 74 per cent to 100 per cent in cable and DTH satellite platforms.

Government has also allotted industry status to the film industry for easy finance.

1.1.2 Employability in Media and Entertainment Sector

The Media & Entertainment sector employs 11-12 lakh people directly (as per 2017 reports) and if we consider indirect employments as well then count goes to 35-40 lakh people. The Media sector is highly dependent on advertising revenues and performance of Industry for economy outlook. This sector was having 4 lakhs workforce in 2013 and we expect it to reach 13 lakhs by 2022 which means employing 9 lakhs of additional employment in the period of 2013-22.

- 1/4th of the people employed in Media and Entertainment sector are from film industry.
- The Media & Entertainment sector has about 4.60 lakhs people employed, and is projected to grow at the rate of 13 % to reach 7.5 lakhs by 2017.
- The Media and Entertainment sector which is expected to grow at rate of 13.1 % by 2023 which means to reach 2.7 lakh crore of business for skilled professionals.
- Film & Television sector has a major portion of the workforce employed in media and entertainment. Digitization activities being done in both films and television arena are the key player for this demand.

Workforce in the sector

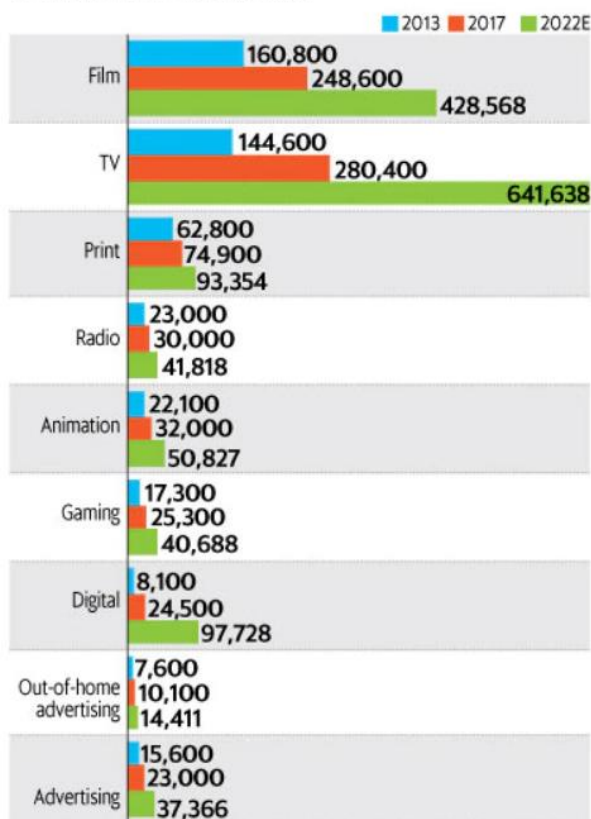


Figure 1.1. 3 Employments in Different Sectors of Media and Entertainment

1.1.3 Evolution of Media and Entertainment Sector

- Radio broadcasting came by Radio Club of Bombay in 1923 in India under the British rule.
- All India Radio (AIR), one of the largest radio networks in the world, started working in 1936.
- Doordarshan (DD) started the era of TV on Sept 15, 1959 in India.
- The Indian economy was closed until 1990, and no private player was allowed to enter the space. In the 1990s, the Indian film industry was completely fragmented.
- BBC launched its national service in 1995.
- In 1999, the government allowed private Indian Firms to set up their FM stations on a license fee basis.
- In May 2000, as part of Phase I of radio broadcast licensing, the auction was conducted and 37 licenses were issued, out of which 21 are operational in 14 cities.
- Approximately 1000 TV channels and 1052 radio stations are expected to be working by 2022.

1.1.4 Major Subsector and Segments

- The Indian M&E industry comprises several sub-sectors, such as television, radio, print media (including newspapers and magazines), films, animation and visual effects (VFX), Sound & Music, Amusement & Theme Parks, Art & Culture, and Event Management/Live Performances.
- Advertising industry is the major revenues generating part of the industry and the growth of the sector decides the overall growth of the industry.
- Although there is not much to export from this industry but imports have a considerable share in the economy like imports of newsprints, set-top boxes and antennae.

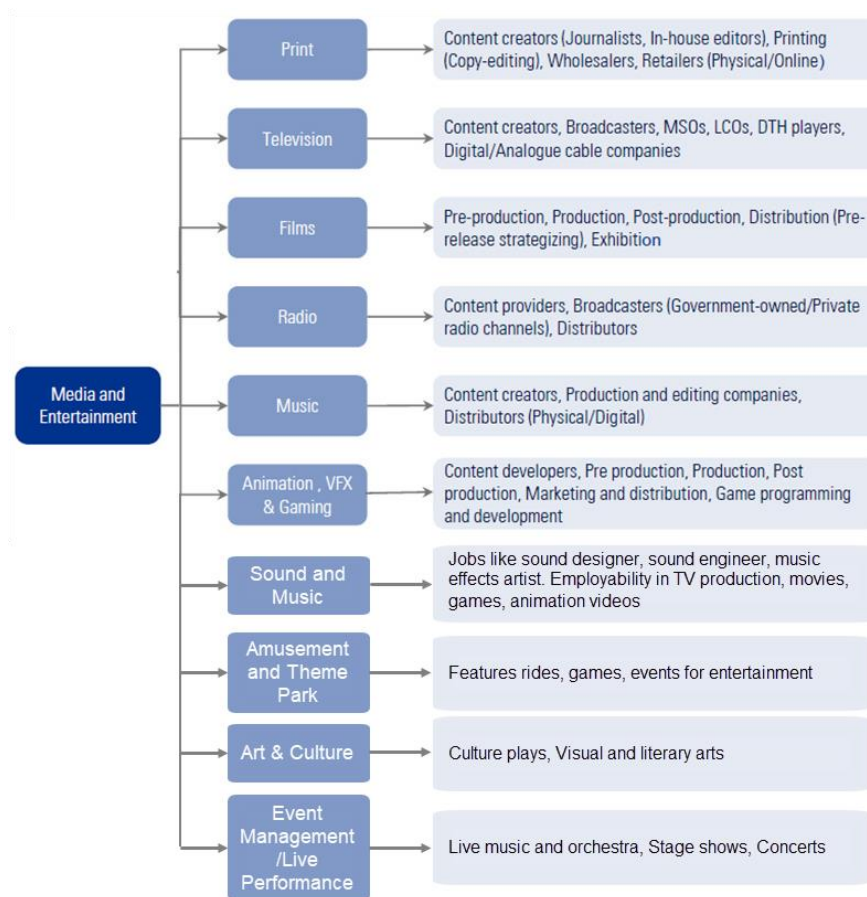


Figure 1.1. 4 Media and Entertainment Sector

- The industry is specific to cultural and ethnic backgrounds, and is organized around specific hubs that specialize in output for a given population segment. For example, the Mumbai film industry (Bollywood) is a key film hub in the country. A similar hub also exists in South India.

Growth rate by sub-sector

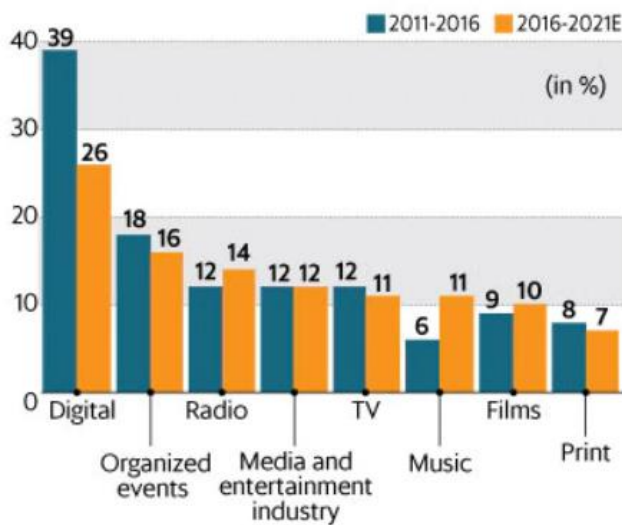


Figure 1.1. 5 Media and Entertainment Sector Growth Rates expected in 2016-2021

1.1.5 Sector Specific Terms Used in This Book

Animatic: A series of images edited together with dialogues and sound is called animatic.

Compositing: Combining layers of images/elements into a single frame is called compositing.

Composition: Positioning character with respect to the background and camera is called composition.

Creative Brief: A document that captures the key questions for the production including the vision, objective of the target audience, budgets, project, milestones, timelines and stakeholders is called creative brief.

Key Frame: Key poses that start and end poses for a particular animation sequence are called key frames.

Modeling: Creation of three-dimensional models for animation using a specialized software is called modelling.

Rendering: Conversion of three-dimensional models into two-dimensional images with 3D effects is called rendering.

Rigging: Process of adding joints to a static three-dimensional model to aid movement during posing is called rigging.

2D animation: Moving pictures in a two-dimensional environment is called 2D animation like in computerized animation software.

3D animation: 2D animation with depth is called 3D animation. Examples include video games such as Halo and Madden Football.

Animation: Sequential play of various inter-related frames is called animation.

Anticipation: Anticipation are created through the preparation of an action.

Aspect Ratio: The width to height ratio of a tv picture is called aspect ratio.

Background Painting: An artwork done in the background of an animation is called background painting.

CGI (Computer Generated Imagery): Creation of Figures, settings, or other material in the frame using computer software is called CGI.

Clean-Up: The process of refining the rough artwork of 2D animation is called Clean-up.

Computer Animation: Any kind of animation created in computer is called computer animation.

Frame: one of a series of still transparent photographs on a strip of film used in making movies or animations.

Frame Rate: The rate of change of frames in an animation is called frame rate. It is measured in frames per second (fps).

Graphics Tablet: This is a device used to draw sketches.

Pixel: The smallest indivisible portion of an image is called pixel.

Raster: Rastering is the projections of various pixels on CRT screen to form an image.

Rotoscoping: Creation and manipulation of background images of an animation is called rotoscoping. This can be done manually as well as using computer software.

Title Cards: Title cards are also called FIR of an animation. Title cards give brief information about the animation.

Tween: The transition of one frame to another in animation is called tween.

Vector: Some of the artwork is created by vectors rather than pixels. This allows cleaner and smoother animation because images are displayed by mathematical equation solutions.

CEL: It is a cellulose sheet used to paint characters. In practice, it is now a day. plastic sheet in combination with the outline and coloring of a character, object, and/or special effect.

Exercise-1



Discuss the role of Media & Entertainment sector in India economy.

Exercise-2

Discuss the employability of various sub-sectors in Media & Entertainment Sector.

UNIT 1.2: Duties and Responsibilities of Composer

Unit Objectives



At the end of this unit, you will be able to:

1. Learn about the role of Composer in industry.
2. Identify the minimum requirement to become a certified Composer.
3. Describe the work area of Composer.
4. Find the opportunities available for Composer.

1.2.1 Introduction to Composer Job Role

Composer in the Media & Entertainment Industry is also known as a CG Composer/ Compositing artist. Individuals at this job need to merge the various layers/elements created during post-production into a final product



Figure 1.2.1 Work of a compositor

This job requires the individual to have a good understanding of the process of filmmaking and the principles of animation and visual effects. The individual must also know the theory and principles of light, shadows, exposure and color space. The individual must have a good working knowledge of compositing software such as Nuke, Fusion, Combustion, After Effects, Flame, Inferno and Shake.

Compositor or compositing artist is responsible for creating the final image after combining layers of materials created by other artists. Compositor receives material in the form of renderings, computer animations, special effects, live action, and static background. A compositor combines the material while enhancing light, adding motion blur, matchings blacks, adding, grains, creating convincing shadows, and so on. He needs to make sure that the layers match seamlessly and fit in continuation of the previous frame of video. A compositor needs to acquire good knowledge of computer graphics and 3D lightings.

1.2.2 Job Profile of Compositor

A compositor/compositing artist performs following tasks in the industry:

- Determine key post-production processes that would be involved to produce the desired outcome and chart-out the process workflow, as per role.
- Translate, or support senior personnel in translating, expectations into effort estimates for each process.
- Prepare a work plan, for oneself or other team members if appropriate, keeping in mind the impact on the production budget, timelines and technical viability.
- Gather raw footage/material and select, or assist in selecting, relevant material that can be used for post-production
- Ingest, or support in ingesting, the footage and keep the material ready for the post-production process
- Ensure that back-ups for interim work-products are saved in the appropriate file formats, and take responsibility/manage others' interim work-products as relevant to the role
- Ensure, or supervise others in ensuring, that final work-products are prepared in appropriate file formats (such as mp4, avi, wmv, mpg and mov), appropriate mediums (such as DVD, film, tape and digital), and are compatible with intended distribution/exhibition mediums.
- Analyze briefs, scripts, visual references, technical and production parameters to determine what is needed
- Visualize creative ways of enhancing the image.
- Compile and merge all the layers and enhancements together and ensure that the final work-product meets requirements and is in sync with the creative and quality standards of the production.
- Ensure continuity in the final output.
- Identify the people responsible for health and safety in the workplace, including those to contact in case of an emergency.
- Identify security signals e.g. fire alarms and places such as staircases, fire warden stations, first aid and medical rooms.
- Ensure own personal health and safety, and that of others in the workplace though precautionary measures

1.2.3 Opportunities for Composer

Compositing artists work with lighting directors and FX artists to help create the final finished product. There are various opportunities for compositor in the field of production houses and game developments. Job growth in the animation industry is expected to average six percent for the 2012-2022 decade and three percent in the entertainment industry. Although growth in the animation and entertainment industries will be slower than average for the 2012-2022 decade, the demand for talented compositing artists is still high. A compositor has following benefits for career aspect:

- Medium range of salary with low educational investment
- Opportunities in Movie production houses, news networks, game industry, and animation industry
- Lots of opportunities to grow in the industry.

1.2.4 Key Professional Skills

This job requires the individual to have a good understanding of the fundamentals and principles of computer graphics. The individual must know the fundamentals of depth and should possess good drawing and illustration skills. The individual must have a good working knowledge of compositing software including Adobe After Effects, Flame 3D Visual Effects (VFX), Motion 5, Nuke etc.

Exercise



- Who is a compositing artist?

- What are the common industries where compositor finds job?

- Discuss the job responsibilities of compositor.



2. Planning Workflow



Unit 2.1 – Post-Production Processes

Unit 2.2 – Planning Post-production process
and cost estimation



Key Learning Outcomes



At the end of this module, you will be able to:

1. Attain the creative and technical requirements and expectations in terms of quality of deliverables and timelines, as necessary to the role.
2. Determine key post-production processes like computer-generated effects, color grading, digital intermediate, screen conversion, rendering, rotoscoping, keying, match-moving and compositing.
3. Translate expectations into effort estimates for each process.
4. Prepare a work plan for oneself or other team members based on the production budget, timelines and technical viability.

UNIT 2.1: Post-Production Processes

Unit Objectives

At the end of this unit, you will be able to:

1. Attain the creative and technical requirements and expectations in terms of quality of deliverables and timelines, as necessary to the role.
2. Determine key post-production processes like computer-generated effects, color grading, digital intermediate, screen conversion, rendering, rotoscoping, keying, match-moving and compositing.
3. Translate expectations into effort estimates for each process.
4. Prepare a work plan for oneself or other team members based on the production budget, timelines and technical viability.

2.1.1 Post-Production Processes

Post Production process is the last step of movie/animation production process. Before post-production process, you go through pre-production and production process. In pre-production process, you decide the theme and basic parameters of your product. In production process, the raw footage is created based on pre-production data. In post-production process, the raw footage is edited and modified to get the desired results. Some of the processes involved in post-production are:

- Computer Generated Effects (CG Effects)
- Color Grading
- Digital Intermediate
- Screen Conversion
- Rendering
- Lighting
- Animating
- Rigging
- Rotoscopy
- Keying
- Match Moving
- Compositing

Short descriptions of these processes are given next.

2.1.1.1 CG Effects

CG Effects (Computer Generated Effects) are the scenes or modification of recorded clips to enhance the intent of scene. A CG Imagery (CGI) is the final result of all the processes applied on a scene for post-production. VFX is a part of CG Effects.



Figure 2.1.1 Computer Graphics Effect

2.1.1.2 Color Grading

Color grading is the process making a selected image or scene better presentable in terms of colors. In color grading, we control color, contrast, saturation, black level, sharpness, and white point for motion pictures, videos, or still images.



Figure 2.1.2 Color Grading

2.1.1.3 Digital Intermediate

Digital Intermediate (DI) is the final process of making the video ready for production. In this process, an edited film is taken in the form of an EDL or a cut list. The film is scanned for the OK shots at a very high resolution by working on the shots one at a time, fixing the colors to make the film look interesting, maybe doing effects and blending CG with "normal" footage. Finally a negative is produced from which the producer can make multiple prints to show in theatres. This negative that comes out is an "intermediate" and since it is done digitally, so the process is called "digital intermediate".



Figure 2.1.3 Preparing Digital Intermediate

2.1.1.4 Screen Conversion or Stereo Conversion

Screen conversion or stereo conversion is the process of converting the 2D scene into a 3D scene. In this process, separate images are created for each eye and then collaborated to give the feel of depth while viewing the scene. This process is very costly due to high skills and time required for conversion.

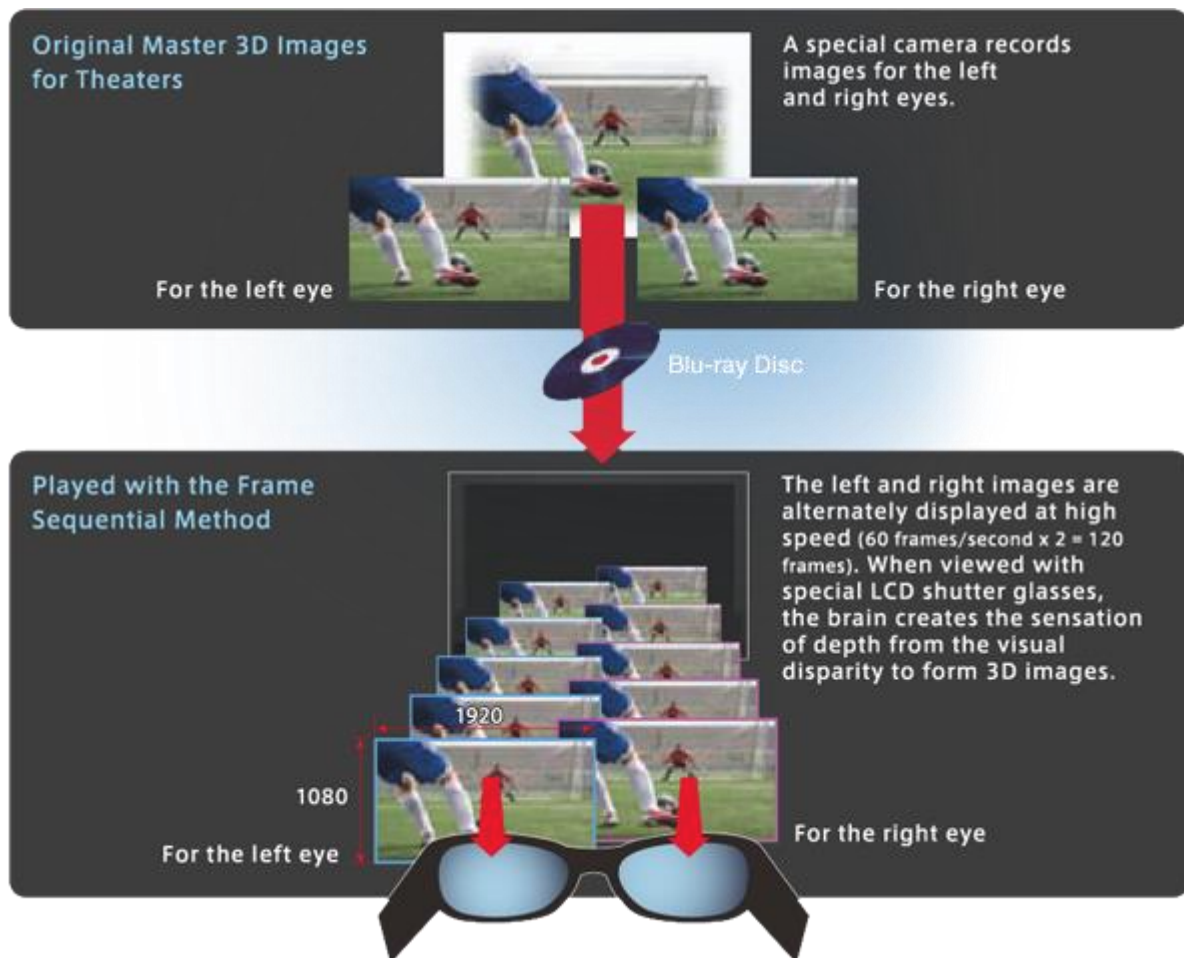


Figure 2.1.4 Screen Conversion

2.1.1.5 Rendering

Rendering is the process of adding shade, color, and texture to a 2-D or 3-D wireframe in order to create life-like images on a screen. Rendering performed for movies and animations are called Pre-rendering and renderings created for games are called Real-time rendering.



Figure 2.1.5 Rendering of 3D computerized model

2.1.1.6 Lighting

In Lighting process, the artist enhanced each scene of the clip to look more realistic in terms of light. Lighting should match the mood of scene and atmosphere.



Figure 2.1.6 Lighting

2.1.1.7 Animating

Computer animation is the process of moving 2D or 3D objects in a 3D environment to create motion pictures. Using the manipulation of objects (3D models) within the 3D software, we export picture sequences which will give the illusion of movement (animation) based on how we manipulate the objects. The process of animation is shown in next figure.

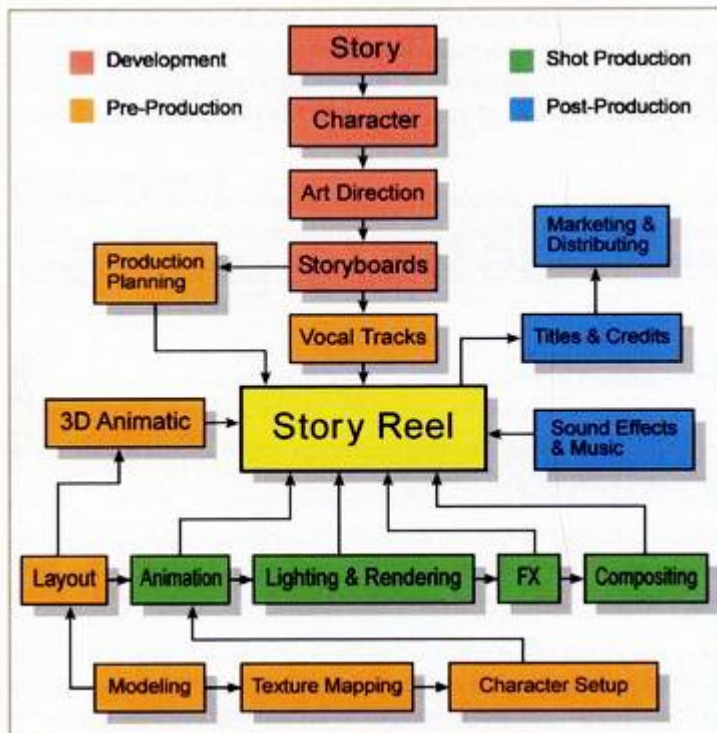


Figure 2.1.7 Animation process

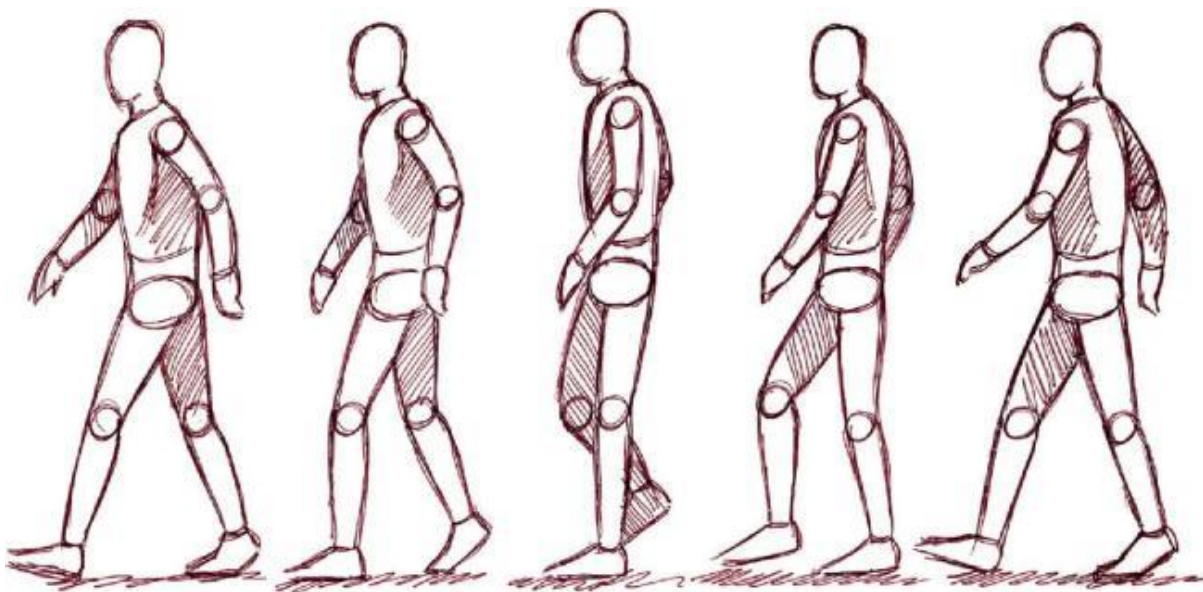


Figure 2.1.8 Animating model

2.1.1.8 Rigging

Rigging is the process of making skeleton of the model so that you can deform and move your model. In rigging process, you add bones to model and then apply different type of joints to represent realistic movement in the model.

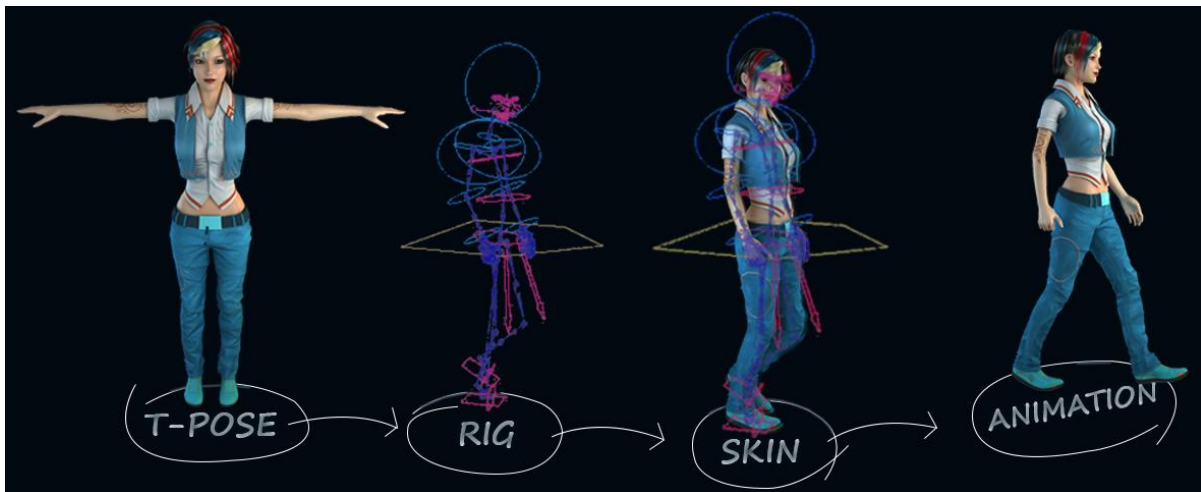


Figure 2.1.9 Rigging in a model

2.1.1.9 Rotoscopy

Rotoscopy is the process of motion of character in motion picture frame by frame. Prior to computers, rotoscope was used to perform tracing of action frames. In modern computer system, we use software to do the same job. These traced portions of action frame are later replaced by desired character or object.



Figure 2.1.10 Rotoscopy

2.1.1.10 Keying

In modern software, there is a tool called Key like in After Effects. Using this tool, one can make blue or green screen as transparent. The process of making the background of an image transparent and then replacing it with desired one is called keying.



Figure 2.1.11 Keying

2.1.1.11 Match Moving

Match moving is used to track the movement of camera in a shot and replace it with identical virtual movement created in 3D animation software.

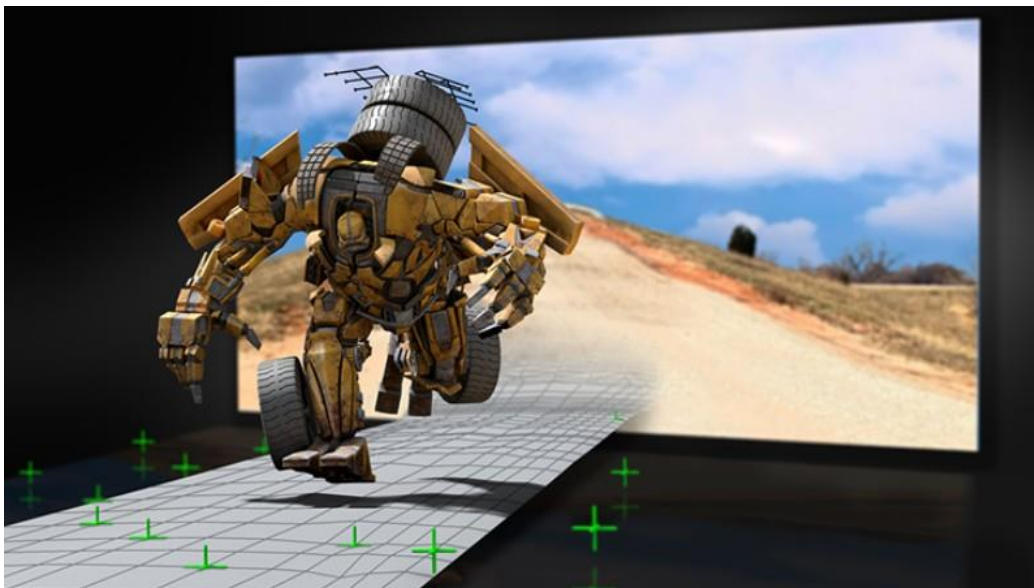


Figure 2.1.12 Match Moving

2.1.1.12 Compositing

Compositing is the combining of visual elements from separate sources into single images to create the illusion that all those elements are parts of the same scene.



Figure 2.1.13 Compositing

UNIT 2.2: Post-Production Processes Planning and Cost Estimation

Unit Objectives



At the end of this unit, you will be able to:

1. Achieve the creative and technical requirements and expectations in terms of quality of deliverables and timelines, as necessary to the role.
2. Translate expectations into effort estimates for each process.
3. Prepare a work plan for oneself or other team members based on the production budget, timelines and technical viability.

2.2.1 Post-Production Processes Planning

There are various factors involved in planning of post-production processes. Some of the most influential factors are discussed next.

- Customer Requirement
- Tools and Equipment required for process
- Cost of process
- Technical skills required for the process
- Time taken by the process

Based on these factors, the production manager decides which process to be used in post-production. These factors are discussed next.

2.2.1.1 Customer Requirement

Customer requirement is the most important and influential factor. Most of the time customer is a production manager or movie director. He/She decides when to use vfx, animation, match moving or any other effect.

2.2.1.2 Tools and Equipment required for process

There are various tools and equipment used by animators that cost almost equal to cost of small production movies. Some of the cameras like Imax, Phantom Flex cost so much that they are only available as rental items.

2.2.1.3 Cost of Process

Cost of a post-production process is also important factor for budget movies. Cost of VFX in movies like The Amazing Spider Man 2, Man In Black 3 was about \$65 million (approx. 460 crore Rupee). So the person responsible for inclusion of VFX needs to consider the cost before deciding the post-production processes.

2.2.1.4 Technical Skills Required

Some of the post-production processes need high technical skills in the artist. Jobs like Scientific Visualization Developer, Character Rigger and so on need very competitive skills in the artist. Some jobs even need degree in science and math. While selecting the post production process, one needs to consider if the respective artists are available in the vicinity or not.

2.2.1.5 Time Taken by Process

Some of the processes like Rotoscopy, 3D Modeling, Match Moving take most of the time in VFX. Sometimes rotoscopy of a 3 second clip can take almost 20 hours. Various processes involved in VFX are given next.

- Concept art
- Storyboard / Pre Production
- 3D Cinematic / Animatic / Pre-visualization
- Sculpting of main characters and props (if required)
- 3D Modeling, UV unwrapping, Texturing
- Rigging, Animation
- FX / Simulation
- Shading, Lighting
- Render passes
- Live action shooting
- Rotoscopy, Chroma removal, Tracking, Match moving, Wire removal, Paint (Prep), Matte painting
- Projection mapping, Relighting
- Compositing of all elements

2.2.2 Cost Estimation

Cost of movie production and profit made by movie are the main factors that concern the producer of every movie. Budget creation of movie can be divided into four phases Above-the-line, Shooting Period, Post-Production, and Miscellaneous. In Above-the-Line section, write down the cost of script preparation, script rights securing, salaries and living expenses of staff. In Shooting section, note down the cost of shooting equipment, local rentals, transportation, film cost, camera cost, and production crew salary. In Post-Production section, note down the cost associated with finishing of movie like cost of VFX and screening cost. In the Miscellaneous section, note down the cost associated with packaging the film, shipping it to theaters, attending film festivals or Internet streaming costs and showing the film. An example of cost break-up of a high-end movie is given next.

• Concept and Story Boarding	:	₹50,000 to ₹2,00,000
• Project Management Cost	:	₹1,00,000 to ₹3,00,000
• Film Crew Cost	:	₹4,25,000 to ₹12,50,000
• Direction Cost	:	₹35,000 to ₹2,70,000
• Studio Rent	:	₹30,000 to ₹2,00,000
• Special Equipment	:	₹40,000 to ₹2,00,000
• Teleprompter	:	₹12,000 - ₹27,000
• Talent	:	₹60,000 - ₹60,00,000
• Talent Shooting Days	:	3 days
• Hair & Make-up	:	₹20,000 - ₹70,000
• Location costs	:	₹50,000 - ₹2,00,000
• Extras	:	₹20,000 - ₹1,00,000
• Craft Services	:	₹20,000 - ₹70,000
• Props and staging	:	₹40,000 - ₹2,00,000
• Transportation	:	₹35,000 - ₹1,00,000
• Editing	:	₹1,20,000 - ₹5,00,000
• Animation & Special Effects	:	₹1,20,000 - ₹6,00,000
• Music	:	₹1,00,000 - ₹1,00,00,000
• Voice-Over	:	₹20,000 - ₹10,00,000
• Audio and Foley	:	₹50,000 - ₹2,00,000
• Stock Images and Footage	:	₹10,000 - ₹2,00,000

Exercise



1. Write a note on history of camera development.

2. How does an analog film camera works ?

3. What are the factors that affect video quality?

4. Why do we use green or blue color only in the vfx?

5. Discuss the steps for transporting camera from rental store.

6. Discuss the basic steps of assembling battery and card in camera.

3. Managing Equipment and Material



Unit 3.1 – Tools and Equipment for Compositing
Unit 3.2 – Preparing Data for Compositing



Key Learning Outcomes



At the end of this module, you will be able to:

1. Gather raw footage/material and select, or assist in selecting, relevant material that can be used for post-production.
2. Ingest, or support in ingesting, the footage and keep the material ready for the post-production process.
3. Create back-ups for interim work-products saved in the appropriate file formats, and take responsibility/manage others' interim work-products as relevant to the role.
4. Supervise others in ensuring, that final work-products are prepared in appropriate file formats (such as mp4, avi, wmv, mpg and mov), appropriate mediums (such as DVD, film, tape and digital), and are compatible with intended distribution/exhibition mediums.
5. Clear logs/data and keep the software and equipment ready for future use.

UNIT 3.1: Tools and Equipment for Compositing

Unit Objectives

At the end of this unit, you will be able to:

1. Use tools and equipment for compositing like computer system, software, data transfer devices, .
2. Create back-ups for interim work-products saved in the appropriate file formats, and take responsibility/manage others' interim work-products as relevant to the role.
3. Supervise others in ensuring, that final work-products are prepared in appropriate file formats (such as mp4, avi, wmv, mpg and mov), appropriate mediums (such as DVD, film, tape and digital), and are compatible with intended distribution/exhibition mediums.
4. Clear logs/data and keep the software and equipment ready for future use.

3.1.1 Tools and Equipment

The work performed by a compositor is mainly digital. So, there are not too many hardware tools needed by a compositor. A compositor must have a computer system with good configuration. A common system configuration required by compositor these days is given next.

- Processor : i7 (8th or 9th generation) or AMD Ryzen 7
- RAM : 16 GB to 32 GB
- Graphic Card : Nvidia GTX 1050 for entry and GTX 1080 for high-end
- Storage : SSD of 250 GB minimum for software and Operating system and Hard Disk of minimum 1 TB
- Motherboard : Compatible for your CPU, RAM, GPU and Storage media
- One additional screen for simultaneous editing and video preview with minimum 4k resolution

3.1.1.1 Software

Apart from hardware tools, a compositor needs an array of software for doing their work. There are mainly two categories of compositing software.

- Layer Based Compositing
- Node Based Compositing

In Layer based compositing software, all the clips/images are stacked one over the other in the form of layers.

In Node based compositing software, node works as modifier for the video. When you pass the video through a node which can change the color, resolution etc. of the video then at output you can see the effect and at input you can check the raw video. In this way, you have full control of output with live preview. In node based software, you get node graph where you can check the effects of different node operations.

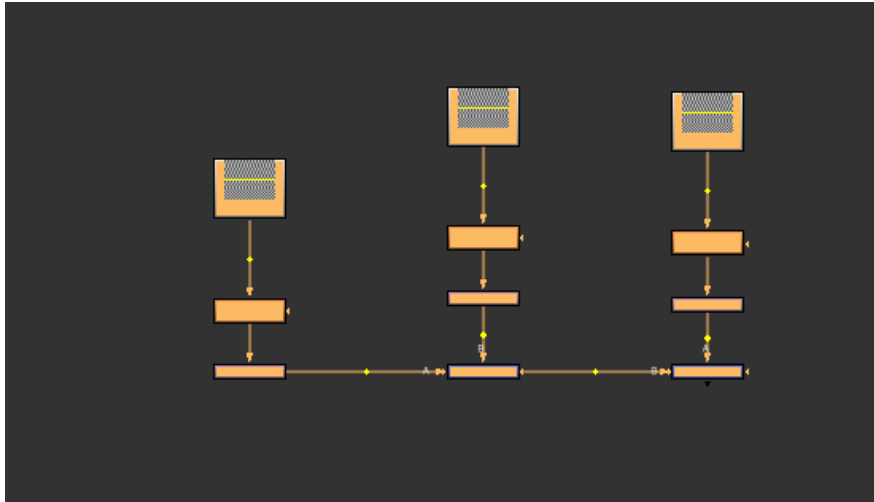


Figure 3.1.1 Node graph

Both the software types are capable of compositing operation but selection depends on the complexity of operation. If you need a few effects in your video then a layer based software is better due to faster solution. When you need multiple passes to create a perfect finish then it is better to use node based software.

Some of the commonly used software are discussed next.

Adobe After Effects

Adobe After Effects is the most famous layer based compositing software. It is a digital visual effects, motion graphics and compositing software by Adobe Systems. There are many third party plug-ins available for After Effects that can apply realist effects of rain, fire, snow etc. in your video.

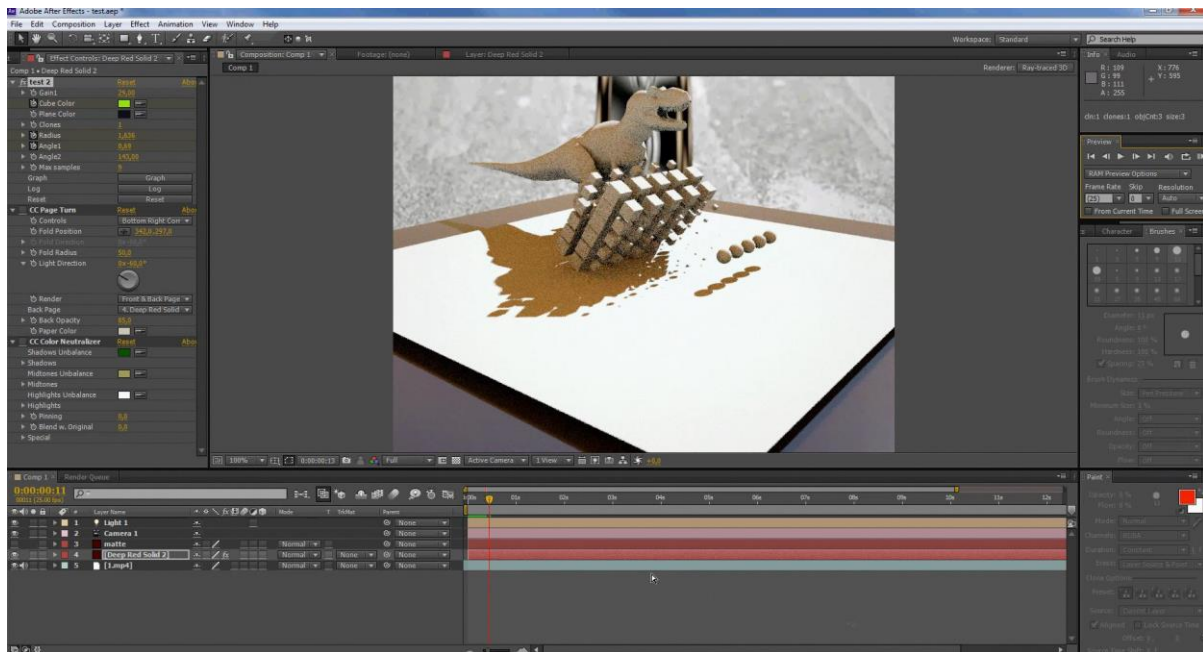


Figure 3.1.2 Adobe After Effects Interface

Blender

Blender is a free and open-source 3D content creation suite available for all major operating systems under the GNU General Public License. It may not have all the features of leading packages such as Max and Maya but this software is a great value considering it costs nothing. Everyone can take advantage of Blender's tools for modeling, animation, rigging, rendering, shading, UV unwrapping, physics and particles, imaging and compositing, and real time 3D/game creation. It is a node based compositing software. Blender can be downloaded from www.blender.org where visitors will find educational materials, support as well as an online community of users.

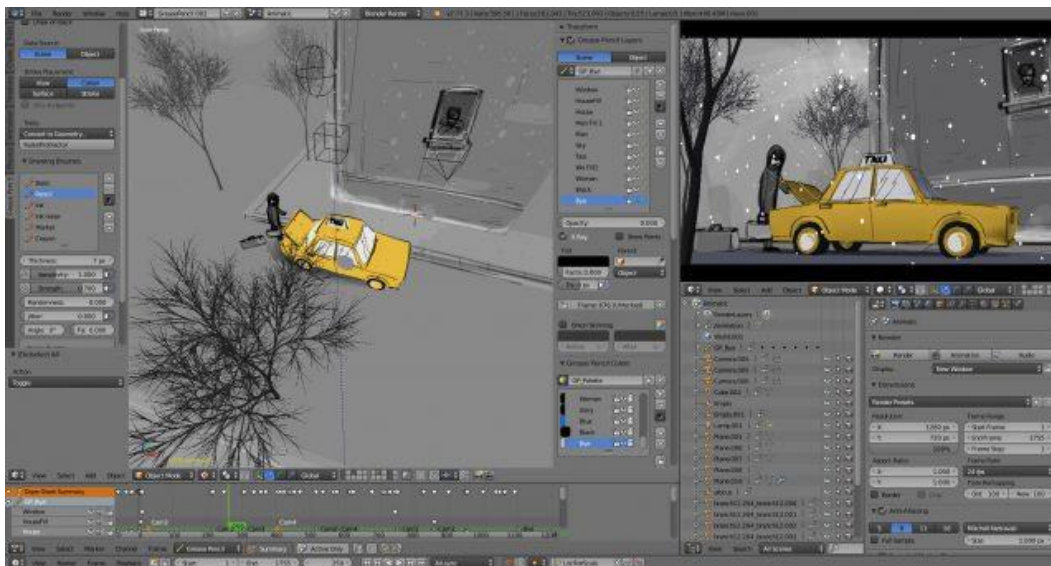


Figure 3.1.3 Blender Interface

Nuke

Nuke is a node based digital compositing software developed by The Foundry Visionmongers company. This is one of the most popular software used by compositors. The software is available on multiple platforms like Windows, Linux, Apple OS etc.

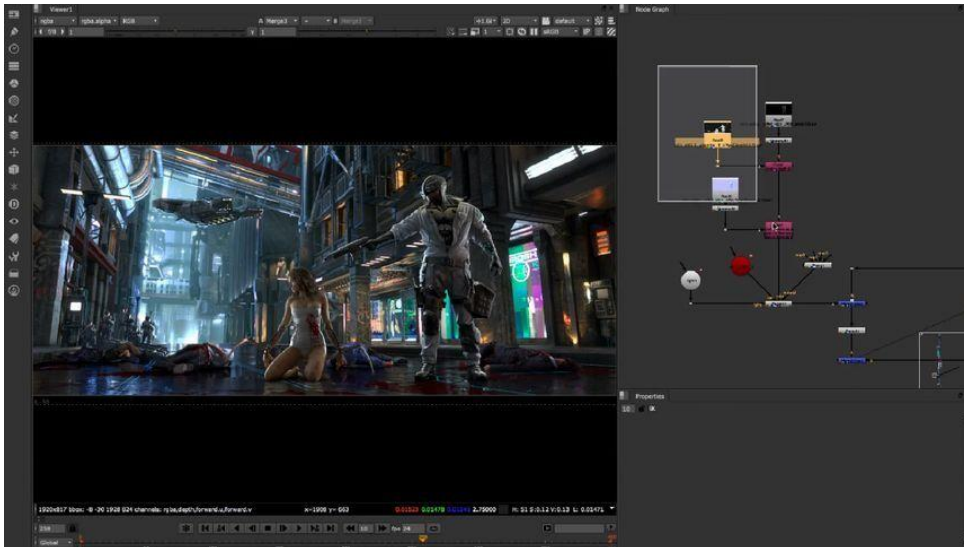


Figure 3.1.4 Nuke Interface

Natron

Natron is an open source powerful compositing software that can handle 2D and 2.5D compositing operations. Natron has powerful rotokeying, keying and tracker tools. This software is free to use for everyone.

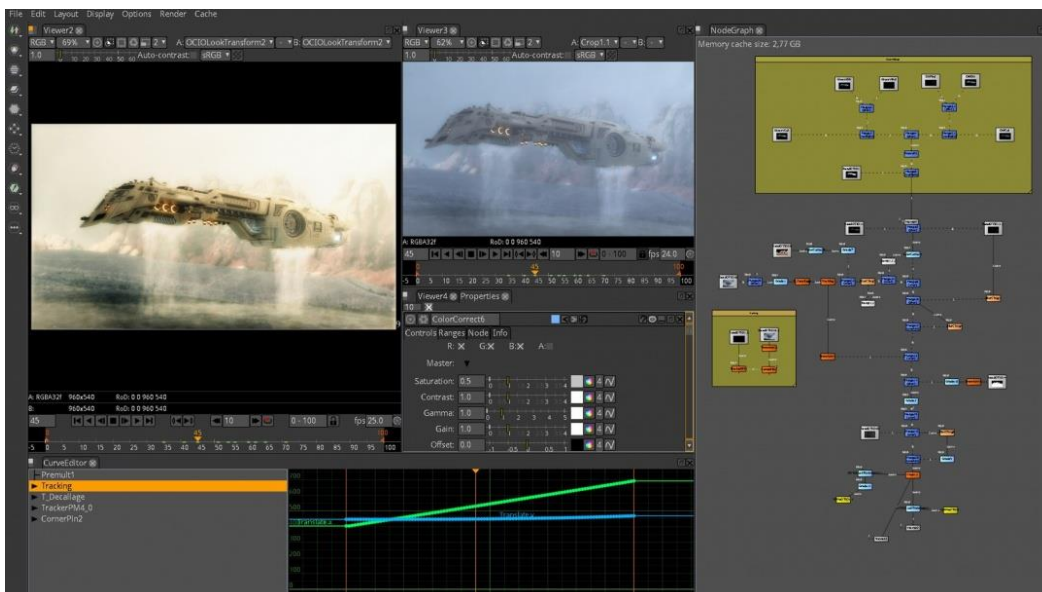


Figure 3.1.5 Natron Interface

Fusion

Fusion earlier known by the name Eyeon Fusion has recently been acquired by Blackmagic. The latest version of software Fusion 9 is available free to use. For studios, company offer a premium version of software with the name Fusion 9 Studio. Fusion is also a node based compositing software.

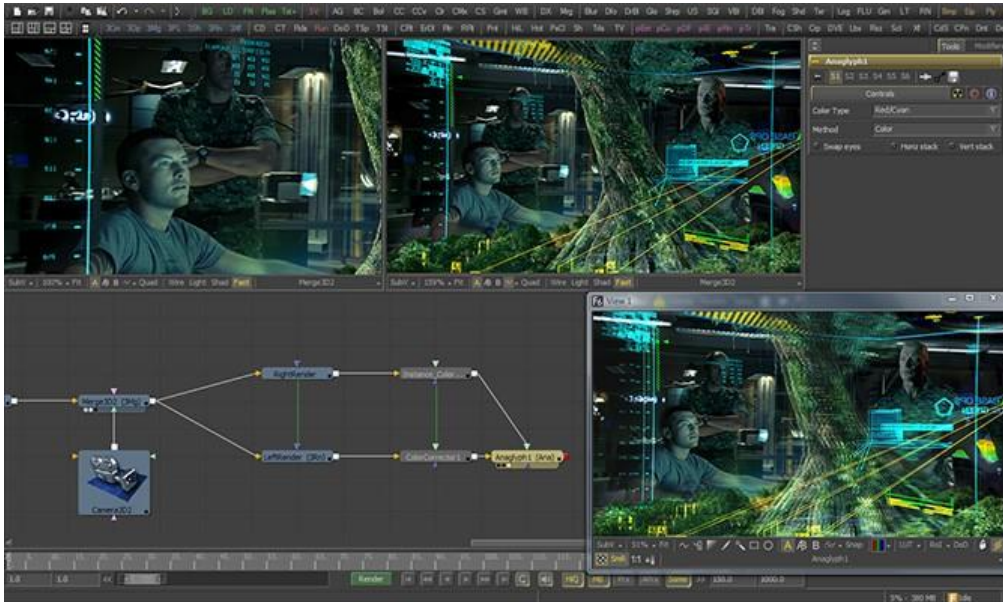


Figure 3.1.6 Eyeon Fusion Interface

Autodesk Flame

Autodesk Flame is a node based compositing software used by many vfx artists in creating Hollywood movies. Flame provides tools for visual effects, 3D compositing, and editorial finishing.

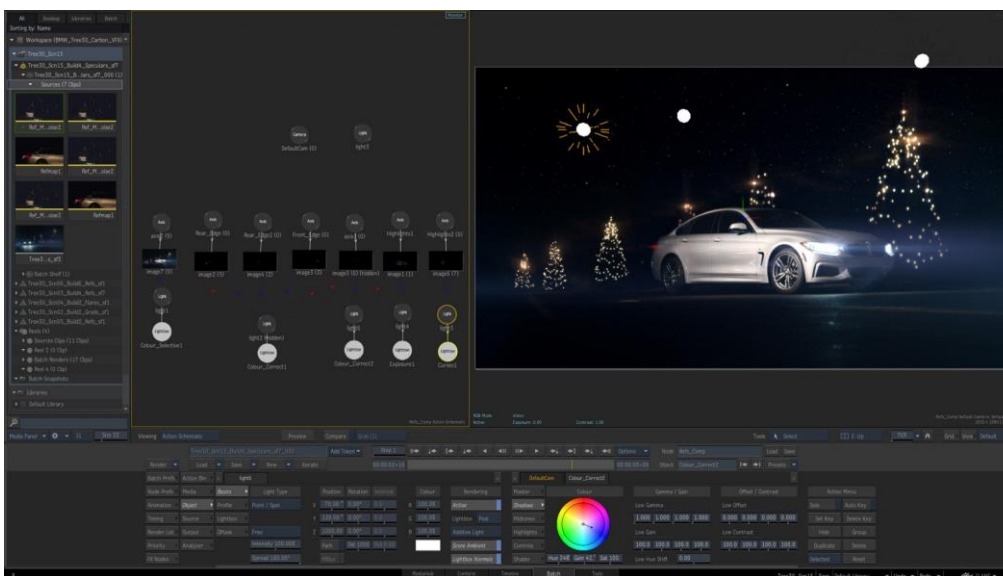


Figure 3.1.7 Flame Interface

There can be many other software generic or specialized for the studio requirement.

Other than software and computer hardware there are various other tools required by compositor. These tools are discussed next.

3.1.1.2 Data Transfer Media

There are various data transfer tools used by compositor to transfer video from source to their computer system and from their computer system to production agency. These tools are as follows:

Pen Drive or USB Flash Drive

A pen drive is also known by the names thumb drive, flash drive, gig stick, jump drive, disk key, and so on. Most of the pen drive core weight less than 30 gram. These days you can easily find pen drive of storage capacity 2 GB to 1 TB.



Figure 3.1.8 Pen drive

Backup Drive or Portable Hard Drive

Backup Drive, also called portable hard drive is used to transfer large amount of data.

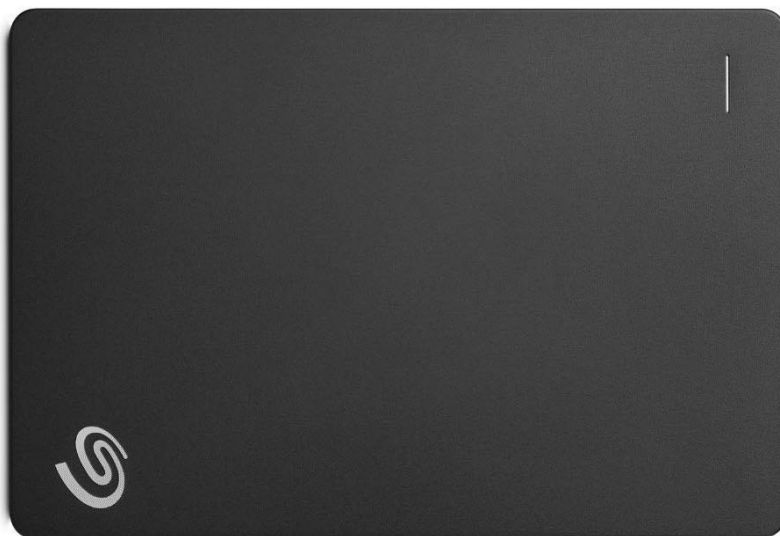


Figure 3.1.9 Backup Drive

CDs, DVDs, and Blu-ray discs

CD (Compact Discs) and DVD (Digital Versatile Discs) are used to permanently store data in optical record. A CD can store data of 700 MB, a single sided DVD can store 4.7 GB data and a double sided DVD can store data up to 9.4 GB. A dual layer double sided DVD can store up to 17 GB data. A single layer blu-ray disc has a capacity of 25GB and dual layer blu-ray disc has capacity of 50 GB data storage.



Figure 3.1.10 Disc types

Notes



A large rectangular area with a red border, containing 18 horizontal lines for writing notes.

UNIT 3.2: Preparing Data for Compositing

Unit Objectives



At the end of this unit, you will be able to:

1. Gather raw footage/material and select, or assist in selecting, relevant material that can be used for post-production.
2. Ingest, or support in ingesting, the footage and keep the material ready for the post-production process.
3. Prepare back-ups for interim work-products are saved in the appropriate file formats, and take responsibility/manage others' interim work-products as relevant to the role.
4. Apply different effects on video using Adobe After Effects.

3.2.1 Gathering Data for Composition

A compositor's job is to combine different videos and images to get the desired clip but the important part is what type of videos or images can be combined so that compositor gets the desired results. More precisely, what factors influence the composition of different videos/images. Following is the list of factors that should match properly while making composition.

VFX Lighting Cues

- Location/direction
- Quantity—intensity
- Color
- Quality—hardness/softness
- Movement
- Distribution (throw)

Finished Lighting

- Black (shadow), white (highlight), gray (gamma) density match
- Brightness and contrast match
- Color match
- Light direction match
- Light quantity/intensity
- Light quality match
- Interactive lighting
- Shadow match
- Atmospheric haze

VFX Camera Cues

- Format
- Aspect ratio
- Height
- Angle
- Focus
- Movement
- Motion blur
- Film stock/video source (grain/noise)

Finished Camera Lens Matching

- Focus
- Depth of field
- Lens flare
- Light fog glare
- Lens distortion

Screen Aspect Ratio

- Standard PC (4:3)
- Standard PC—Vertical (3:4)
- Photo (36:24)
- Square (1:1)
- 16mm (18:13)
- IMAX (10:7)
- Television HDTV (16:9)
- 70mm (46:21)
- Panavision (47:20)
- Cinemascope (8:3)
- 65mm (11:4)
- UltraPanavision 70mm (69:25)
- U.S. Letter (279:216)
- A4 (297:210)

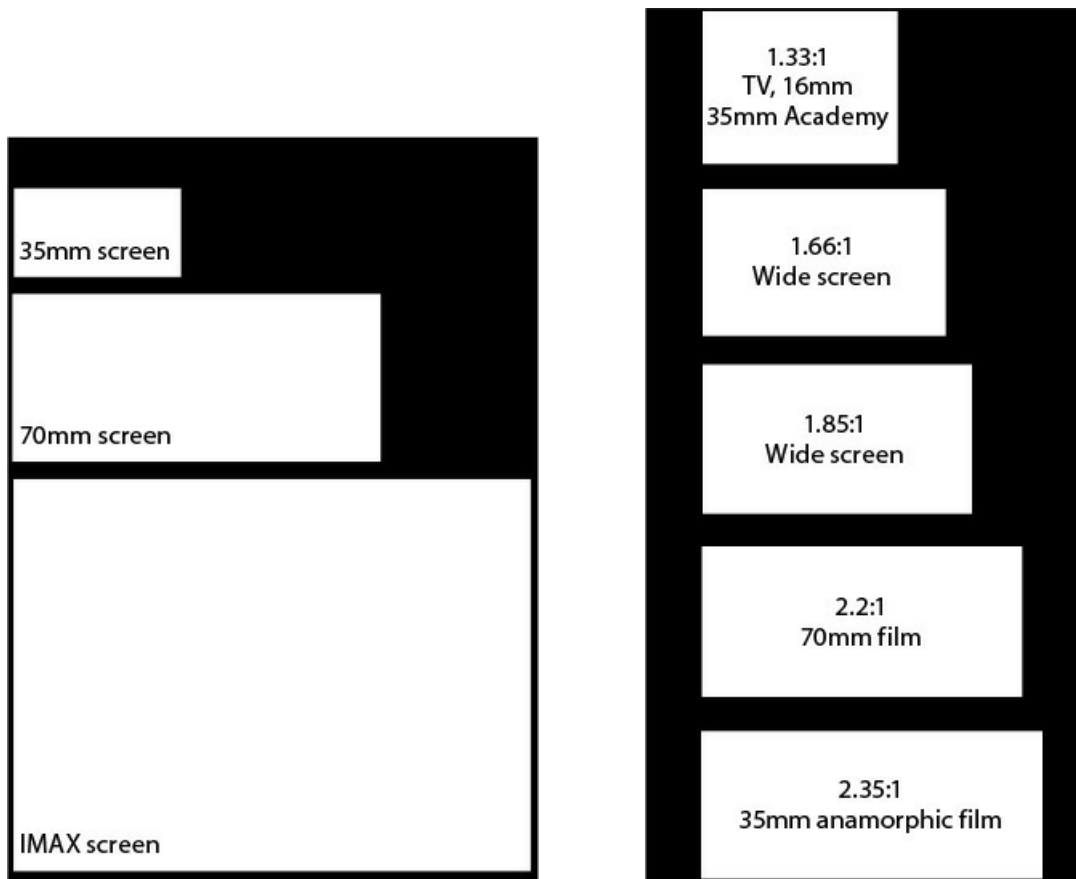


Figure 3.2.1 Screen Aspect Ratio

3D Object Inspection

- What is the object?
- What are the base colors?
- How was the object made?
- What is the object made of?
- Where was the object made?
- When was the object made?
- Who made the object?
- What is the object's history?
- How was the object used?
- What kind of wear would this use cause to this object?
- How has the weather affected it?
- What does it feel like?
- How does light affect the object?
- How has the environment affected the object?
- What kind of damage and dirt buildup should the object show and where?

Photography for 3D Textures

- Even lighting, no harsh directional shadows (overcast days)
- Orthographic (step far back and zoom in to reduce parallax distortion)

- Resolution (highest possible)

On-Set VFX Camera Data and Scene Reference

- Camera make and model
- Film back, CCD, or CMOS sensor size
- Camera mount
- Film stock or video acquisition format
- Lens information (make, model, focal length, zoom, and so on)
- Aperture/F-stop
- Shutter speed
- Depth of field
- Camera height
- Camera distance to subject/focal distance
- Camera angle or tilt
- Camera settings (iris, filters, zoom, and so on)
- After shoot (shoot reference and registration photos using a reference object of known dimensions, camera lens distortion correction grid, lighting reference/probes, and take set and prop measurements)

Most of the factors are not in direct control of a compositor. In few cases, compositor has to as for a new shot but most of the time, a compositor can edit the footage using software to get desired results. In this book, we are going to use two software to perform compositing which are Adobe After Effects and Nuke.

3.2.2 Preparing Videos for Composition

Most of the time video preparation will need color correction, resizing, distortion, noising, and text addition. We will discuss these modifications using Adobe After Effects.

3.2.2.1 Opening Video File in After Effects

- Start Adobe After Effects by clicking on the shortcut from Start Menu. The interface of Adobe After Effects will be displayed.

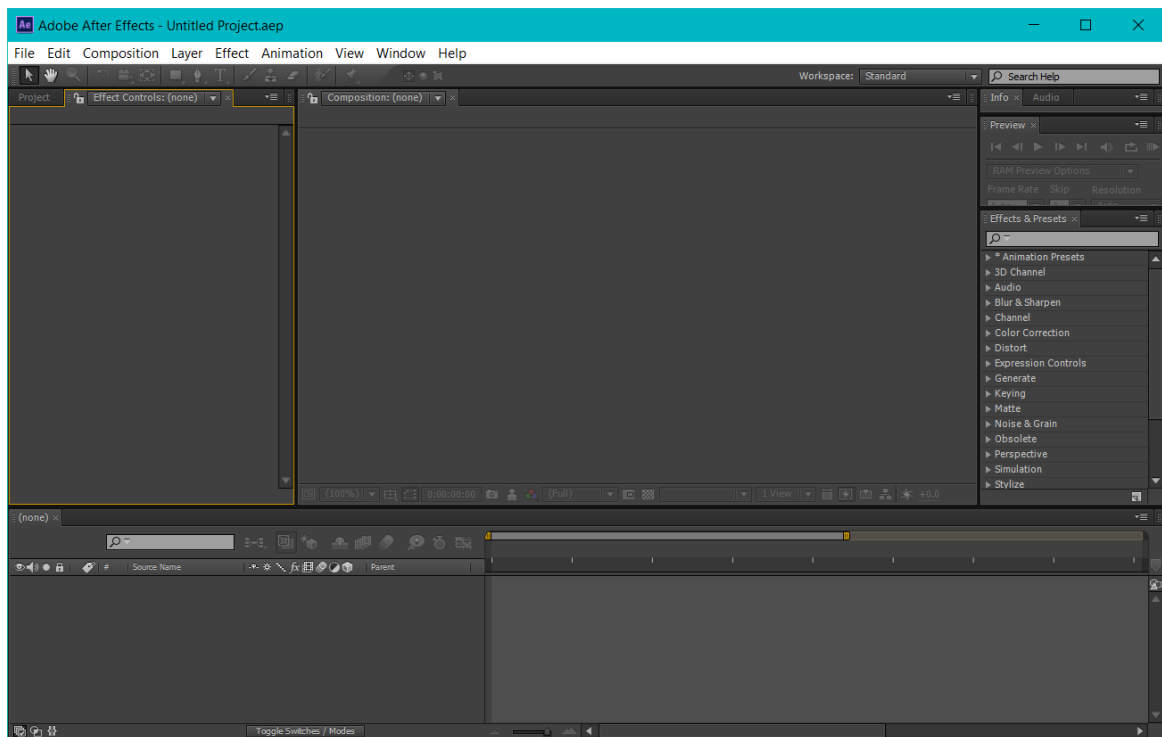


Figure 3.2. 2 Adobe After Effects interface

- Click on the Import->File option from the File menu in the Menu bar. The Import File dialog box will be displayed.

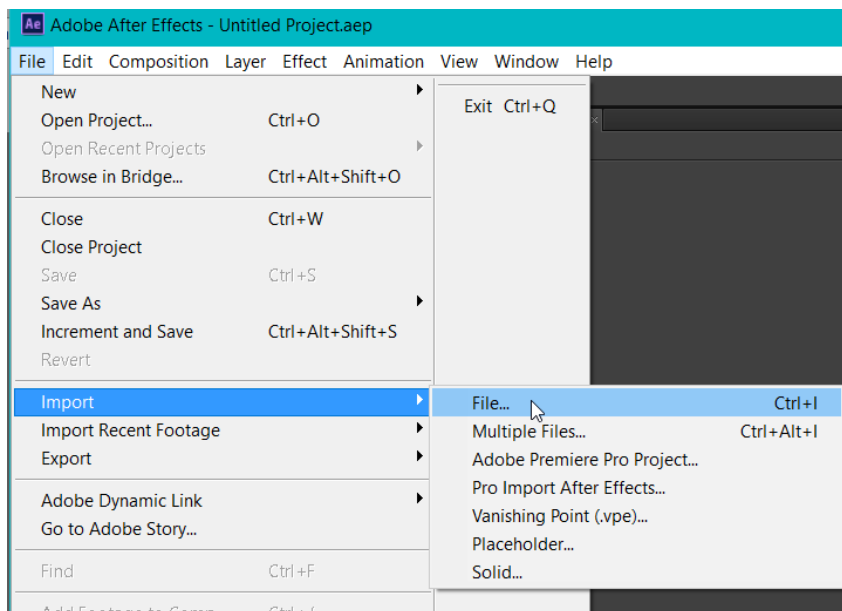


Figure 3.2. 3 Importing file option

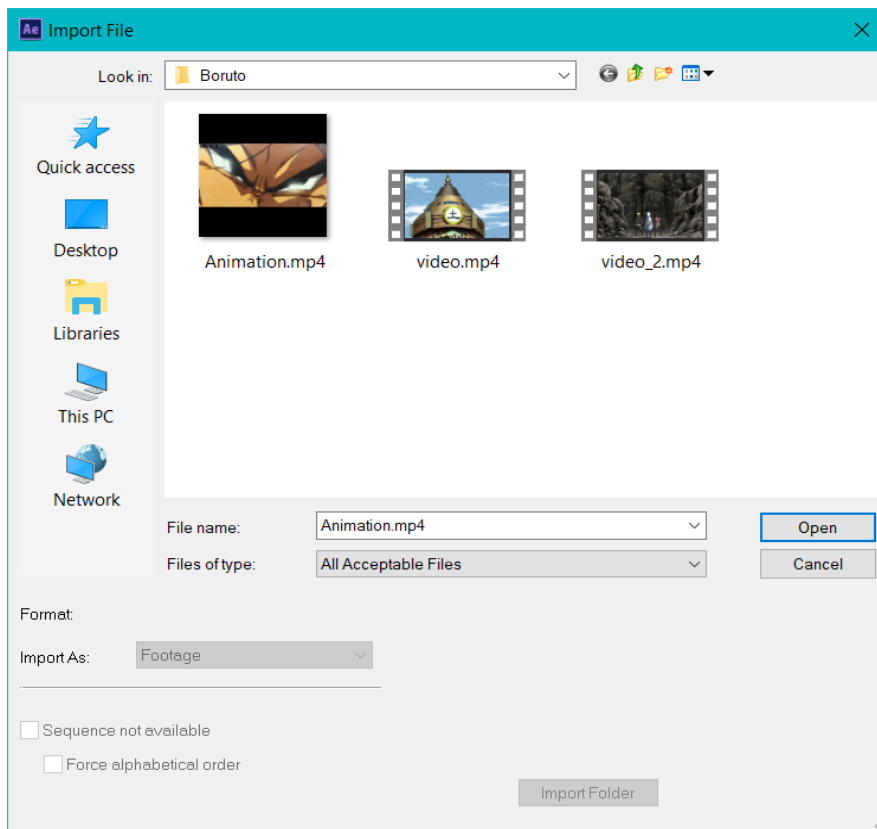


Figure 3.2. 4 Import File dialog box

- Double-click on the file that you want to import for editing. The imported file will be added in the Project panel of the software.

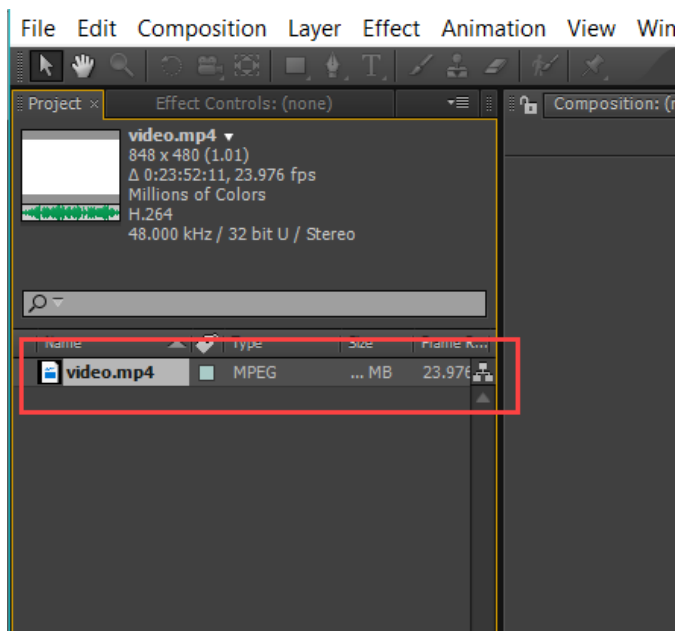


Figure 3.2. 5 Loading video file

- Drag the file from Project panel to timeline.

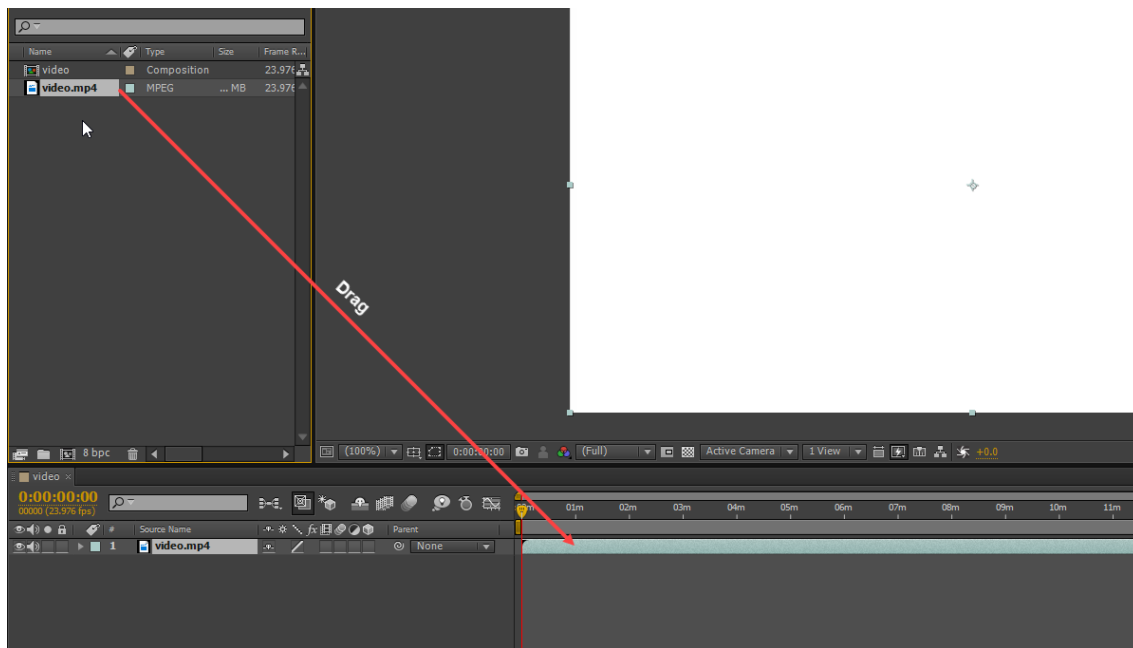


Figure 3.2. 6 Loading video in project

3.2.2.2 Color Correction

In previous step, we have imported a file on which we are going to perform color correction and other editing steps.

- Click on the video in timeline once to activate the tools in Effects menu.
- Click on the Color Correction cascading menu in the Effects menu to check the tools available for color correction.

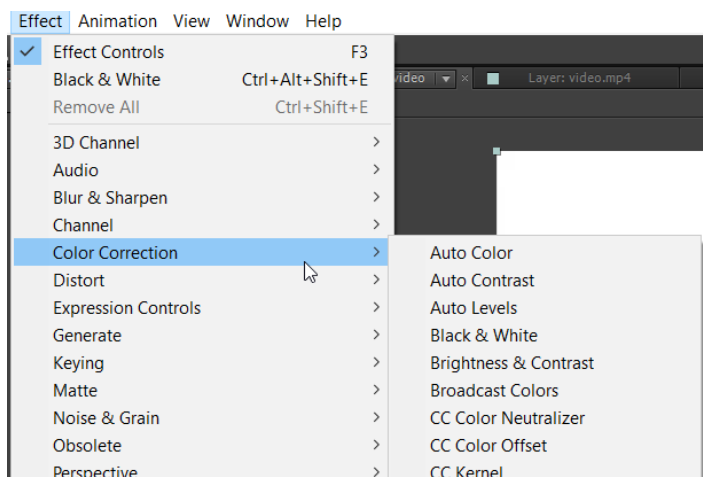


Figure 3.2. 7 Color Correction

There are various tools available in Color Correction cascading menu to correct color of the video or image. Some the important color correction operations are discussed next.

Auto Color, Contrast or Levels

The three Auto tools in Color Correction cascading menu are used to automatically set the color, contrast and difference between highs and lows of color based on the shadows, mid tones and highlights of the video frames/image.

- Click on the Auto Color to adjust the color automatically.
- Click on the Auto Contrast to adjust the contrast automatically.
- Click on the Auto Level to adjust the difference between highs and lows of color automatically.

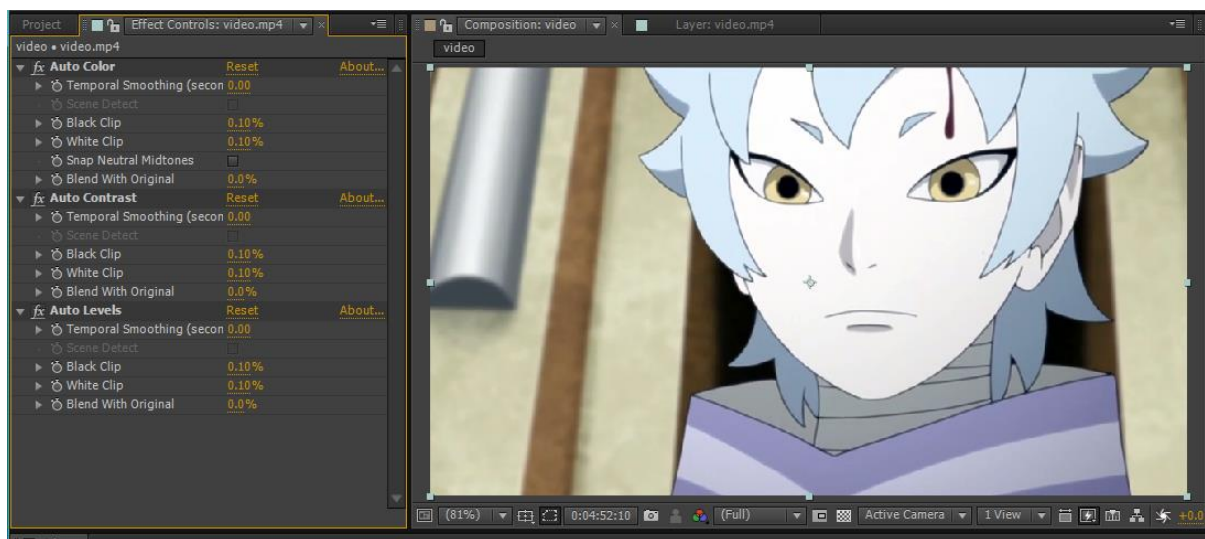


Figure 3.2. 8 Auto Corrections applied

Black & White Effect

Using this effect, you can make the image black and white from colored. To use this effect, click on Black & White option from the Color Correction cascading menu of the Effects menu in the menu bar. The effect will be added in the project and you can modify the parameters from the Effects Control panel.

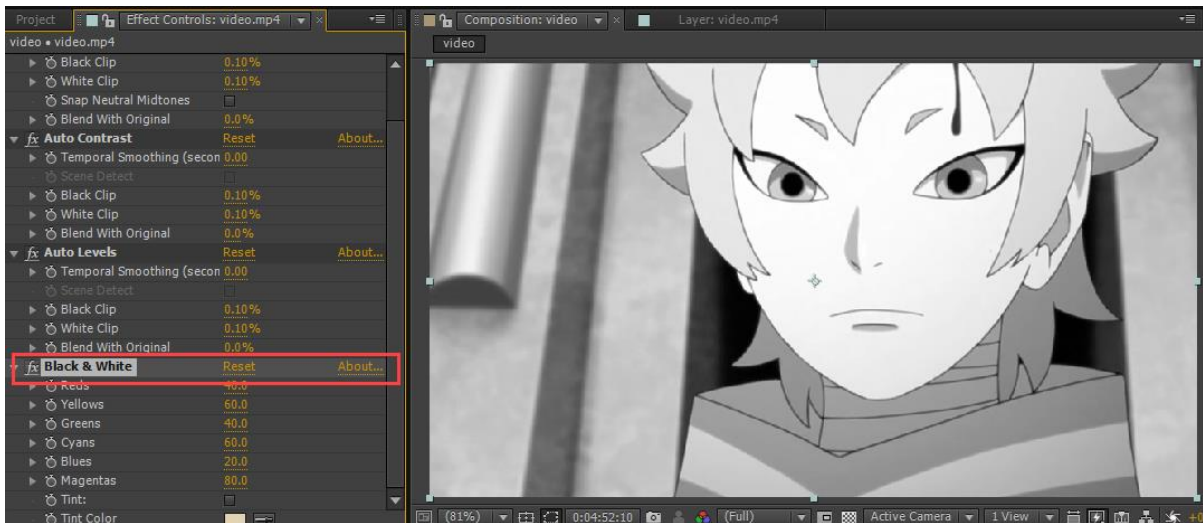


Figure 3.2. 9 Applying Black & White effect

Note that if you want to remove any effect then click once on fx button for respective effect in the Effects Control panel.

Adjusting Brightness and Contrast

The Brightness and Contrast tool in Color Correction cascading menu of the Effects menu is used to adjust brightness and contrast of the video. After selecting the tool, hover the cursor over the value of brightness or contrast and drag to change the value. To manually enter the value, double-click on it.

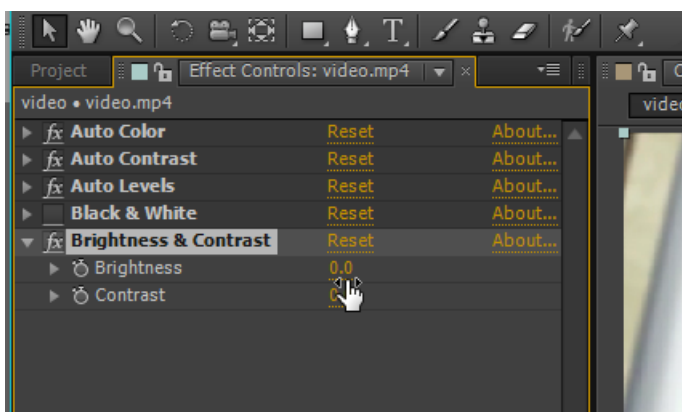


Figure 3.2. 10 Adjusting brightness and contrast

Change Color

The Change Color tool in Effects cascading menu is used to change the selected color in the image/video. After selecting this tool, click on the box of Color to Change field and select the color to be changed. Set the other parameters as desired in the Control panel.

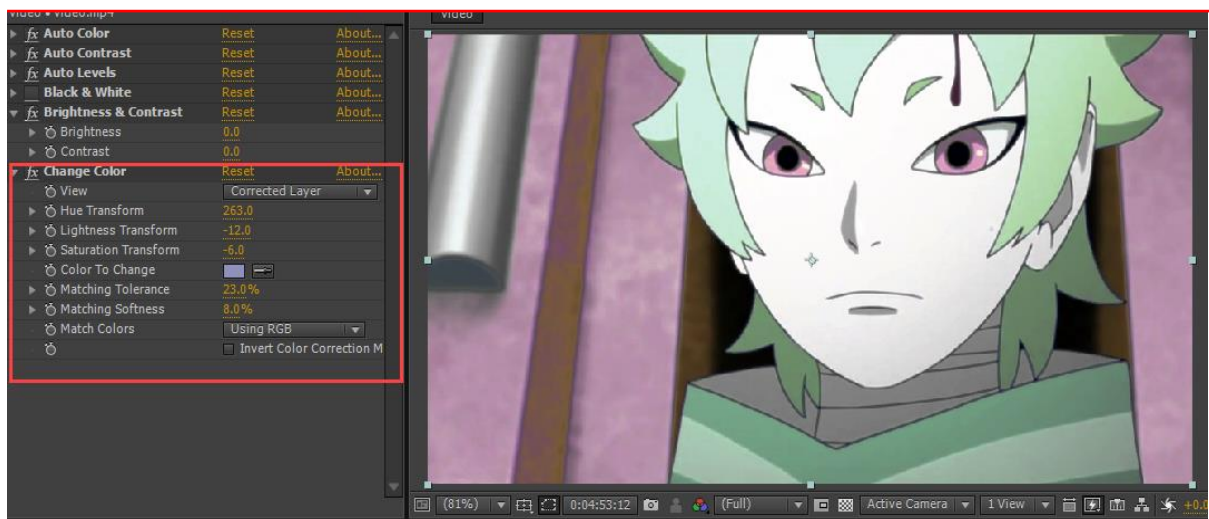


Figure 3.2. 11 Changing color

Change to Color

The Change to Color tool is used to change selected color to a desired color. Select this tool from the Color Correction cascading menu. The options will be displayed as shown below. Set the desired parameters to change color.

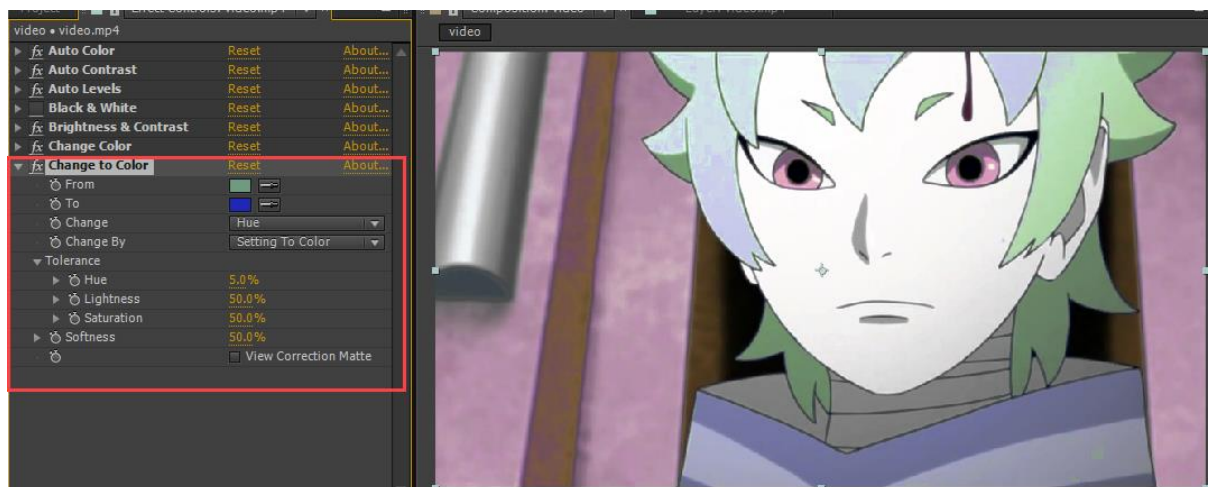


Figure 3.2. 12 Replacing color

Similarly, you can use the other tools in the Color Correction cascading menu like color balance, color stabilizer, exposure, and so on.

3.2.2.3 Resizing

The tools to resize are available in the Transform cascading menu of the Layer menu in the Menu bar.

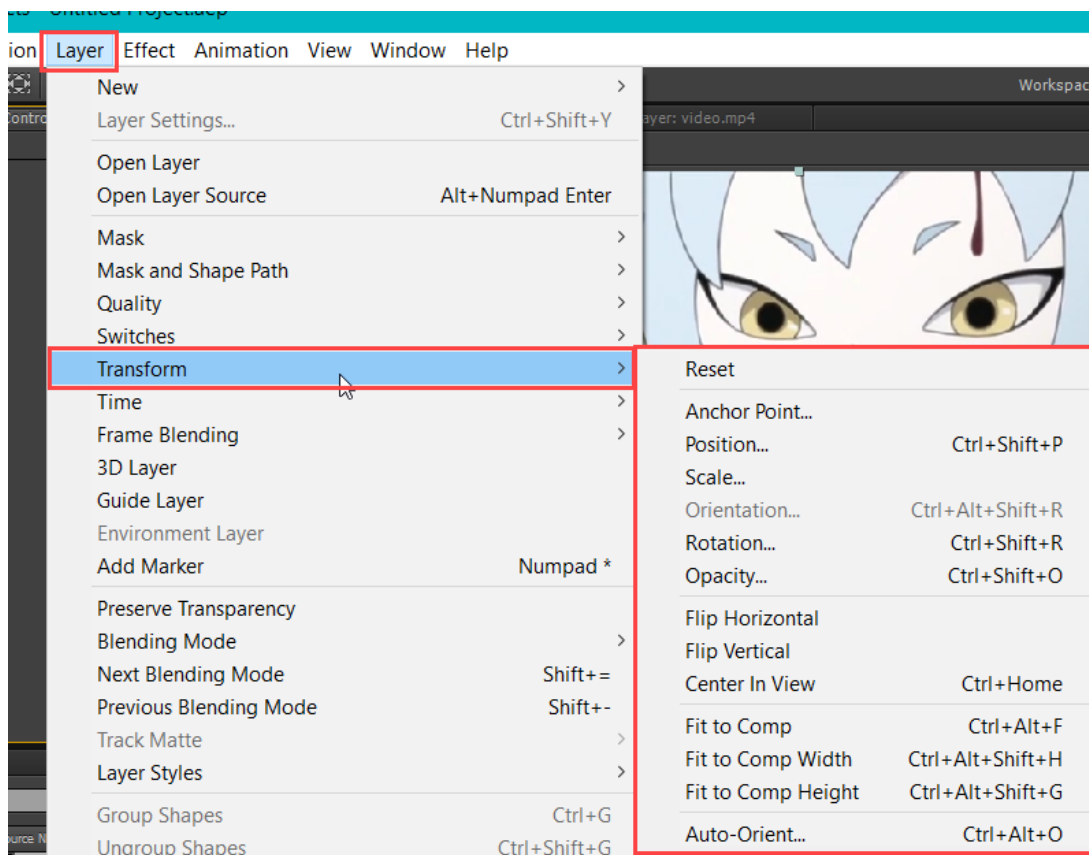


Figure 3.2. 13 Transformation tools

- Click on the Scale tool from the Transform cascading menu. The Scale dialog box will be displayed. Set the desired parameters in the dialog box and click on the OK button.

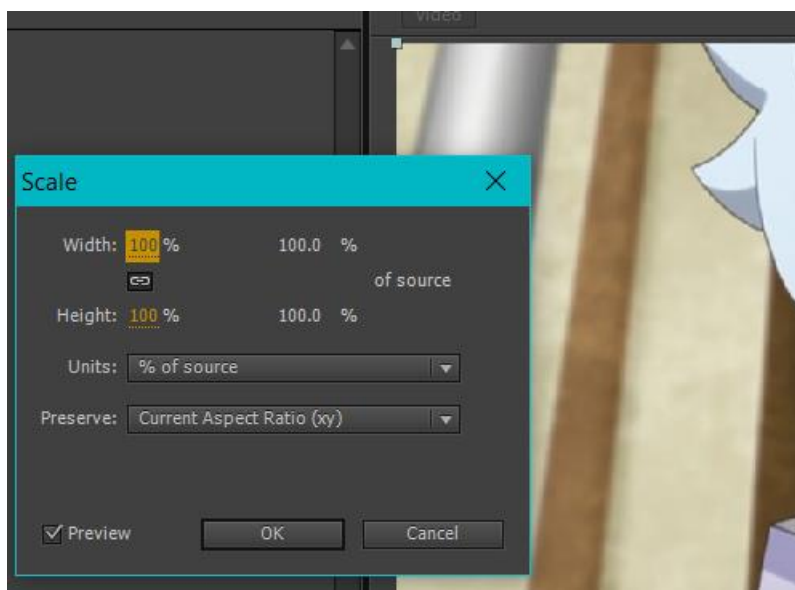


Figure 3.2. 14 Scale dialog box

Similarly, you can use the other tools in the cascading menu like rotation, position, flip and so on.

3.2.2.4 Distortion

There are various tools available in the Distort cascading menu to modify the shape of image/video clip.

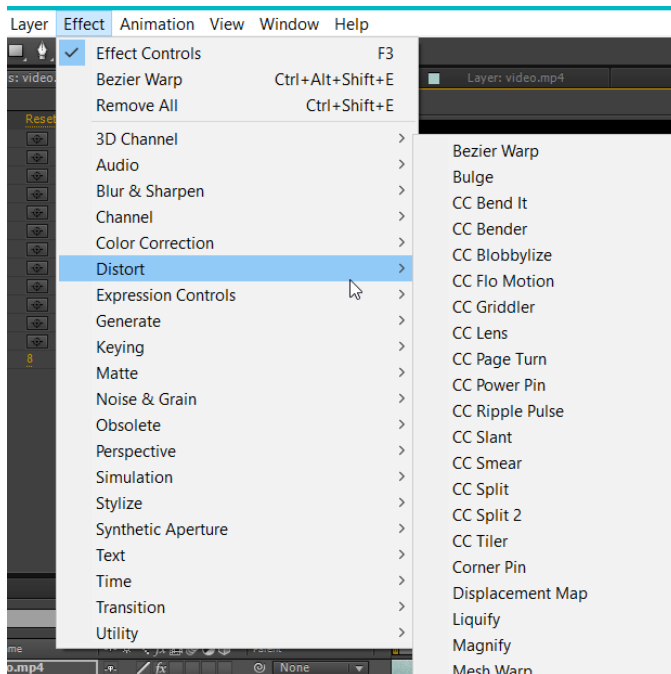


Figure 3.2. 15 Distort option

We will discuss the Bezier Warp tool here. You use the other tools in the same way.

Bezier Warp

- Click on the Bezier Warp tool from the Distortion cascading menu of the Effect menu in the Menu bar.

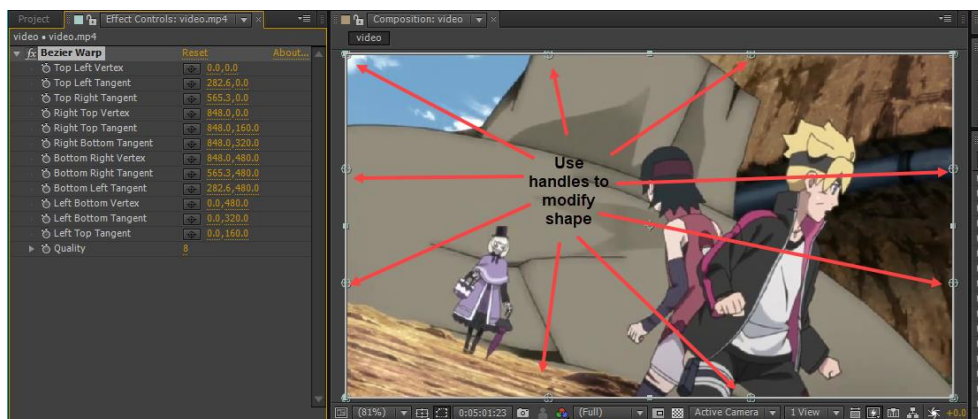


Figure 3.2. 16 Applying Bezier warp

- Drag the handles to modify the shape of image/video or specify the desired values in the Effects control panel.

3.2.2.5 Adding Grains and Noise

The tools to add grain and noise are available in the Noise & Grain cascading menu of the Effect menu in the Menu bar.

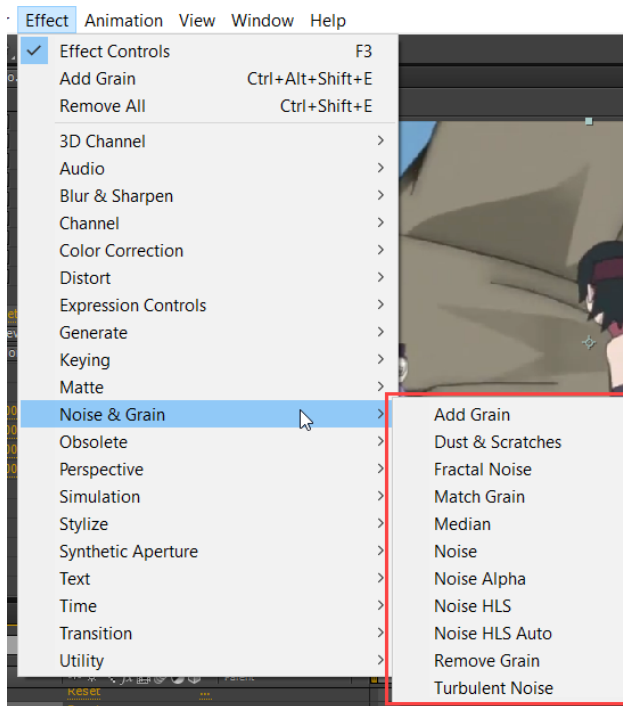


Figure 3.2. 17 Noise and Grain options

The procedure to add grains and noise is discussed next. You can apply the same procedure for other tools.

Adding Grain

- Click on the Add Grain tool from the Noise & Grain cascading menu of the Effect menu. The Add Grain effect will be added in the Effects Control panel and you will be asked to specify placement of grain window.

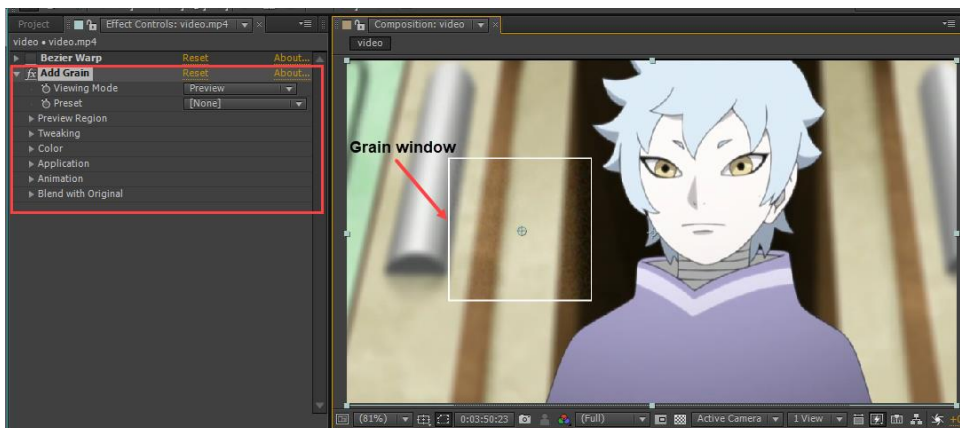


Figure 3.2. 18 Adding grains

- Expand the Preview Region node and set the size of preview window as desired. You can select the Final Output option from the Viewing Mode drop-down in the control panel to check the result of applied grains.
- Set the other parameters as desired to create grains; refer to next figure.

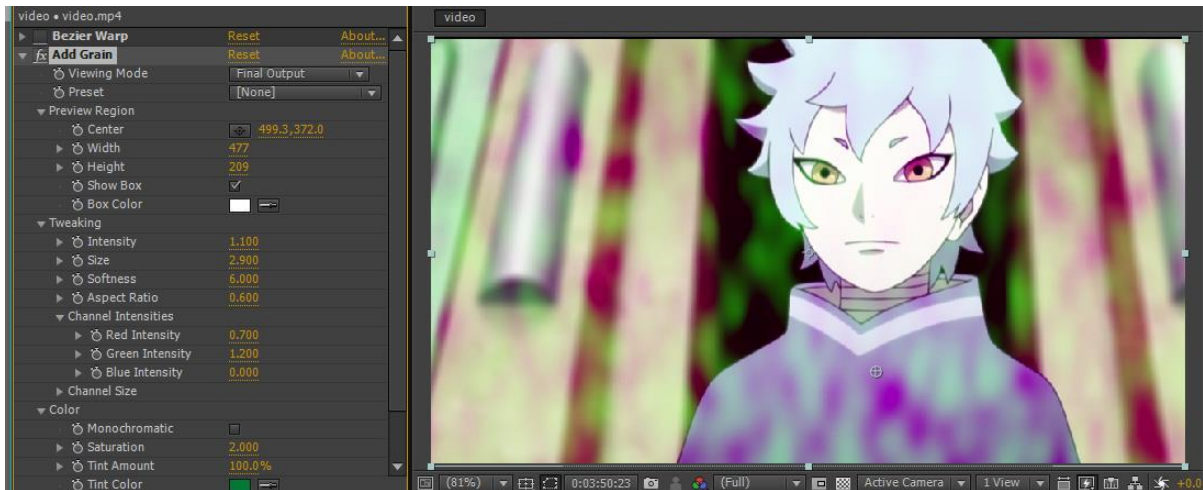


Figure 3.2. 19 Setting grain parameters

Adding Noise

Noise tool in Noise & Grain cascading menu of Effects menu is used to add noise in the video/image.

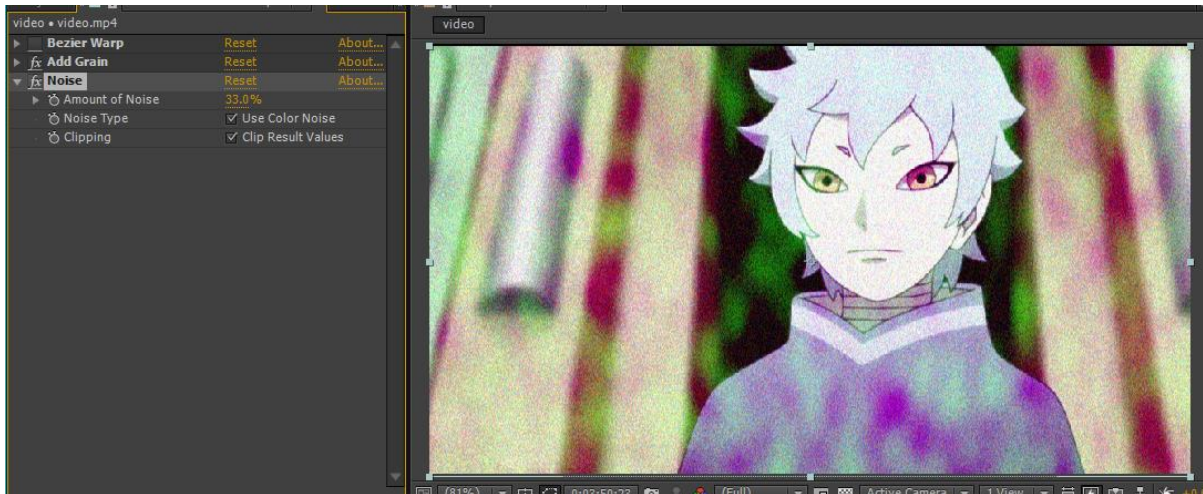


Figure 3.2. 20 Adding noise

Exercise



1. Discuss the conceptual tools of cinematography.

2. Discuss the overlapping or triple-take method of shooting.

3. What are the basic moves of camera?

4. Discuss the moving shots.

5. What is the difference between reflection and refraction of light?

6. Write a note on depth of field and focus setting.

7. Write a note on focus measurement and tools used for focus measurement.

8. What is the effect of F/Stop on focus?





4. Compositing

Unit 4.1 – Fundamentals of Compositing

Unit 4.2 – Performing Compositing



Key Learning Outcomes



At the end of this module, you will be able to:

1. Analyze briefs, scripts, visual references, technical and production parameters to determine what is needed.
2. Gather the raw material/layers that need to be put together in the final output, which could include characters, layouts, props/objects, effects and layers.
3. Visualize creative ways of enhancing the image (including lighting, shadows, colors, textures, shading, exposure and additional layers).
4. Compile and merge all the layers and enhancements together and ensure that the final work-product meets requirements and is in sync with the creative and quality standards of the production.
5. Manage continuity in the final output.

UNIT 4.1: Fundamentals of Compositing

Unit Objectives

At the end of this unit, you will be able to:

1. Analyze briefs, scripts, visual references, technical and production parameters to determine what is needed.
2. Gather the raw material/layers that need to be put together in the final output, which could include characters, layouts, props/objects, effects and layers.
3. Perform different types of key matte like luma key, chroma key, difference matte, bump matte and so on.
4. Perform matte refinement with different methods.
5. Compile and merge all the layers and enhancements together and ensure that the final work-product meets requirements and is in sync with the creative and quality standards of the production.
6. Apply the basics of compositing in production.

4.1.1 Fundamentals of Compositing

The ultimate artistic objective of a digital composite is to take images from a variety of different sources and combine them in such a way that they appear to have been shot at the same time, under the same lighting conditions, with the same camera. To do all of this well, it is important to have a substantial understanding of the technology, because many of the obstacles that you will encounter are, in fact, not artistic obstacles. They stem from underlying technical issues that are not at all obvious to the casual observer but create problems in the shot.

It takes three distinct bodies of knowledge to be a good digital effects artist: the art, the tools, and technique. The artistic knowledge is what allows you to know what it should look like in the first place in order to achieve photo-realism. The knowledge of your tools is simply knowing how to operate your particular compositing software package. The third body of knowledge, which is technique, comes with experience. Eventually, you become a seasoned veteran, to the point where you are seeing most problems for the second or third time and you know exactly what to do about them. The beginner, however, is continually confronting problems for the first time and it takes time to run through all the bad solutions to get to the good ones.

Compositing is mainly used for 2D content. Augmented reality (AR) uses compositing techniques for displaying layers of images at different depth levels.

In compositing, the first step is to prepare matte. A very important point to keep in mind is that pulling a matte from an image, even a perfectly shot bluescreen, is in fact a clever cheat – it is not mathematically valid. It could be characterized as a fundamentally flawed process that merely

appears to work fairly well under most circumstances, so we should not be surprised when things go badly – which they do frequently. Different types of Matte are discussed next.

4.1.1.1 Luma Key Matte

Luma-key mattes get their name from the world of video, where the video signal is naturally separated into luminance and chrominance. The luminance (brightness) part of the video is commonly used to create a matte (or “key,” in video-speak) in order to isolate some item for special treatment.

A luma-keyer takes in an RGB image and computes a luminance version of it, which is a monochrome (one-channel grayscale) image. A threshold value is set, and all pixel values greater than or equal to the threshold are set to 100% white and all pixel values less than the threshold are set to black.

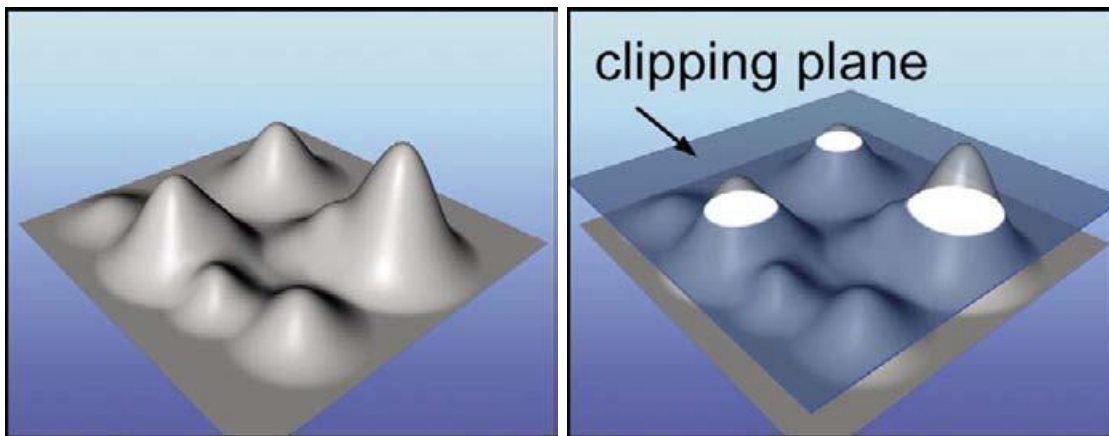


Figure 4.1.1 Luma Key

4.1.1.2 Chroma Key Matte

Chroma-key mattes also get their name from video work, where again, the video signal is naturally separated into luminance and chrominance. The chrominance (color) part of the video is used to create a matte (key) in order to isolate some item for special treatment.

The chroma-keyer node takes in the RGB image and converts it to an HSV (Hue, Saturation, Value or, if you prefer, color, saturation, brightness) or HSL type of representation internally. The reason that the original RGB version is not used internally is because the keyer needs to distinguish between, say, levels of saturation, which is not an RGB attribute, but is an HSV attribute. A starting RGB value is set which represents the “center” of the chroma key matte, then additional tolerances are set that permit the addition of saturation and value (brightness) ranges to be included in the matte. A good chroma-keyer will also permit some sort of “tolerance” settings to allow for a graceful transition with soft edges.

The chroma key is very flexible for two important reasons. First, it allows you to go after any arbitrary color. It does not have to be a carefully controlled bluescreen, for example. Second, it accommodates the natural variations in the color of real surfaces by having saturation and value

ranges to expand its window of acceptance. If you examine the color of skin, for example, you will find that the shadow regions not only get darker, but also have lower saturation. To pull a matte on skin, therefore, you need something that will not only select the RGB color you picked for the main skin tone, but also follow it down into the shadows with lower saturation and value.



Figure 4.1.2 Chroma Key Matte

4.1.1.3 Difference Matte

The difference matte works by detecting the difference between two plates: one plate with the item of interest (the “target”) to be isolated, and the other a clean plate without the item of interest. For example, a scene with the actor in it, and the same scene without the actor. This obviously requires the scene to be shot twice with either a locked off camera or, if the camera is moving, two passes with a motion control camera.



Figure 4.1.3 Difference Matte

4.1.1.4 Bump Matte

The bump matte will give you a matte of just the bumps even when they are on an uneven surface. Because of the uneven brightness, many of the bump tips are darker than the brighter regions of the surface. You need a method that just lifts out the bumps, regardless of their absolute brightness. The bump matte is based on the local brightness of the region immediately surrounding each bump, so it continuously adapts to the local brightness everywhere in the picture. The idea is to make a luminance version of the target plate that makes the bumps stand out as much as possible. A blurred version of the target plate is then generated, and this blurred version is subtracted from the luminance version. Wherever the bumps stick up above the blurred plate, you will get a matte point.

This is an entirely different result from performing an edge detect. The edge detection would actually draw circles around all the bumps, while the bump matte actually gets the bumps themselves.

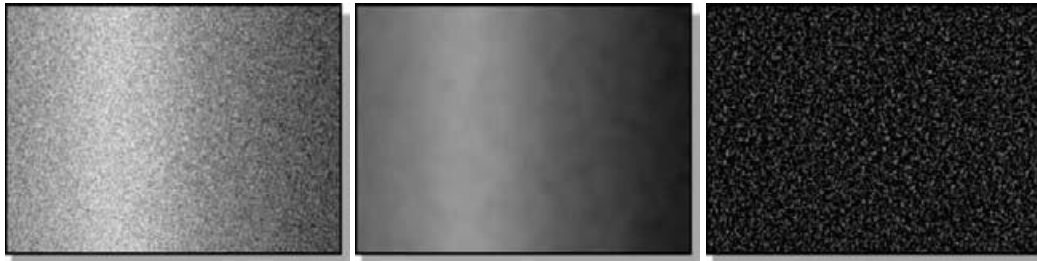


Figure 4.1.4 Bump Matte

4.1.1.5 Color Difference Matte

The color difference matte (not to be confused with the plain “difference matte”) is one of the best matte extraction methods for bluescreens, because of its superior edge quality and reasonable semi-transparency characteristics. Though originally conceived for bluescreen matte extraction, the color difference matte technique can often be used to pull a matte on an arbitrary object that has a single dominant color, such as a red shirt or a blue sky, for example. The importance of this section is twofold. First, by understanding the color difference matte process, you will be able to “assist” your favorite keyer when it’s having trouble. Second, if you cannot use a keyer, either because your software doesn’t have one or it’s having problems with a bluescreen plate, you can always make your own color difference matte.

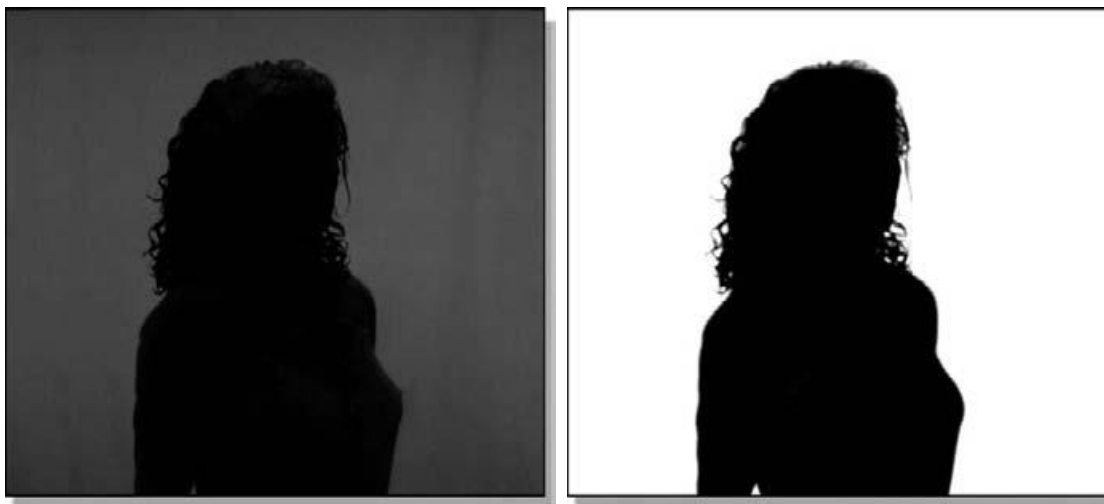


Figure 4.1.5 Color Difference Matte

4.1.1.6 Adobe After Effects Matte

Adobe has developed a rather different method of generating a raw matte that is very simple and, frankly, works much better than it should. It only uses the blue and red channels; the classical method uses all three. For a bluescreen, the blue channel is inverted, and then the blacks are scaled

down to zero. This result is then screened with the red channel to create the raw matte, which is then scaled to make a solid white core and zero black backing.



Figure 4.1.5 Adobe After Effects Matte

4.1.2 Matte Refinement

Regardless of the method used to pull a matte, there are a variety of operations that can be applied to refine the quality of any matte like reduce grain noise, soften the edges, and expand or contract the matte size to get a better composite. One of the first preprocessing operations to be done on virtually any bluescreen matte extraction process is to garbage-matte the backing color. The basic idea is to replace the backing area all the way out to the edges of the frame with a clean, uniform color so that when the matte is extracted, the backing region will be clean and solid all the way out to the edges of the frame. There are two important criteria to this operation. First, that it replaces the bluescreen a safe distance away from the edges of the foreground object. You must make sure that it is the matte extraction process that takes care of the foreground object edges, not the garbage matte. The second criteria is that it not take too much time.

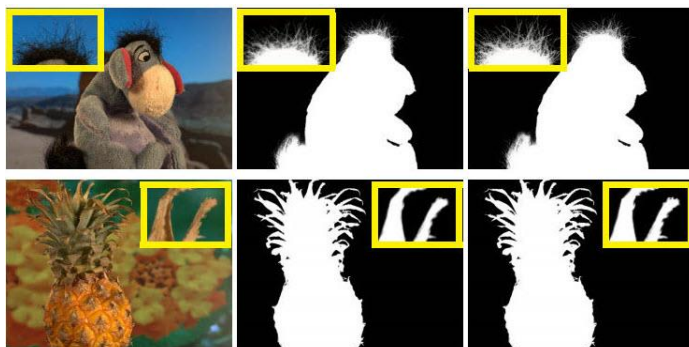


Figure 4.1. 6 Matte Refinement

Following are some of the operations performed on the matte for refinement.

- Noise Suppression
- Softer Edges
- Controlling the Blur Operation
- Adjusting the Matte Size

4.1.3 Despill

When an object is filmed in front of a green screen, green light from the brightly lit green backing screen contaminates the foreground object in a variety of ways. The edges of the foreground object are not perfectly sharp due to lens limitations, so the edges become blended with the green backing. There may also be semi-transparent elements, such as smoke or glass, and the ever-present wisps of hair. There can be shiny elements that reflect the green backing, regardless of how much dulling spray is used. Then there is the ubiquitous flare and spill.

Flare is seen as a green “haze” that covers everything in the frame, including the foreground object that you are trying to isolate from the green backing. It is caused by the flood of green light entering the camera and bouncing around inside, lightly exposing the negative all over to green. The second contamination is spill. This stems from the fact that the green backing is in fact emitting a great deal of green light, some of which shines directly on areas of the foreground object that are visible to the camera.

In broad strokes, the despill operation simply removes the excess green from the green screen plate based on some rule, of which there are many to choose from. The despilled version of the green screen is then used as the foreground layer of the composite.

4.1.4 Compositing

The compositing operation is the fundamental image combining operation of, well, digital compositing. The process is essentially the same, even when done optically – there is a foreground layer, a background layer, a matte to identify which region is which, and the final composited results. In addition to defining where the foreground and background appears in the frame, the matte also controls the degree of foreground transparency. The key elements of a basic composite are shown in figure next.

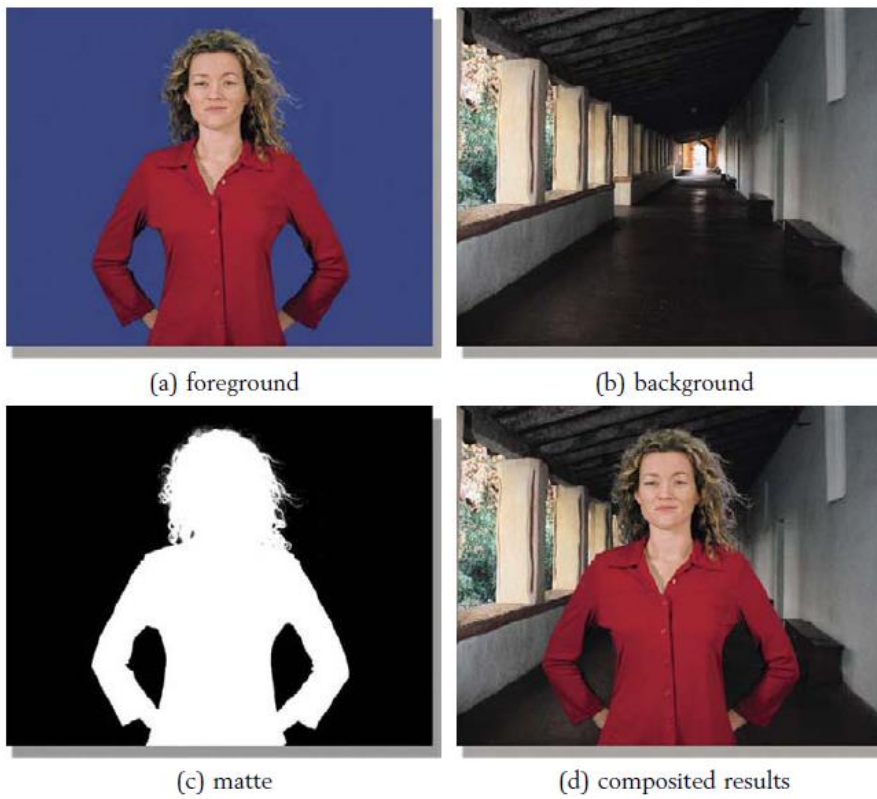


Figure 4.1.7 Compositing

You will learn about various compositing techniques in next unit.

UNIT 4.2: Performing Compositing

Unit Objectives

At the end of this unit, you will be able to:

1. Operate basic functions in Nuke.
2. Apply the workflow of compositing in Nuke.
3. Gather the raw material/layers that need to be put together in the final output and import them in Nuke software.
4. Visualize creative ways of enhancing the image (including lighting, shadows, colors, textures, shading, exposure and additional layers).
5. Compile and merge all the layers and enhancements together and ensure that the final work-product meets requirements and is in sync with the creative and quality standards of the production.
6. Manage continuity in the final output and perform rendering.
7. Create animation of compositing to generate a video.

4.2.1 Performing Compositing with Nuke

Nuke uses node-based workflow where you need to connect nodes to read, process, and manipulate images for compositing.

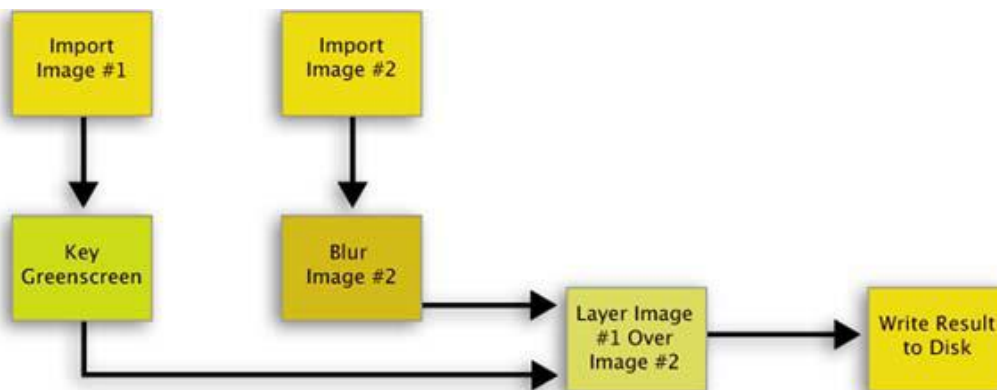


Figure 4.2.1 Workflow of Nuke

Saved projects are called script files.

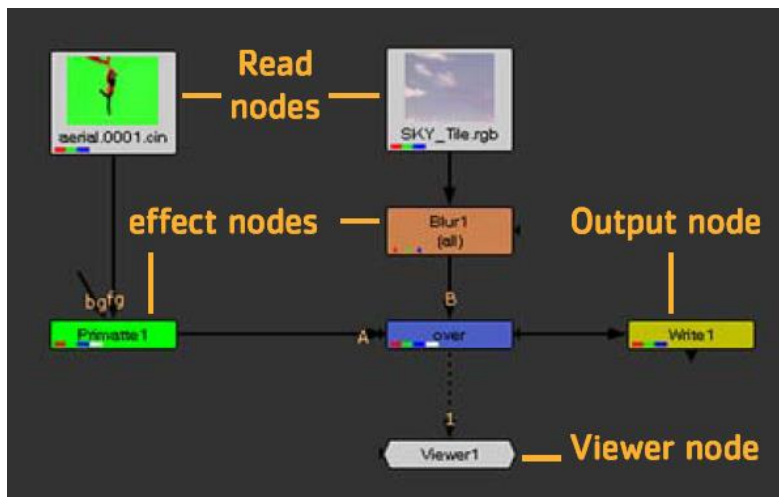


Figure 4.2.2 Nuke Script

4.2.1.1 Nuke Windows and Interface

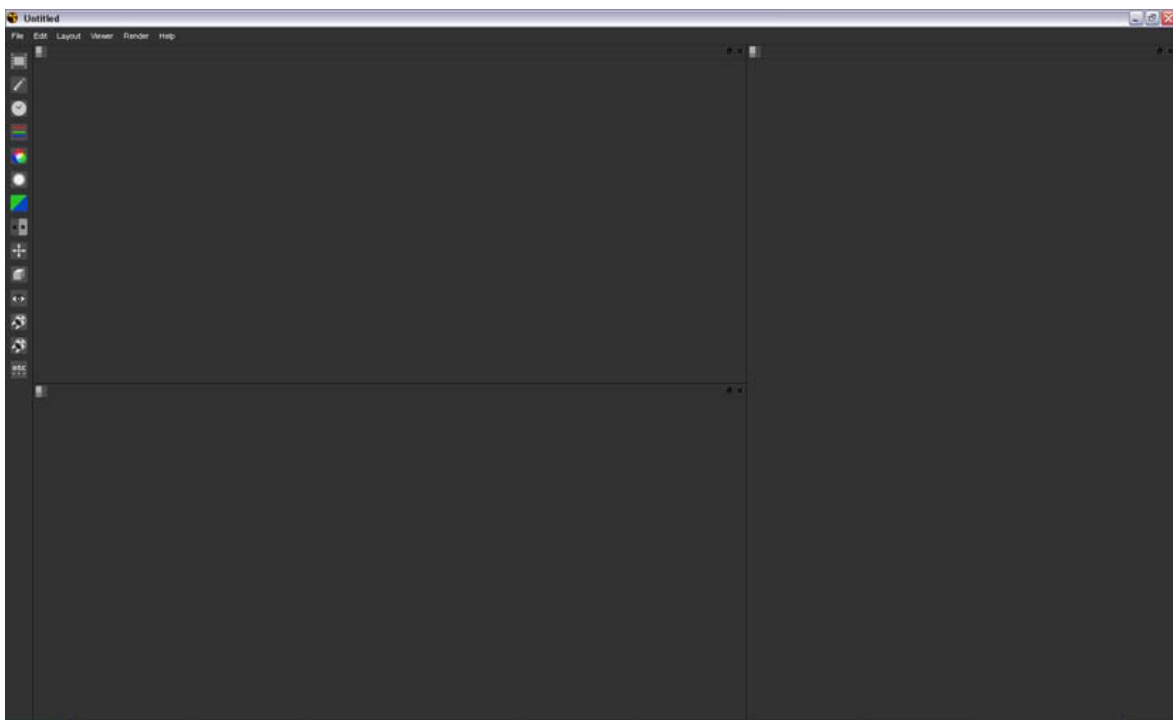


Figure 4.2.3 Nuke Windows

Onto these panes, you can add the following panels:

- Toolbars for selecting nodes
- Node Graphs (also known as DAGs) for building node trees
- Curve Editors for editing animation curves
- Properties Bins for adjusting the nodes' controls
- Viewers for previewing the output
- Script Editors for executing Python commands.

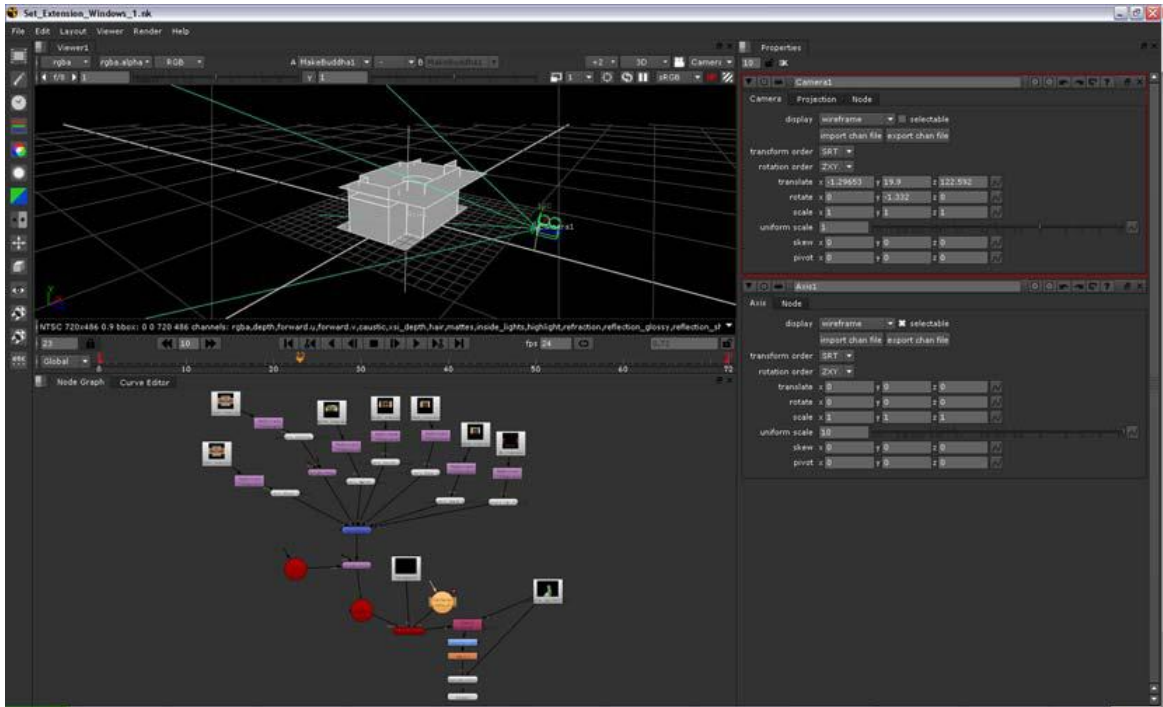


Figure 4.2.4 Main window with a Node Graph, Viewer, and Properties Bin

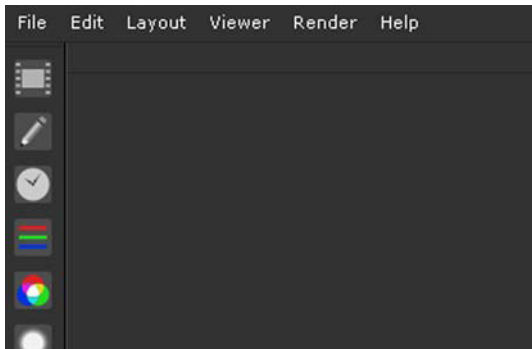


Figure 4.2.5 Menu and Toolbar

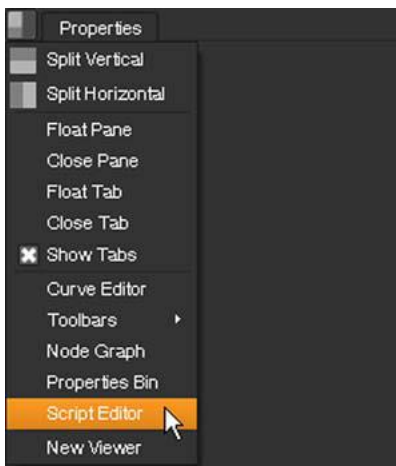


Figure 4.2.6 Content Menus

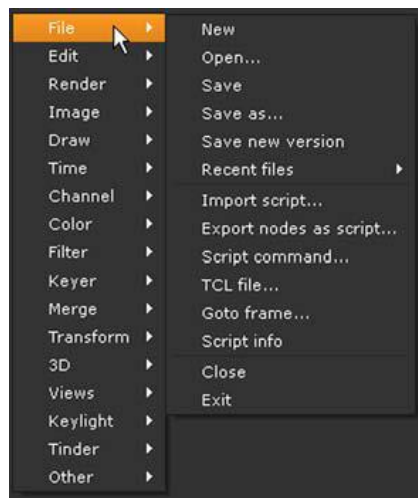


Figure 4.2.7 Right-click menu

Menu Functions

Menu	Functions
File	Commands for disk operations, including loading, saving, and importing scripts.
Edit	Editing functions, preferences, and project settings.
Layout	Restoring and saving layouts.
Viewer	Adding and connecting viewers.
Render	Rendering the output.
Help	Accessing a list of hot keys, user documentation, training resources, tutorial files, and Nuke-related e-mail lists.

Table 1 Menu options

Nodes in Nuke

Nodes are the building blocks of the process tree. Everything that happens to an image in Nuke happens by using nodes.

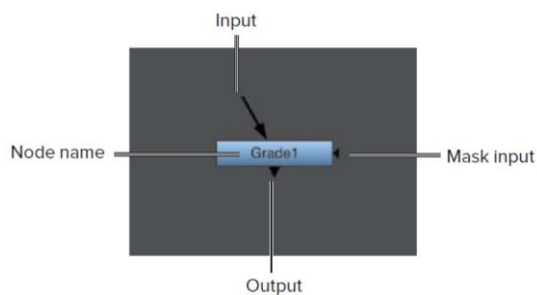


Figure 4.2.8 Node

A node is usually represented by a rectangular shape with the name of the node in the middle. There's usually an input (or more than one) at the top of the node, and a single output at the bottom. On some nodes there is a mask input on the side of the node. To create a node, select the desired tool from the Nodes toolbar. The Nodes Toolbar is split into several toolboxes.

Icon	Name	Description
	Image	Image read and write nodes, built-in Nuke elements, and Viewer nodes.
	Draw	Roto shapes, paint tools, film grain, lens flares, sparkles, other vector-based image tools.
	Time	Retiming tools.
	Channel	Channel and layer set management.
	Color	Applying color correction effects.

Figure 4.2.9 Icons for Nuke nodes










Icon	Name	Description
	Filter	Applying convolve filters, such as blur, sharpen, edge detect, and erode.
	Keyer	Extracting procedural mattes.
	Merge	Layering tools.
	Transform	Translating, scaling, tracking and stabilizing, and distorting elements.
	3D	3D compositing nodes and tools.
	Views	Nodes for working with views and stereoscopic or multi-view material.
	Metadata	Metadata-related nodes.
	Furnace Core	Furnace Core plug-ins are bundled in with NukeX.
	Other	Additional operators for project and viewer management.

Figure 4.2.10 Icons for Nuke nodes

Nuke File Browser

The File Browser is used whenever reading or writing images to and from the disk drive.

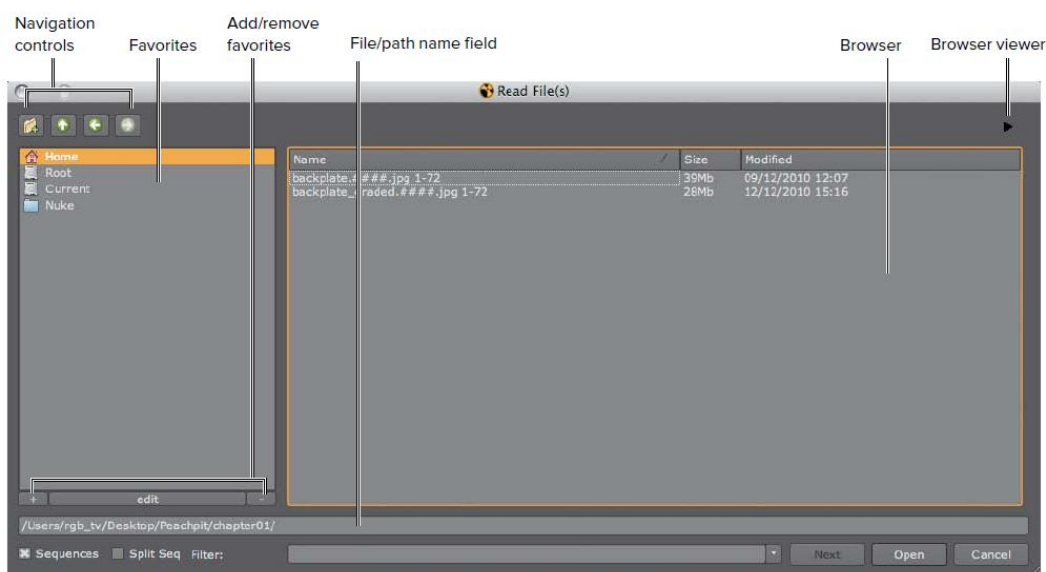


Figure 4.2.11 File Browser

Viewer

The Viewer is used to view your work as you go, receive feedback when editing nodes, compare different images, and manipulate properties on the image.

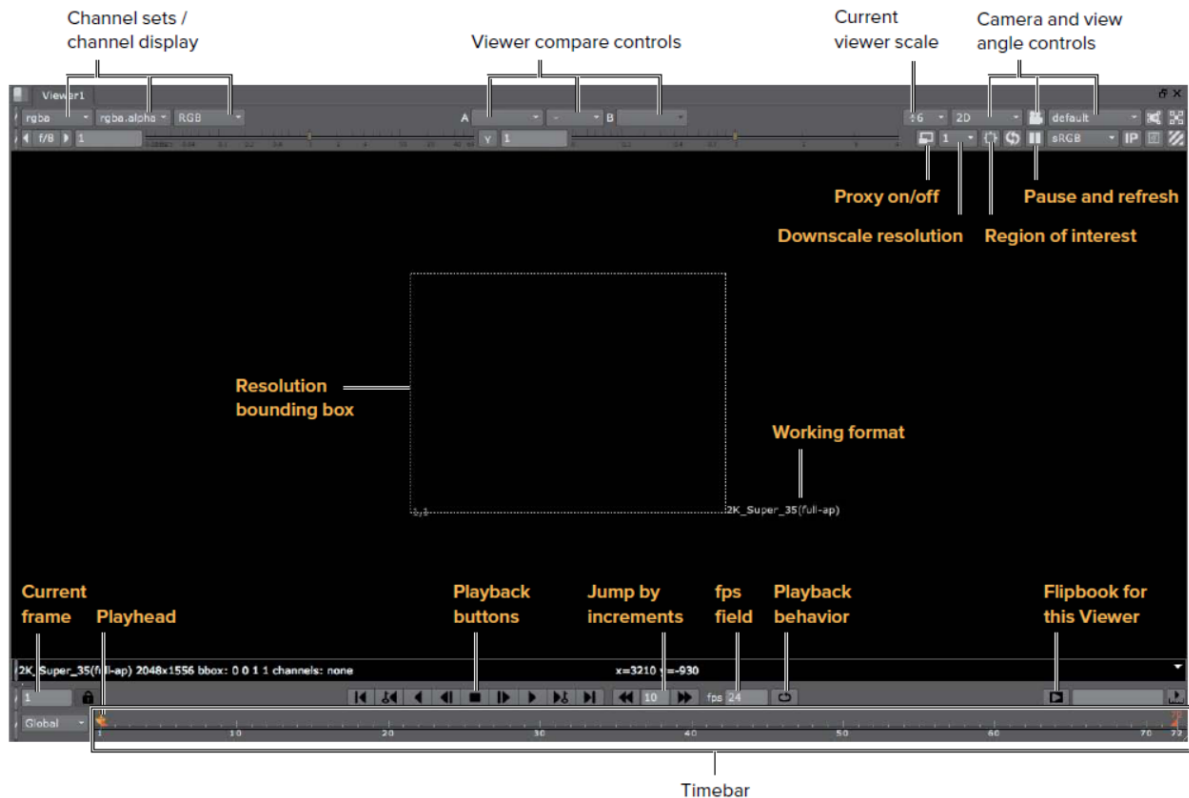


Figure 4.2.12 Viewer

Nuke Process Tree

A process tree is a very intuitive way to change the appearance of images. It is essentially a graphical representation of the process the image or images are going through. If you know what process you want your images to go through, the process tree will represent the process you are thinking of.

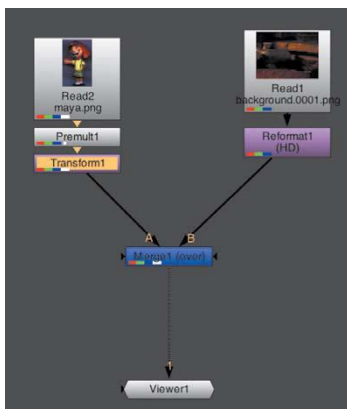


Figure 4.2.13 Process Tree

4.2.2 Loading Images in Nuke

- Launch Nuke.
- While hovering the mouse pointer over the DAG (the Directed Acyclic Graph, also called the Node Graph), press the R key.
- Navigate to the directory of desired files.
- Select the first file and click the Next button, then select the second file and click the open button or press the Enter/Return key on your keyboard. You now have two new Read nodes in the DAG.

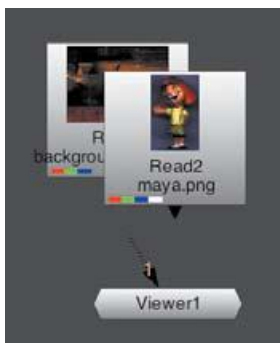


Figure 4.2.14 Read Nodes

- Hover the mouse on desired node and press 1 to check the loaded file.

4.2.3 Merging Images

The definition of compositing is combining two or more images into a seamless, single image.

- Select Read2 and choose Merge from the Merge toolbox. The Merge node can connect two or more images together using various layering operations such as overlay, Screen, and Multiply. However, the default operation called over simply places a foreground image with an alpha channel over a background image.

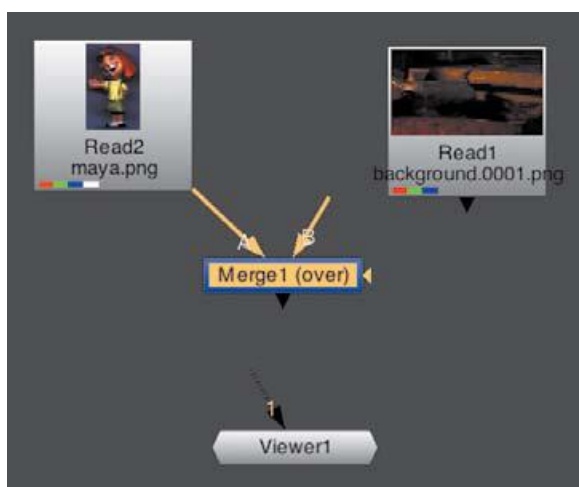


Figure 4.2.15 Merge Node

- Click and drag Merge1's B input towards Read1 and release it over Read1.
- Select Merge1 and press 1 on the keyboard to view the result in the Viewer.



Figure 4.2.16 Preview of merging

- Click Read2 and press 1 on the keyboard to view it in the Viewer.
- While hovering your mouse pointer over the Viewer, press the A key to view the alpha channel.



Figure 4.2.17 Checking alpha channel of doll

- Press the A key again to switch back to viewing the RGB channels.

4.2.4 Saving Nuke Script

Nuke saves its project files, or scripts, as ASCII files. An ASCII file is a text file that you can open in a text editor. ASCII files stand in contrast to binary files, which do not make any sense when opened in a text editor and are only readable by specific applications.

- Press Ctrl-S to save the file or choose File > Save.

4.2.5 Transforming Image

The Transform node is a 2D axis that can reposition an image on the X and Y axes and rotate, scale, and skew. The Transform node resides in the Transform toolbox in the Nodes Toolbar. It also has a hot key assigned to it (T).

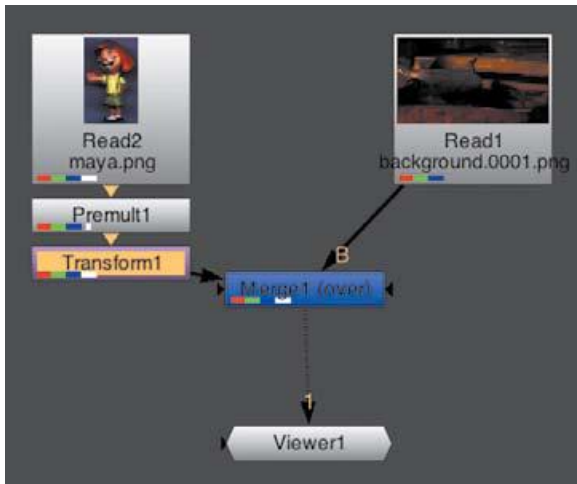


Figure 4.2.18 Transforming Image

4.2.6 Connecting Nodes

- To connect an unattached node, drag its input pipe to the center of the node to which you want to connect.
- To move a pipe from one node to another, click the end you want to connect (input or output) and drag it to the node you want to connect it to.
- To branch an existing output to an existing node, Shift-click the existing outgoing pipe and drag the newly created pipe to the existing node.

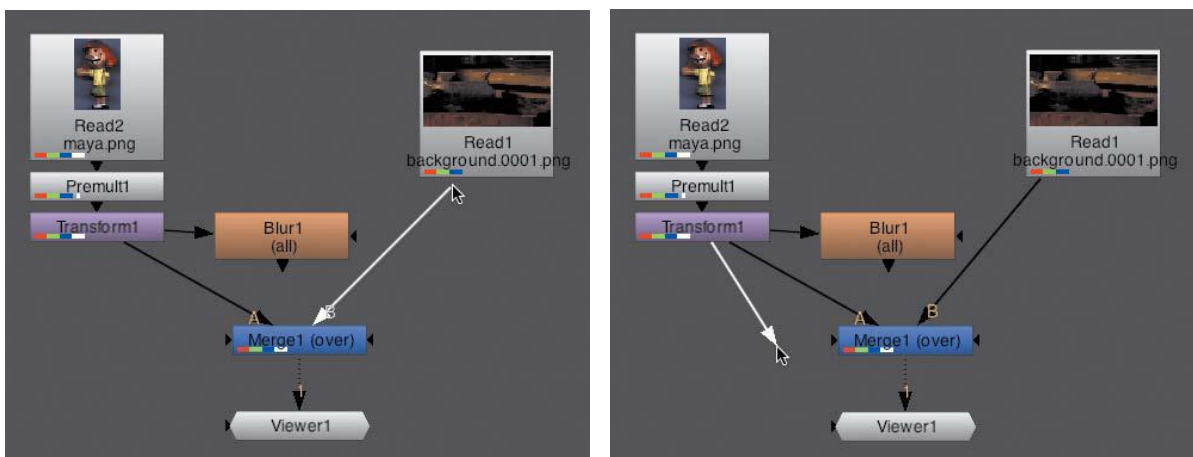


Figure 4.2.19 Connecting Nodes

4.2.7 Arranging Nodes

It is also good practice to keep a tree organized. The definition of “organized” is subjective, but the general idea is that looking at the tree makes sense, and following the flow from one node to the next is easy. Here are a few ways to keep an organized tree:

- Nodes snap to position when they get close to other nodes both horizontally and vertically.
- To arrange a few nodes together, select them, and then press L on the keyboard. Use this with caution—you can get unexpected results because Nuke uses simple mathematical rules instead of common sense. You might expect that the Read nodes would be on top, but sometimes they’re on the side.
- You can also create backdrops around part of your tree that remind you where you did certain things—a kind of group, if you will. Access these Backdrop nodes through the other toolbox. You will learn this shortly.

4.2.7 Disabling and deleting nodes

As you add nodes, you can also disable and delete nodes by using shortcuts.

- To disable a node, select it and press D on the keyboard. To enable it, repeat.
- To delete a node, select it and press Backspace/ Delete on the keyboard.

4.2.8 Changing Properties

You can change the properties of composition by on-screen controls. Some nodes, such as the Transform node, have on-screen controls. When a node is created, its Properties panel is automatically loaded into the Properties Bin. The controls that are now on-screen belong to the newly created Transform1 node. You can use these controls to change the position, scale, rotation, skew, and pivot of the image.



Figure 4.2.20 On-Screen Controls for Nodes

4.2.9 Animation Menu

The Animation button/menu on the right side of any property deals with animation related options. Choose options from this menu to create a keyframe, load a curve onto the curve editor, and set the value of a property to its default state. The Animation menu controls all values grouped under this property.

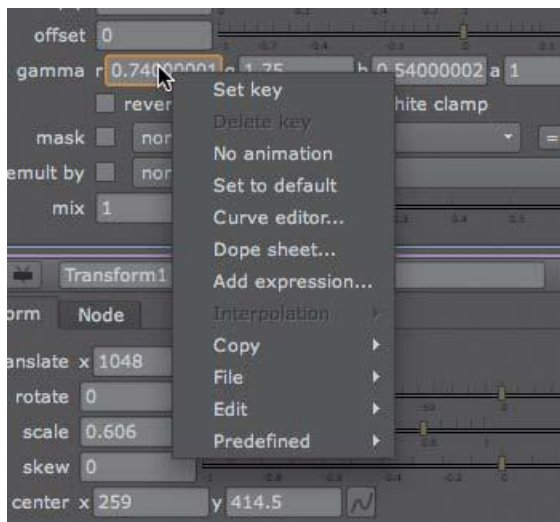


Figure 4.2.21 Animation menu

After applying the modifications, the next step is to render.

4.2.10 Rendering

To render your tree, you need to use a Write node, which contains several functions. The Write node defines which part of the tree to render, where to render to, how to call your file or files, and what type of file you want to create. The end of your tree is where you can see the final composite. You need to add Write node there.

- Click Merge1 at the bottom of the tree and press the W key. You can also choose Write from the Image toolbox in the Nodes Toolbar or use the Tab key to create a Write node by starting to type the word write

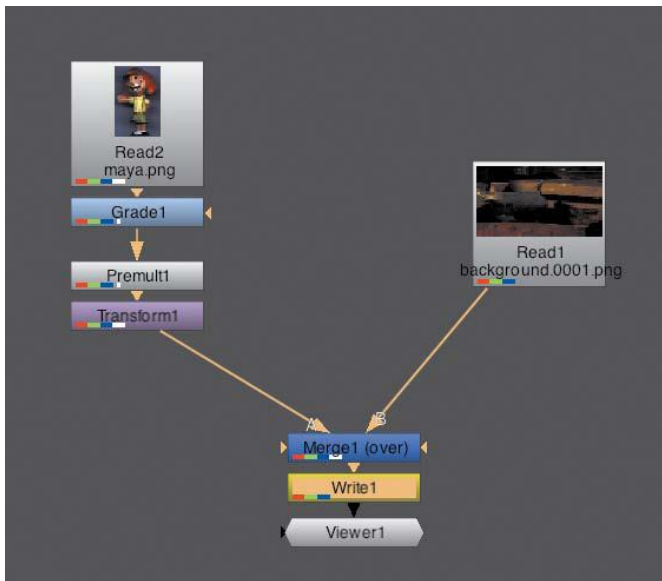


Figure 4.2.22 Write node

- In the Write1 Properties panel, click on the File property line. The File Browser will be displayed.
- Set the desired location for saving the files.
- In the field at the bottom, at the end of your path, add the name of your file sequence.



Figure 4.2.23 Adding sequence

- Click Save. Choose LZW from the Compression drop-down menu.

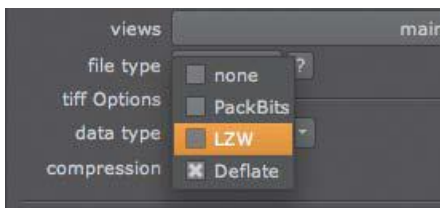


Figure 4.2.24 Setting compression

- Save your Nuke script by pressing Ctrl-S.
- Click the Render button from the Render panel.

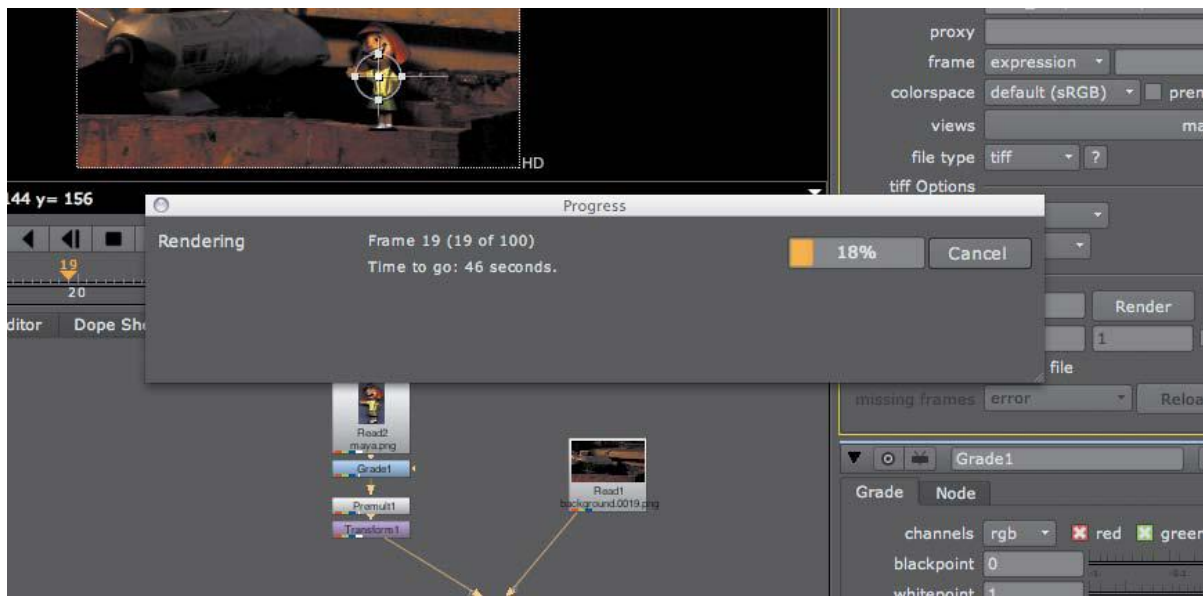


Figure 4.2.25 Rendering process

4.2.11 Creating Animation

Key frames specify that you want animation. To do this, the property needs to change its value over time. So if you want your image to have a Blur value of 20 to begin with and then, at frame 10, to have a value of 10, you need to specify these two pieces of information: a value for frame 1 and a value for frame 10, and the application will interpolate the in-between values.

- Go to desired frame from the Timebar.



Figure 4.2.26 Timebar

- Select Grade1 and press G on the keyboard to create another Grade node.
- In Grade2's Properties panel, click the Gain property's Animation menu and choose Set Key.

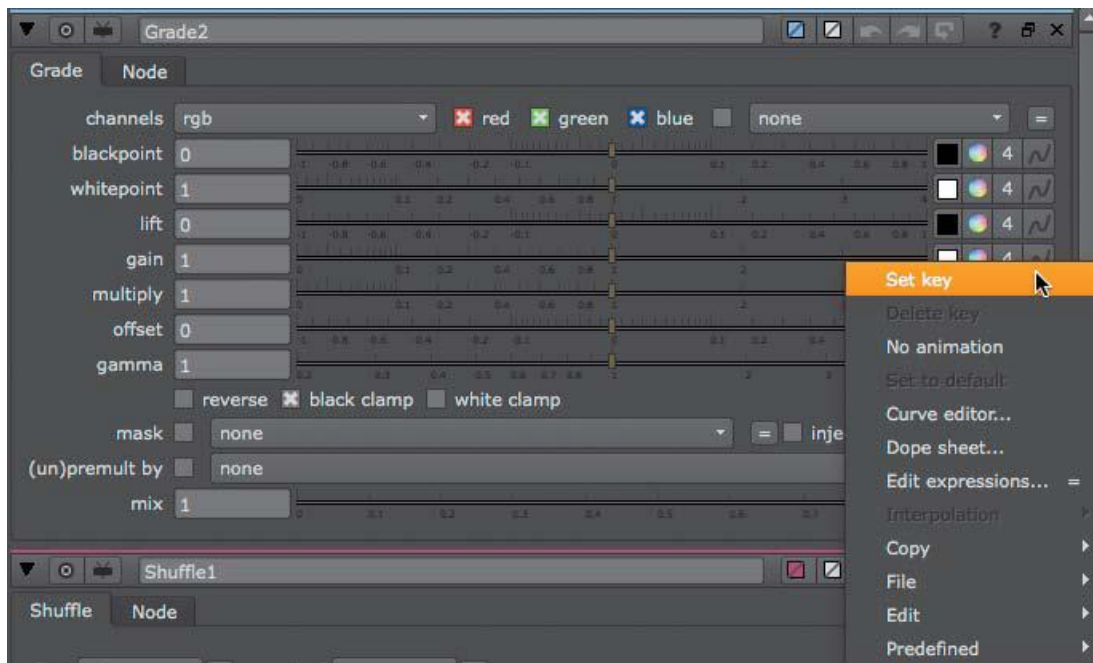


Figure 4.2.27 Setting Gain properties

- Advance one frame by hovering over the Viewer and pressing the right arrow on your keyboard.
- Play with the Gain slider until you reach a result that matches the brightness to that of the background.
- Advance another frame forward to frame 44 and adjust the gain again.
- Repeat the process for frames 45 and 46 as well.
- Choose Curve Editor from the Gain property's Animation menu.

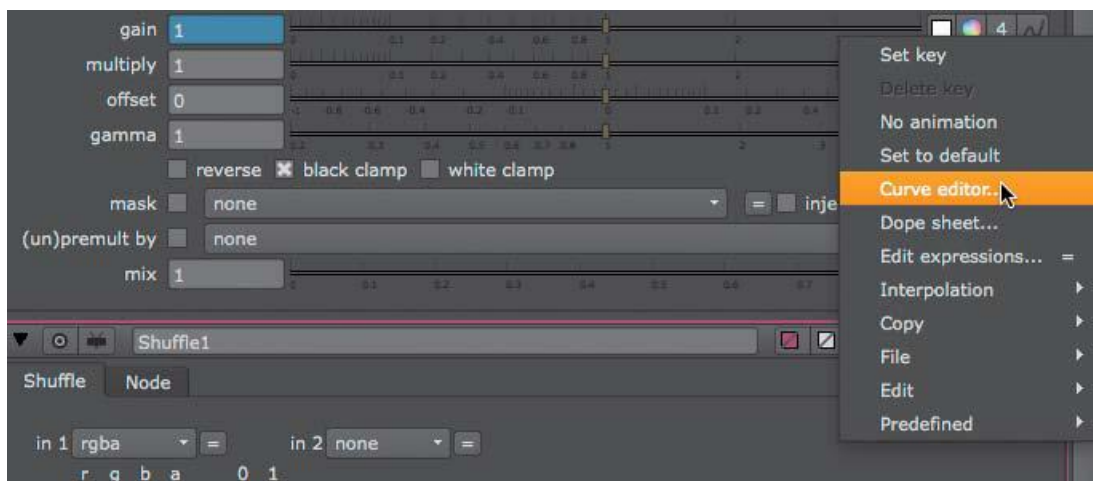


Figure 4.2.28 Curve editor option

- Click the Node Graph tab to go back to the DAG.

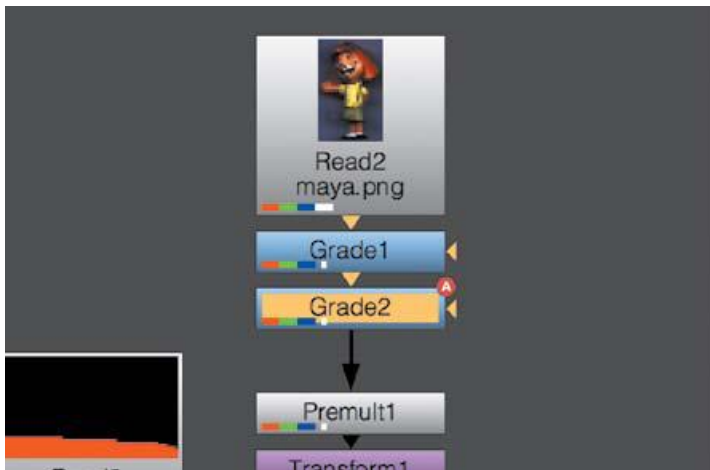


Figure 4.2.29 Nodes prepared for animation

- Click the Play button in the Viewer.

You can find free video tutorials on Nuke at following link:

<https://community.foundry.com/playlist/1050/nuke-basics-nuke-feature-based-tutorials>

Exercise

1. Discuss the types of Matte used in compositing.

2. What are the common operations performed for refinement of the matte?

3. Discuss the despill operation.

4. What are the four common elements of compositing?

5. What is node in Nuke software?

6. What is the function of Nuke process tree?

7. What are the common operations performed for refinement of the matte?

8. Discuss the procedure of loading images in Nuke and then merging them?



5. Health and Safety Compliance at Workplace

Unit 5.1 – Safety, Health, and Hygiene

Unit 5.2 – First Aid



Key Learning Outcomes



At the end of this module, you will be able to:

1. Apply the current health, safety, security policies and procedure of organization.
2. Perform the safe working practices pertaining to own occupation.
3. Apply the government rules and policies related to the health and safety including emergency procedures for accidents, illness, fires or others.
4. Identify the person responsible for health and safety in the working area, including those persons whom to contact in emergency.
5. Use the security signals in the workplace like fire alarms, staircases, fire warden stations, first aid and medical rooms.
6. Avoid the possible work hazards in the working area which can cause risk to others health and safety.
7. Maintain own and other's health and safety in the workplace through precautionary measures.
8. Recommend the basic terms and opportunities to the designated person of your workplace for improving health, safety, and security.
9. Correct the cause of accidents, illness, and fires in your working area and within the limits of individual's authority.

UNIT 5.1: Maintain Workplace Health and Safety

Unit Objectives

At the end of this unit, you will be able to:

1. Apply the current health, safety, security policies and procedure of organization.
2. Maintain own and others' health and safety in the workplace through precautionary measures.
3. Recommend the basic terms and opportunities to the designated person of your workplace for improving health, safety, and security.

5.1.1 Introduction

Emergency evacuation is needed when staying within the building not safe anymore. Every organization has an evacuation procedure. Every organization has a safe place within the organization compound or outside the organization compound where all employees are expected to assemble in case of an emergency evacuation. The team leader guides the team and takes them to safe place. It is very important in these cases, to assemble at the safe area immediately.

If you do not reach the safe area on time, the team leader who is responsible for your safety will send someone to look for you. This will put the other person's life in danger.

Conditions for Evacuation

Emergencies which require immediate evacuation includes:

- Explosions
- Fires
- Earthquakes
- Hurricanes
- Floods
- Workplace violence
- Toxic material releases
- Tornadoes
- Civil disturbances

Every company has:

- **An evacuation policy.** All the TLs are responsible for informing their employees about it. When the TL is informing you about these details, pay attention. This negligence could cost lives.
- **A designated place for emergencies.** Ensure that you know where it is.
- **A “buddy system” for individuals with special needs or disabilities.** If you are a buddy to someone, ensure that your buddy is safely out of the premises with you.

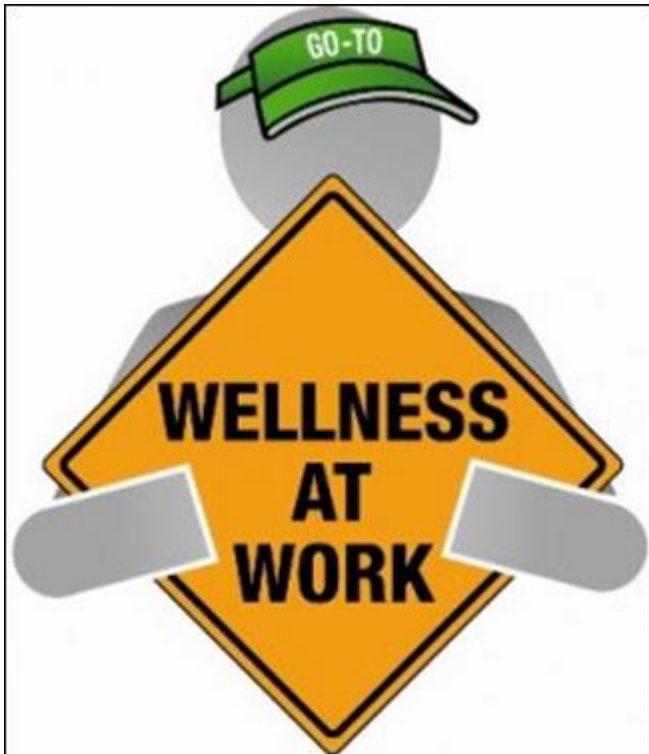


Figure 5.1.1 Conditions for evacuation

- **Floor plans with evacuation routes in work areas.** Ensure that you understand it so that you can use it in time of need.
- **Assembly areas.** These are the areas where you are required to assemble after evacuation.
- **Periodic evacuation drills.** Ensure that you pay attention during those drills. You need to save your life and you can be helpful in saving someone else's life too.

5.1.2 Mock Drills/ Evacuations

The responsibility of the safety of the workers in case of emergency is on the fire safety and evacuation workers. These workers need to go through the training to know the duties and responsibilities. In a workplace, the practice drill should be done in every 3 months under simulated fire conditions so that the workers know the techniques of saving their and other life. By practicing in the fire drills, all the workers are able to know the lifesaving method required in case of emergency.

These are the exercises designed to check the staff response as per emergency. It is also a test of the emergency staff, working staff and other members of the fire safety department. Sometimes the drill is not successful but that's okay because humans learn from previous mistakes. But it is important for all the members that they correct their mistakes on time. Sometimes all the mistakes were not done by the members of staff, the mistake is done by the faulty equipment and safety plans. But, there is a need for staff training periodically.



Figure 5.1.2 Mock Drills

There are two vital components for preparing the fire safety plan which are written below:

1. An emergency action plan, which tells the procedure to be optimized in case of emergency.
2. A fire prevention plan, which tells the methods to be optimized to cool the fire as soon as possible.

You need to participate in arranged by organization for your personal safety and also for others safety. These drills help you in understanding the

Fire safety and evacuation plans sketch staff duties and accountabilities in time of emergency. Continuing training is required to help safeguard that the employees are conscious of those duties and responsibilities. Firefighting trainings serve as an prospect for staff members to validate, under replicated fire conditions, that they can perform those duties and responsibilities safely and efficiently. It's also a time for the workers or employee to demonstrate about the defend-in-place strategies and also the workers are able to take advantage of facility's fire protection features and exit facilities to protect the people in their care.

Fare excellent exercise designed to evaluate staff response to a replicated emergency. The fare is also a test of facility's fire safety/evacuation strategies and staff training programs. It is not essential that all frun smoothly. That's okay, so long as staff and the organization understand from them and correct mistakes made. It's vital, therefore, that there be a analysis of each drill so that any problems met can be addressed. Perhaps the problems are due to unfinished or out-dated fire safety/emigration plans. Perhaps there's a need for further training of staff.

The two essential components of a fire preparedness plan are the following:

1. An emergency action plan, which details what to do when a fire occurs.
2. A fire prevention plan, which describes what to do to prevent a fire from occurring.

5.1.3 Medical Emergencies

Everyone plans for emergencies. That is the reason why we keep a first aid kit with ourselves. At work, however one is exposed to a lot of stress and physical activity. This could lead to certain medical emergencies. It's better to be prepared with the first aid measures and knowledge of implementing them on ourselves and on others. This module equips you with that information. Pay

attention to these medical emergency procedures to understand how to conduct you in these crucial movements. Pay attention during these sessions. You might be able to save your own and your friend lives.

5.1.3.1 In case of Medical Emergency

A medical emergency is a situation in which a worker met in accident and needs medical help. The medical injury may be severe or life threatening. Some situation where:

- Person is not inhaling
- Heart attack or stock
- Heavy or severe bleeding
- Electric Shock
- In case of Poisoning
- Person get somebody Burns

In case of medical emergency, the person or victim requires the immediate help. Sometime the person need attention before the you call the emergency helpline.

It is important to know or remember the number of emergency helpline or Emergency Medical Service (EMS) for the safety of self and other workers.

DON'T

- Let the victim to eat or drink anything.
- Confine the victim
- splash any fluid on victim face or on injury.
- shift the victim to another area or place unless it is the only way to protect the victim.

Bleeding

- Apply any type of pressure on the wound of victim with the help of bandage or any other means.
- Elevate the wound to slow the bleeding.
- When necessary, apply the pressure on pressure points near wound to block excess bleeding.

Fainting

- Fainting is a loss of consciousness which is due to temporary reduction flow of blood in the victim's brain.
- The unconsciousness of the victim may led to more injury in the workplace.
- Slow pulse of the victim.
- The pale, cold skin and sweating of the victim.

Causes of fainting:

- Eating or drinking lack of fluids which is also known as dehydration.
- The low blood pressure of victim.
- Due to lack of sleep.
- Over exhaustion of the worker

First Aid for Fainting:

- Lie down the victim on the back and raise the legs above his heart level.
- Ensure the clearance of victim's nose.
- Check for indication of coughing, or breathing problem.
- Loose the tight cloths like neck ties, collars, and belts.
- If the victim remains unconscious from the 1 minute, call the EMS as soon as possible.

Shock

The shock occurs in the human body on the failure of circulatory system. When insufficient amount of oxygen is reached in the body tissue, the shocks also occur. This condition is treated as soon as possible if not, it may lead to organ failure, and may cause death. Shock becomes worse by fear and pain of victim.

First Aid for shock:

- If possible, keep the victims in lying down position.
- Raise the legs 10-12 inches from the ground level unless you suspect a injury in back and bone.
- If the victim is feeling cold then cover him. If the victim is feeling hot then don't make suffocation by covering him.
- If the victim starts vomiting then move the victim to the suitable place.
- Loosen the tight clothing.

Muscle Cramps

- Stretch out the affected muscle of the victim to counterbalance the cramp part of the body.
- Firmly massage the cramped muscle.
- Apply some kind of moist heat on the affected area.
- If the cramp remains in the muscle, get medical help as soon as possible.
- Rest- avoids movements and activities that cause pain.
- Apply the ice on the cramped muscle it may reduce the pain and swelling of the muscle.
- Applying the light compression like elastic bandage on the affected area may reduce the swelling.
- Raising the affected area above the heart level may reduce the swelling as well as pain.

Fractures

As we all know about the fracture that is the crack or break in the bone.

Dislocation

A dislocation occurs when the bone slips out from the specified location. It generally occurs in the shoulders, thumb, elbow, fingers, lower jaw and other movable joints.

First Aid for Dislocations & Fractures:

- Immobilize the effected part.
- Stabilize the effected part
- Use a cloth as a sling.
- Use board as a sling.

5.1.4 First Aid

First aid is the assistance given to any person suffering a sudden illness or injury with care provided to preserve life, prevent the condition from worsening, or promote recovery.

Kits vary in contents but most kits have the following items:

- Band-aids / Adhesive bandages
- Gauze pads and tape
- Scissors, cold pack
- Wound bandage / compress
- Eye pads / eye wash solution
- First aid / burn cream
- Antibiotic ointment
- Face shield or barrier mask for providing CPR
- Forceps / tweezers
- Disposable thermometers
- First aid instruction booklet

5.1.5 Personal Protective Equipment's (PPE)

Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The safety by protective equipment includes electrical, heat, physical, biohazards, chemicals, and airborne particulate matter.



Figure 5.1.3 Personal Protective Equipment's

In the workplace, there are many situations which require immediate first aid to the victim and many countries have made some regulation, legislation, and guidance which specify the minimum level of first aid to be given to the victim. For this, the worker needs the special training and area for achieving the immediate first aid. To achieve this, the training should be given by specialist first aid officer and necessary training given by learning institute. The training of first aid does not need any type of specific tools and equipment but may involve the improvisation with material offered at the time of training.

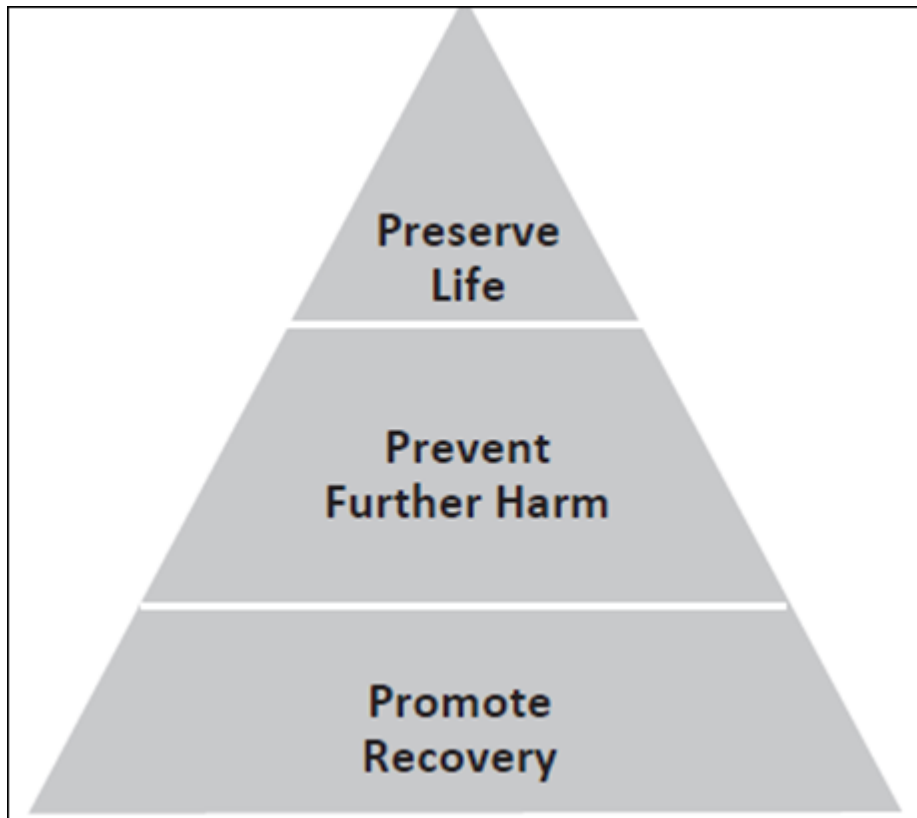


Figure 5.1.4 First Aid pyramid

While delivering First Aid always remember:

- To prevent from degradation.
- Act deliberately and confidently with the victim.
- The timings of Golden Hour should be first 60 minutes from an accident.
- The timings of Platinum Period should be first 15 minutes following an accident.
- Prevent the body shock and choking.
- Stop bleeding from the wound.
- Loosen the clothes of victim.
- Regulate the respiratory system of the victim.
- Avoid crowding near the victim.
- Take the victim to safe place or hospital near the workplace.
- Attend the emergencies situation with ease and without fear.
- Always remember to not overdo. Because the person giving the first aid is not doctor.

Exercise



1. Discuss some general safety rules for working in the workshop.

2. What is PPE and are the common components of PPE?

3. What is an accident and what are the types of accidents?

4. Discuss the types of fire-extinguisher and their uses?

5. Write a short note on health and hygiene?

6. What are the common components of First-Aid kit?

7. What are the symptoms of shock and what should be the first-aid?

8. What are the symptoms of heat exhaustion and what should be the first-aid?

