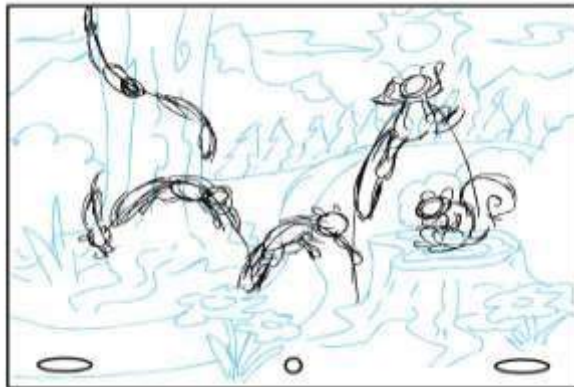
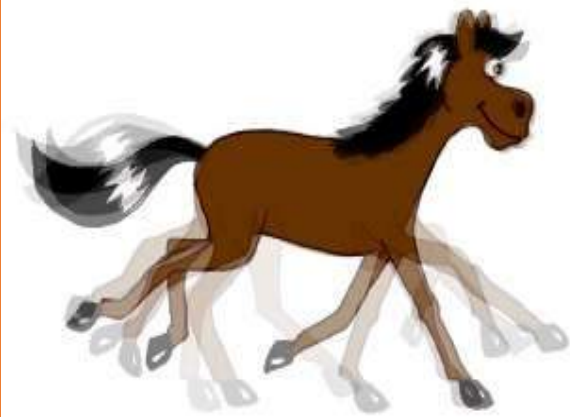


UNIT 1: 3D Production Pipeline

Student Workbook

(Class 12; NSQF Level 4)

Course: Media and Entertainment



PSS Central Institute of Vocational Education

(a constituent unit of NCERT, an autonomous organization under
Ministry of Human Resource Development, Government of India)
Shyamla Hills, Bhopal - 462 013, M.P., India

Student Workbook

(Class 12; NSQF Level 4)

Course: Media and Entertainment

(Job Role: Animator, QP Ref. Id.: MES/ Q 0701)

Dr. Vinay Swarup Mehrotra
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Student Details

StudentName: _____

Student RollNumber: _____

Batch StartDate: _____

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Preface

The National Curriculum Framework, 2005, recommends that children's life at school must be linked to their life outside the school. This principle makes a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home, community, and the workplace.

The student workbook on “**3D Production Pipeline**” is a part of the qualification package developed for the implementation of National Vocational Education Qualification Framework (NVEQF). The NVEQF, an initiative of the Ministry of Human Resource Development (MHRD), Government of India, set common principles and guidelines for a nationally recognized qualification system covering Schools, Vocational Education and Training Institutions, Technical Education Institutions, Colleges and Universities. It was subsumed in National Skills Qualifications Framework (NSQF) in 2013. It is envisaged that the NSQF will promote transparency of qualifications, cross-sectoral learning, and student-centred learning and facilitate learner's mobility between different qualifications, thus encouraging lifelong learning.

This student workbook, which forms a part of vocational qualification package for students who have passed Class VIII or equivalent examination, was created by a group of experts. The Media and Entertainment Sector Skill Council approved by the National Skill Development Corporation (NSDC) for the Media and Entertainment Industry developed the corresponding National Occupational Standards (NOS) and the Qualification Pack (QP). The National Occupational Standards are a set of competency standards and guidelines endorsed by the representatives of Media and Entertainment Industry for recognizing and assessing skills and knowledge needed to perform effectively in the workplace.

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), a constituent of National Council of Educational Research and Training (NCERT) has developed modular curricula and teaching-learning materials for the vocational qualification package in Media and Entertainment sector for NSQF levels 1 to 4; level 1 is equivalent to Class IX. Based on NOS, generic and occupation related core competencies (knowledge, skills, and abilities) were identified for development of curricula and learning modules.

This student workbook attempts to discourage rote learning and to bring about necessary flexibility in offering of courses, necessary for breaking the sharp boundaries between different subject areas. The workbook attempts to enhance these endeavours by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups and activities requiring hands-on-experience. We hope these measures will take us significantly further in the direction of a child-centred system of education outlined in the National Policy of Education(1986).

The success of this effort depends on the steps that school Principals and Teachers will take to encourage children to reflect their own learning and to pursue imaginative and on-the-job activities and questions. Participation of learners in skill development exercises and inculcation of values and creativity is possible if we involve children as participants in learning, and not as receiver of information. These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table would be a necessity to maintain the rigour in implementing the activities and the required number of teaching days will have to be increased for teaching and training.

About Your Workbook

This workbook is to assist you with completing the Unit of Competency “3D Production Pipeline”. You should work through the workbook in the classroom, at the workplace or in your own time under the guidance and supervision of your teacher or trainer. This workbook contains sessions which will help you to acquire relevant knowledge and skills (soft and hard) on various aspects of the unit of competency. Each session is small enough to be easily tackled and digested by you before you move on to the next session. Animated pictures and photographs have been included to bring about visual appeal and to make the text lively and interactive for you. You can also try to create your own illustrations using your imagination or taking the help of your teacher. Let us now see what the sections in the sessions have for you.

Section 1: Introduction

This section introduces you to the topic of the Unit. It also tells you what you will learn through the various sessions covered in the Unit.

Section 2: Relevant Knowledge

This section provides you with the relevant information on the topic(s) covered in the session. The knowledge developed through this section will enable you to perform certain activities. You should read through the information to develop an understanding on the various aspects of the topic before you complete the exercise(s).

Section 3: Exercise

Each session has exercises, which you should complete on time. You will perform the activities in the classroom, at home or at the workplace. The activities included in this section will help you to develop necessary knowledge, skills, and attitude that you need for becoming competent in performing the tasks at workplace. The activities should be done under the supervision of your teacher or trainer who will guide you in completing the tasks and also provide feedback to you for improving your performance. To achieve this, prepare a timetable in consultation with your teacher or trainer and strictly adhere to the stipulated norms or standards. Do not hesitate to ask your teacher or trainer to explain anything that you do not understand.

Section 4: Assessment

The review questions included in this section will help you to check your progress. You must be able to answer all the questions before you proceed to the next session.

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Introduction

2D animation figures are created or edited on the computer using 2D bitmap graphics or using 2D vector graphics. This includes automated computerized versions of traditional animation techniques, such as interpolated morphing, onion skinning and interpolated rotoscoping. 2D animation has many applications, including analog computer animation, Flash animation and Power Point animation. The 2D production pipeline starts with workbook and goes all the way through final checking, compositing and final output in the form of an animated film.



3D Production Pipe-Line

A 3D animation is essentially a digital version of 2D animation. 3D animators create poses on a series of still images that are referred to as frames. By creating a series of poses and playing it over a certain amount of frames you can create the illusion of movement. 3D animation is digitally modelled and manipulated by an animator. The 3D Computer Generated Image (CCI) production process emphasizes the importance of a smooth production path. It covers design, modelling and rigging steps through touch up and final output in the form of a video or film.

In 3D animation, the animator usually starts by creating a 3D polygon mesh to manipulate. A mesh typically includes many vertices that are connected by edges and faces, to give the visual appearance of form to a 3D object or 3D environment. Sometimes, the mesh is given an internal digital skeletal structure called an armature that can be used to control the mesh by weighting the vertices. This process is called rigging and can be used in conjunction with key frames to create movement.

As a student, you should know the basics of a 3D production pipeline, before you start learning about the various other complex techniques in animation. It will help you in understanding the production process and the role of various people involved in 3D animation. The first process in the animation pipeline, and also one of the most important, is the **pre-production**. It begins with the main concept or idea, which is turned into a full story through a storyboard and then, once the story has been finalized, other things such as the shot sequence and camera angles are worked out. Some of the major components of pre-production are storyboarding, layouts, model sheets and animatics. Pre-production process is followed by production and post production steps, which involves design, modeling, rigging, staging, animation, lighting, effects, rendering, composite, touchup and final film/video output. In this Unit, you will learn about the various terms and stages of 3D animation production line. It will help you in building your foundation for developing a 3D animated film.

Session 1:Pre-Production

In this session you will learn how to perform pre-production activities.

Relevant Knowledge

Pre-production is the phase of developing ideas and planning prior to the process of production. It begins with the main concepts or ideas which are initially turned into a full story, and then, once the story has been finalized, other things such as the script, shot sequence and camera angles are worked out. It is the period before any real animation work takesplace.

In this session, you will learn about the different steps involved in the pre-production process and how each step helps to develop a foundation on which further production stages are built. The work done during the pre-production serves as a visual reminder of the original plan; something that can be referred back to throughout the production.

The major components of a pre-production process are as follows:

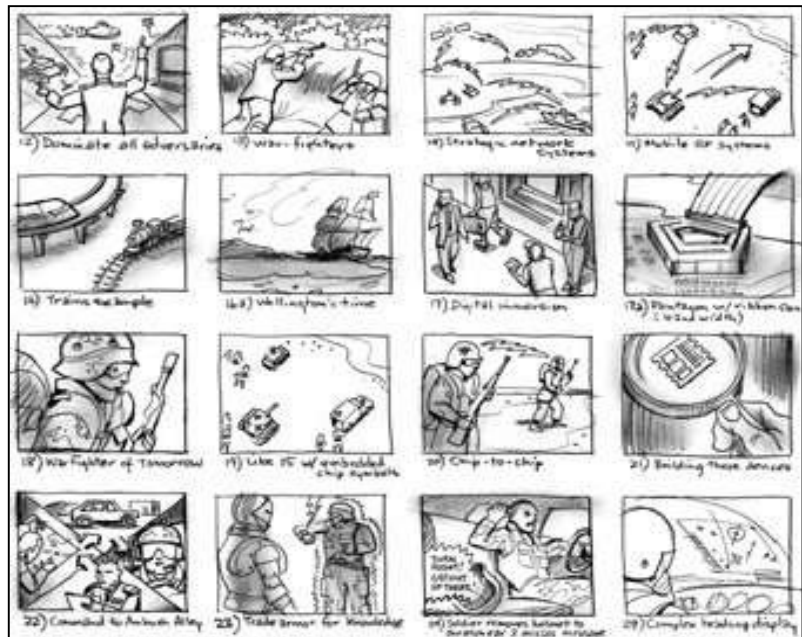
1. StoryBoarding
2. Layouts
3. ModelSheets
4. Animatics

Storyboard

The **storyboard** helps to finalize the development of the storyline, and is an essential stage of the animation process. It is made up of drawings in the form of a comic strip, and is used to both help visualise the animation and to communicate ideas clearly. Storyboards often include notes to describe the frame in more detail, such as mood and lighting, as well as camera moves. It details key events and scene changes in the animation, often accompanied by text notes describing what is occurring in the scene such as camera movements. It is a visual reminder of the plan and can be referred back to throughout the production stage. Storyboards can be especially useful when working in group environments, something quite common in the animation industry.

Character Design

Character design involves developing the appearance and features of characters in an animation. **Model Sheets** and **Expression Sheets** are produced to help animators be consistent with the appearance of characters. **Character Line-up Sheets** are also produced to compare the scale of the characters against one another.



Layouts

Once the storyboards have been approved, they are sent to the layout department which then works closely with the director to design the locations and costumes. With this, they begin to stage the scenes, showing the various characters' positions throughout the course of each shot.

Model Sheets

Model sheets are precisely drawn groups of pictures that show all of the possible expressions that a character can make, and all of the many different poses that they could adopt. These sheets are created in order to both accurately maintain character detail and to keep the designs of the characters uniform whilst different animators are working on them across several shots. During this stage the character designs are finalized so that when production starts, their blueprints can be sent to the modelling department who are responsible for creating the final character models.

Expression Sheets may also be developed as a guide to character facial expressions, such as, smiling, laughing, sad, shocked, startled, sleepy, alert, thoughtful, concerned, etc.

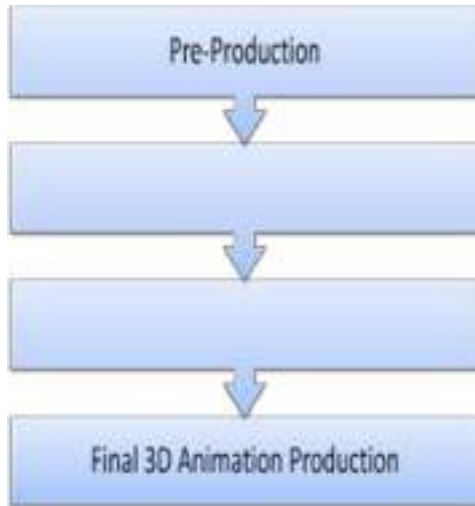
Animatic

An animatic is a timed moving version of the storyboard made up of individual frames taken from the storyboard and is often accompanied by audio such as dialogue, sound effects and music. Each frame of the animatic depicts a certain key point of the scene or movie. The running time should match the intended running time of the final animation. Animatic can assist with decisions regarding scenes to include or exclude. On a commercial

project this is very important as it avoids wastage of time and money during production. These help the Director plan how they will go about staging the above sequences, as well as how visual effects will be integrated into the final shot.

Exercise

1. Fill in the blanks in the flow chart shown for 3D Animation Production Cycle



2. Develop your own storyboard

- Take a short piece of text, illustrating a scenario. For example a nursery rhyme is a good starting point if storyboarding is an unfamiliar task.
- Break down the story, line by line into a series of images that represent the action taking place in the story.
- Draw these images on to storyboard frames
- Write the dialogue under the images and add any details of sound effects that might contribute to the dramatic scene.
- Use variety of different angles to illustrate the story, such as close ups and wide angles.
- Discuss how using a variety of shots creates drama and visual interest to the story You can

use the template given below for developing your storyboard.

Create a short storyboard in the format given below:

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_____	_____	_____
_____	_____	_____
_____	_____	_____

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_____	_____	_____
_____	_____	_____
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_____	_____	_____
_____	_____	_____
_____	_____	_____

Assessment

Answer the following questions

1. What is the purpose of ModelSheet?

2. What is Animatics?

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

Differentiated between the following:

1. Story boarding and layouts
2. Model sheets and animatics

Part B

Discussed in class the following:

1. How to create a storyboard?
2. What are the model sheets and animatics?
3. What is the use of model sheets?

Part C

Performance standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Develop a Storyboard		
Demonstrate the knowledge of character design		
Draw a model sheet of a character		

Session 2: Production -I

In this session you will learn about creating model for stop motion 3D animation and Texture a character.

Relevant Knowledge

Production

Now that the storyboard has been approved, the project enters the production phase. It is here that the actual work can start, based on the guidelines established during pre-production. Some major activities that are undertaken during the production phase are the layout, modelling, texturing, lighting, rigging, and animation. Animation production is a very coordinated process where different teams of artists work together while utilizing optimum resources and achieving the initial goal in the time available. The production phase is often the longest and busiest phase of the animation project. During this stage the Director approves camera moves, depth of field and the composition of the models making up the set and set dressing. It is then the responsibility of the Modelling department to deliver these approved set, prop and character models in the final layout stages. A 2D production pipeline starts with workbook and goes all the way through final checking, compositing and film output, whilst the 3D production process emphasizes the design, modelling and rigging and animation stages.

Layout

A layout is a visual map. It instructs the various artists on a scene where the characters are to be positioned and how they are to move. The timing of the scene and individual character movements will be indicated on the “dopesheet”. A dopesheet looks a little like a spreadsheet with rows and columns but its purpose is to provide instructions concerning the time duration of individual character movements, scenes, camera moves and audio details. It ensures that each and every person working on a production is working to the same basic instructions.

A **Layout Artist** set the stage for each scene of animation. The **Layout Artist** produces the 3D version of what storyboard artists had previously drawn on paper. Each layout is a vital piece of reference for all those involved in the production process. The layout determines lighting and camera angles as well as where characters and props are placed in the scene according to their start positions. The **Layout Artist** will often work closely with the Director and other specialists such as a Scene Planner and Special Effects Supervisor to work out the scene layout.

While the **Layout Artist** is responsible for composing the shot and delivering rough animation to the animators as a guide, the **Background Artist** creates scene settings. A background is essentially a static setting upon which the animation takes place

in the foreground. Background images can be very simple and drawn in a similar flat style to the characters. The **Key Frame Animators** draw the images that determine the beginning of a movement and the end of movement. The **Inbetween animators** draw the images or frames inbetween the key frames to complete the movements prescribed by the Key Frame Animator. The process of colouring of animation frames is carried out by **Digital Ink and Paint Artist** using specialist ink and paint software. **Clean-up Artists** are responsible for re-drawing the Key Frame and Inbetween Animators drawings which are normally of a rough linequality.

The **Scanner Operator** is responsible for scanning drawings prepared by the Clean-up Artist. Ink and Paint, which is the process of colouring the drawn frames is used to transfer drawings over to cels which are then hand painted. However, in the digital age the term is often referred to as **Digital Ink and Paint** as the process now involves scanning the finished drawings into a computer where they can be coloured using a software package. The scanned cels can be coloured in or 'inked' using simple tools such as the '**Paint Bucket**', a tool which is common to many software packages. It is also possible to touch up the scanned line drawings using tools such as the **Paintbrush**.

Line Test

A **Line Test** is a process used to check hand drawn frames prior to them being used for final artwork. Frames are captured either via a video camera, frame by frame or by scanning them into a computer. The resulting sequence allows the animator to assess how well the sequence is flowing. If the result is unsatisfactory then the animator can simply re-draw, add or delete frames and then create another line test.

Onion Skinning

Onion Skinning is a method used to view several frames of an animation simultaneously, it allows the animator to check the changes occurring within each frame and how they flow together. Traditionally this process involved comparing drawn frames on a light box but many animation software packages include the ability to preview frames with several previous and upcoming translucent frames visible.

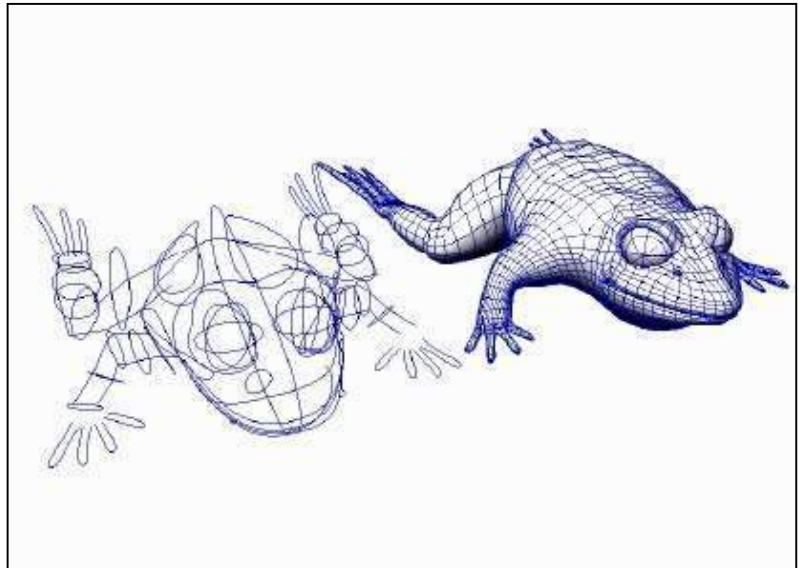
Walk Cycle / Loops

The 'Walk Cycle' form of loop is where the sequence of frames used to show one foot moving in front of another can be repeated continually and gives the effect of continuous walking. **Walk Cycles** are a common form of 'loop' animation, they consist of a sequence of frames which together make a continuous flowing loop. They help to make repetitive movements simpler to animate.

Modelling

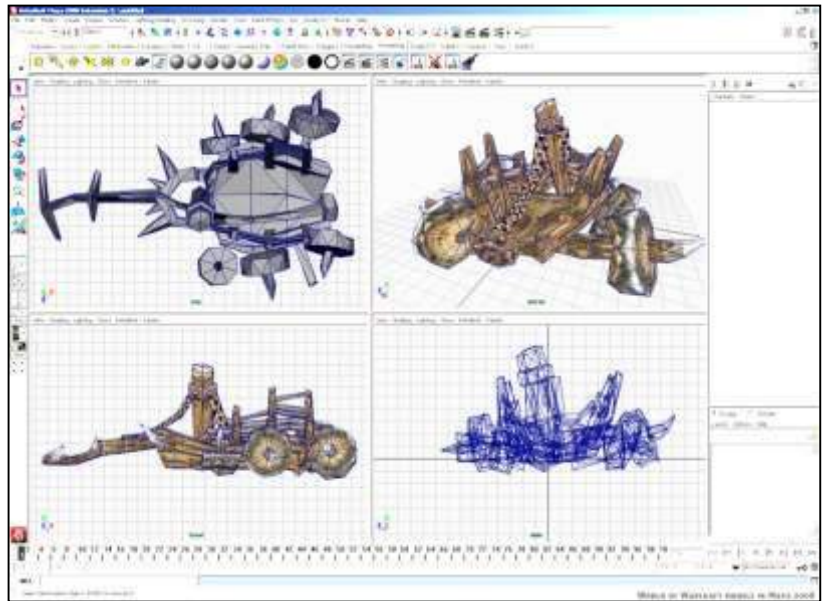
Working closely with the Art Directors, Visual Effects Supervisors and Animation Supervisors, **Modellers** turn the 2D concept art and traditionally sculpted maquettes into high detail, topologically sound 3D models. They then assist the Technical Animator and Enveloper as the model has a skeleton put in place and the skin is developed. Following this, the model may be handed back to the Modeller, who will proceed to sculpt facial expressions and any specific muscle tension/jiggle shapes that may be required.

Modellers are usually split into two or more departments. Whilst Organic Modellers tend to have a sculpture background and specialise in building the characters and other freeform surfaces, Hard-surface Modellers often have a more industrial design or architectural background, and as such they model the vehicles, weapons, props, and buildings.



Once the model is approved, it will be made available to the rigging and texture paint departments, who complete the final stages in preparing the model for animation and rendering. The model will move through the production pipeline without coming back for modelling fixes, although some amount of fixes are inevitable - problems with models sometimes don't appear until the rendering stage, in which case the lighter will send the model back to be fixed.

Whether creating a texture from scratch or through editing an existing image, the Texturing Artists are responsible for writing shades and painting textures as per the scene requirements. Working hand-in-hand with the surfacing and shading departments, textures are painted to match the approved concept art and designs which were delivered by the art department. These textures are created in the form of maps which are then assigned to the model.



Texturing

Lighting Technical Directors make sure there is consistency in lighting, colour balance and mood between the various elements of a shot or scene. When appropriate, they ensure the computer-generated imagery looks photorealistic to match the live action plates. They combine the latest version of the animation, the effects, the camera moves, the shaders and textures, and render out an updated version every day.

Exercise

1. Perform layout animation by applying tweening to each view that is part of the layout being animated. Here are four types of tweening animation that you can perform:
 - Scale animation: to make a view smaller or larger either on x axis or on the y axis.
 - Rotate animation: to rotate a view around a pivot point by a certain number of degrees.
 - Translate animation: to move a view along the x or y axis.
 - Alpha animation: to change the transparency of a view.

Assessment

Answer the following questions

1. What is 3D modeling?

2. What is texturing?

3. Write the roles and functions of the following:

- 1. Layout Artist
- 2. Background Artist
- 3. Key-frame Animator
- 4. In between Animator
- 5. Clean-up Artist
- 6. Scanner Operator

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

Differentiated between the following:

1. Modeling and texturing

Part B

Discussed in class the following:

1. How to model a character in animation?
2. What is UV stage in modelling?
3. How to paint textures in animation?
4. What is rendering?

Part C

Performance standards

The performance Standard may include, but not limited to:

Performance Standards	Yes	No
Demonstrate the knowledge of layout		
Demonstrate the knowledge of onion skinning		
Demonstrate the knowledge of modelling and texturing		

Session 3: Production -2

In this session you will learn about the concept of Lighting and Rigging & the use of concept of lighting to create a bright image

Relevant Knowledge

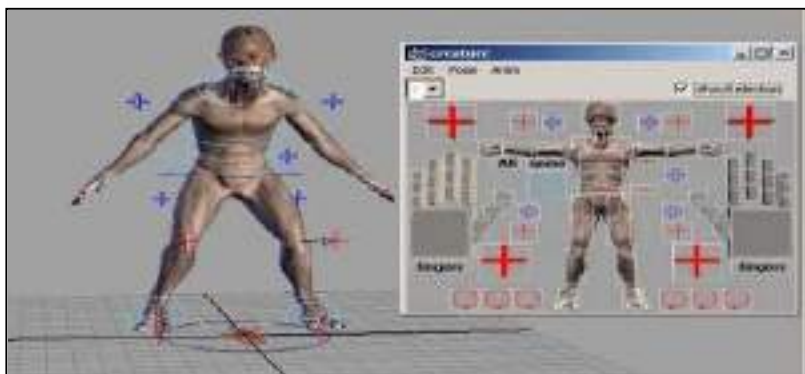
Lighting

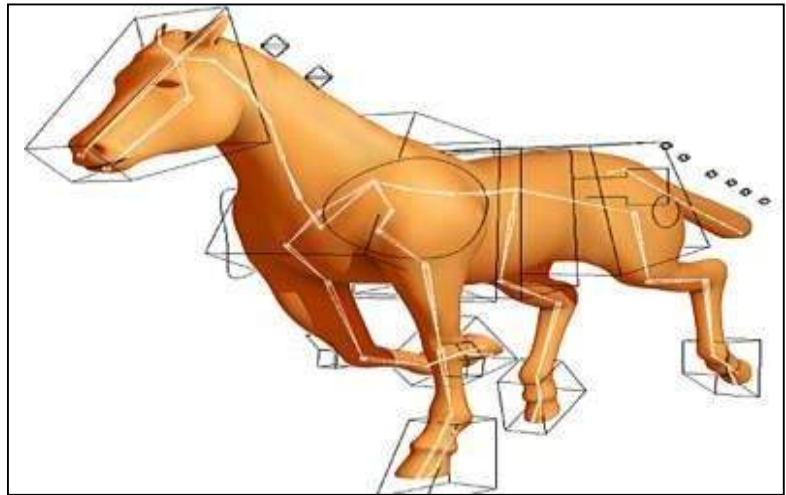
Not only does a Lighting Artist have to think lighting the individual scenes, they also have to consider how to bring together all of the elements that have been created by the other departments. In most companies, lighting TDs combine the latest version of the animation, the effects, the camera moves, the shades and textures into the final scenes, and render out an updated version everyday.

Lighters have a broad range of responsibilities, including placing lights, defining light properties, defining how light interacts with different types of materials, the qualities and complexities of the realistic textures involved, how the position and intensity of lights affect mood and believability, as well as color theory and harmony. They are required to establish direct and reflected lighting and shadows for each assigned shot, ensuring that each shot fits within the continuity of a sequence, all the while aiming to fulfil the vision of the Directors, Production Designers, Art Directors and VFX Supervisors.

Rigging

Rigging is the process of adding bones to a character or defining the movement of a mechanical object, and it's central to the animation process. A character TD will make test animations showing how a creature or character appears when deformed into different poses, and based on the results corrective adjustments are often made. The rigging department is also involved in developing cloth simulation - so as well as making a character able to clench their fist or rotate their arm, the rigging and cloth department is responsible for making their costume move in a believable manner. Planning a character's performance frame by frame uses the same basic principles first developed for 2D animation.



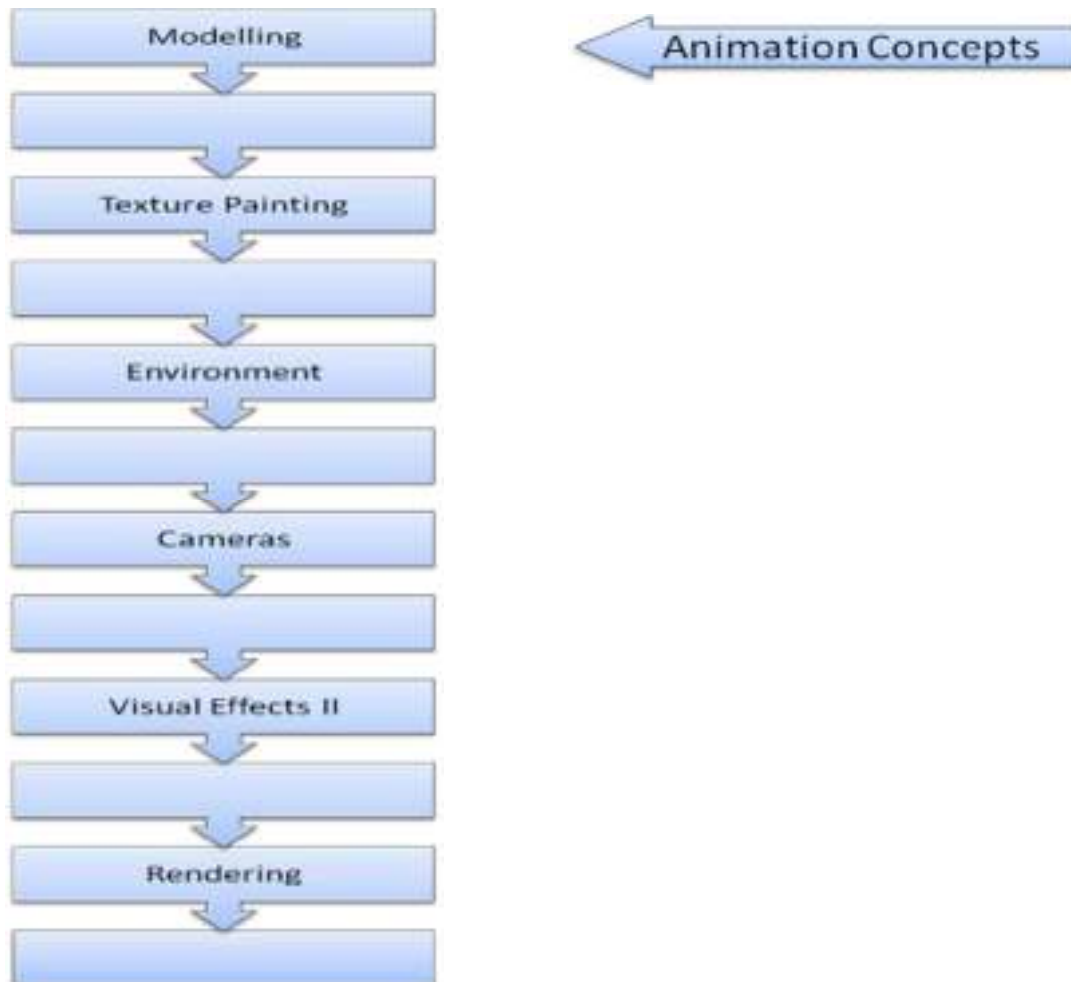


In modern production companies, the practice of meticulously planning a character's performance frame by frame is applied in 3D graphics using the same basic principles and aesthetic judgments that were first developed for 2D and stop-motion animation. If motion capture is used at the studio to digitize the motion of real actors, then a great deal of an animator's time will also be spent cleaning up the motion captured performance and completing the portions of the motion (such as the eyes and hands) that may not have been digitized during the process.

The effects team also produce elements such as smoke, dust, water, and explosions, although development on these aspects does not start until the final animation/lighting has been approved as they are integral to the final shot and often computationally heavy.

Exercise

1. Observe 20 different images of 3D lighting, rigged character and animation scenes, given by the instructor. List your observations, with rationale, for each image.
2. Fill in the blanks in the flow chart shown for 3D Animation



Assessment

Answer the following questions:

1. What is 3D lighting?

2. What is the use of rigging in production pipeline?

3. What is 3D animation?

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

Differentiated between the following:

- 1. Lighting, rigging and animation
- 2. 3D Lighting and 3D animation

Part B

Discussed in class the following:

- 1. How lighting is done in an animated movie?
- 2. How rigging is done to animate a character?

Part C

Performance standards

The performance Standard may include, but not limited to:

Performance Standards	Yes	No
Explain the relation between the various departments of production pipeline		
Demonstrate the knowledge of lighting, rigging and animation		

Session 4: Post-Production

In this session, you will learn how to perform post-production activities and prepare a flow chart of post production activities and required materials/ equipments.

Relevant Knowledge

Post-production is the third and final step in film creation and it refers to the tasks that must be completed or executed after the filming or shooting ends. It involves **exporting** or **rendering** out the animation frames and then editing the pieces of animation together using video editing software. It includes the editing of raw footage to cut scenes together, inserting transitional effects, working with voice and sound actors and dubbing to name just a few of the many post-production tasks.

The three main phases of post-production are rendering, compositing, sound editing, and video editing.

Rendering

The rendering stage is usually associated with computer-generated animation, although **rendering** can also refer to the process of creating final animation frames in traditional hand-drawn animation. Rendering is used in both **2D** and **3D** computer animation. It is the process of getting the final assembled animation scenes or pieces out of the computer in the format of a sequence of individual frames. The aim of rendering is to generate a series of individual pixel based frames or a videoclip.

Compositing

The Compositing Department brings together all of the 3D elements produced by the previous departments in the pipeline, to create the final rendered image ready for film. After the animation has been rendered it may be necessary to add some special effects or to combine separate rendered elements together into one final animated sequence. This process is known as **Compositing**. **Compositors** are responsible for constructing the final image by combining layers of previously-created material. They receive material from various sources including rendered computer animation, special effects, graphics, 2D animation, live action and static background plates. The compositor's job is to assemble the different characters and backgrounds into single frames and sequences and so is often the first to begin to see the animation as intended for the final audience. The compositing stage also allows for the addition of other elements such as special effects which have been created using other equipment and processes.

General compositing tasks include rendering the different passes delivered by a lighting department to form the final shot, paint fixes and rotoscoping (although compositors sometimes rely on mattes created by a dedicated rotoscoping department), as well as the compositing of final elements and general colourgrading.

Editing

The editing stage of post-production involves putting the rendered pieces of our animation together in the correct order of events. In this modern digital age this means the use of digital non-linear video editing software which allows a great deal of flexibility in the editing process. In the past the editing process would have involved the use of video-tape or film based methods which were considerably more time-intensive and less flexible.

Digital editing offers the benefit of being able to work in a completely digital environment regardless of the final output format. One benefit of digital editing is that it is achievable using any latest desktop computer.

Editing is a crucial step in making sure the video flows in a way which achieves the initial goal. Video editing is the process of manipulating and rearranging shots to create a seamless final product, and it is at this stage that any unwanted footage and scenes are removed. Other tasks include titling and adding any effects to the final video and text.

Post-production sound editing primarily involves preparing the sound track for import into the video editing software, this may involve adjustments to the sequence or occurrence of particular sounds due to changes made in the editing stage. Editing the Sound track can be a separate process to editing the video track, although these are combined together within the video editing software. The sound track at this stage is already assembled in a fairly complete form having been created in the Production stage. Many sound changes may take place simply within the Video Editing software itself and may not require much, if any, changes to be made within the Sound Editing software. Editing Assistants support the Editor and editing department in editing process. They make viewing copies on different formats for various departments, clients and composers. They handle the housekeeping tasks for the editing department, keeping it stocked with relevant materials, ensuring that all equipment is in good working order and placing orders with outside suppliers.

Sound and Music Score

The sound and music score or soundtrack, is an important part of the animation production process. The use of audio, such as music, sound effects and vocal dialogue all play a big part in telling the story. Altering the type of sound used, particularly the choice of music or background ambience will have an effect on the mood of an animation. The editing department is responsible for selecting and assembling the sound recordings in preparation for the final sound mix, ensuring lip sync and adding all of the sound effects required for the final film.

Titles and Credits

Titles and Credits are an important part of a finished animation. It helps in people know who made it, when it was made, who funded the project and so on. This may involve adding text or subtitles at various points if appropriate.

Exercise

1. Observe 20 different images of before and after composited and edited scenes, given by the instructor. List your observations, with rationale, for each image.

Assessment

Answer the following questions:

1. What is Post-production?

2. What is compositing?

3. What is editing?

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

Differentiated between the following:

1. Sound editing and video editing

Part B

Discussed in class the following:

1. What is the purpose ofcompositing?
2. Why video and sound editing is required to make amovie?

Part C

Performance standards

The performance Standard may include, but not limited to:

Performance standards	Yes	No
Demonstrate the knowledge of post-production procedure		
Demonstrate knowledge of compositing, sound and video editing		

Glossary

1. **Angle of View** -The viewable field covered by a lens, measured in degrees.
2. **Animatics** - A preliminary version of a television commercial in which animated cutout figures are used instead of live participants and real objects.
3. **Animation** -The process of creating a progressively altering image that gives the appearance of continuous motion.
4. **Compositing** -The process of combining multiple elements shot separately (still images, movie clips) into a final image or sequence to give the impression they were all shot at the same time.
5. **Effects animation** -The animation of non-character elements such as explosions, smoke and rain.
6. **High definition (HD)** -A general term for a video signal with a significantly higher resolution than standard definition.
7. **Layout**- The art or process of arranging printed or graphic matter on a page.
8. **Model sheets** - Model sheets are also used for references in 3D modelling. It usually is used as reference material so as to allow proper proportions in 3D modelling.
9. **Story Boarding** - A panel or series of panels of rough sketches outlining the scene sequence and major changes of action or plot in a production to be shot on film or video.

Suggested Reading

Books

1. Inspired 3D Short Film Production by Jeremy Cantor, Pepe Valencia
2. Production Pipeline Fundamentals for Film and Games by Renee Dunlop
3. Guide to Postproduction for TV and Film: Managing the Process by Barbara Clark, Susan Spohr
4. The Art and Science of Digital Compositing, Second Edition: Techniques for Visual Effects, Animation and Motion Graphics (The Morgan Kaufmann Series in Computer Graphics) by Ron Brinkmann
5. Digital Compositing for Film and Video by Steve Wright
6. The Technique of Film and Video Editing: History, Theory, and Practice by Ken Dancyger

Websites

1. <http://www.wideopensepace.co.uk/animation-tutorial/s6-how-to-guide.html>
2. <http://cgi.tutsplus.com/articles/step-by-step-how-to-make-an-animated-movie--cg-3257>
3. http://www.cs.dartmouth.edu/~fabio/teaching/projects10/lectures/01_pipeline.pdf
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6. <http://www.awn.com/>
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9. <http://blog.digitaltutors.com/understanding-a-3d-production-pipeline-learning-the-basics/>
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12. <http://en.wikipedia.org/wiki/Post-production>
13. <http://www.raindance.org/the-13-steps-of-post-production/>
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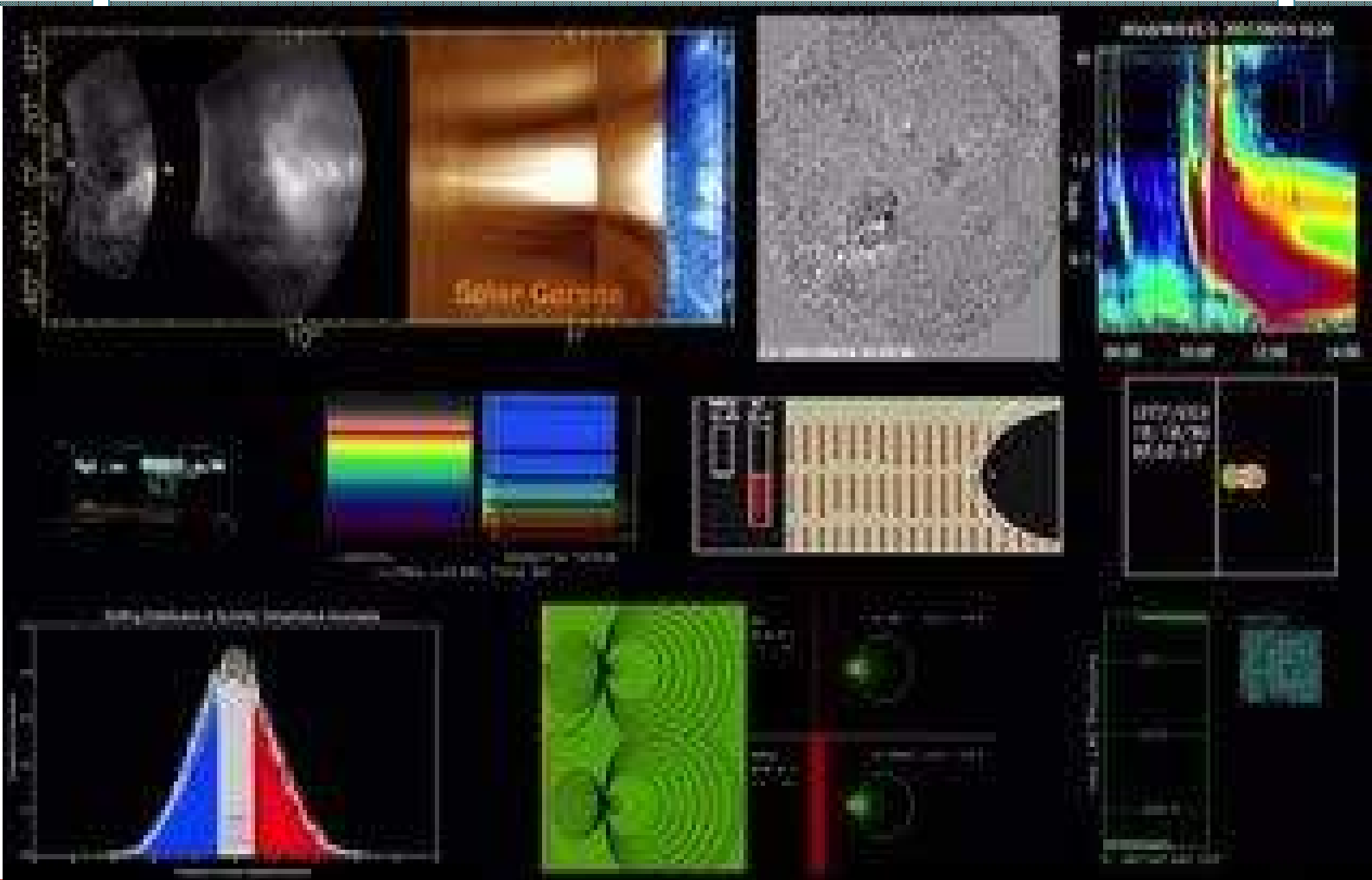
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SECTOR: MEDIA & ENTERTAINMENT

NSQF Level 4 (CLASS XII)

Student Workbook



PSS Central Institute of Vocational Education, Bhopal
(a constituent unit of NCERT, under Ministry of Human Resource Development,
Government of India)

UNIT 2:
Basics of Video and Sound Editing
Student Workbook
(Class 12; NSQF Level 4)

Course: Media and Entertainment
(Job Role: Animator, QP Ref. Id.: MES/Q0701)

Dr. Vinay Swarup Mehrotra
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PREFACE

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Preface

The National Curriculum Framework, 2005, recommends that children's life at school must be linked to their life outside the school. This principle makes a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home, community, and the workplace.

The student workbook is a part of the qualification package developed for the implementation of National Vocational Education Qualification Framework (NVEQF), an initiative of Ministry of Human Resource Development (MHRD), Government of India to set common principles and guidelines for a nationally recognized qualification system covering Schools, Vocational Education and Training Institutions, Technical Education Institutions, Colleges and Universities. The NVEQF was subsumed in National Skills Qualifications Framework (NSQF) in 2013. It is envisaged that the NSQF will promote transparency of qualifications, cross-sectoral learning, and student-centred learning and facilitate learner's mobility between different qualifications, thus encouraging lifelong learning.

This student workbook, which forms a part of vocational qualification package for students who have passed Class IX or equivalent examination, was created by a group of experts. The Media and Entertainment Sector Skill Council approved by the National Skill Development Corporation (NSDC) for the Media and Entertainment Industry developed the National Occupational Standards (NOS) and the Qualification Pack (QP) for the job role. The National Occupational Standards are a set of competency standards and guidelines endorsed by the representatives of Media & Entertainment Industry for recognizing and assessing skills and knowledge needed to perform effectively in the workplace.

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), a constituent of National Council of Educational Research and Training (NCERT) has developed modular curricula and learning materials (Units) for the vocational qualification package in Media and Entertainment sector for NSQF levels 1 to 4; level 1 is equivalent to Class IX. Based on NOS, occupation related core competencies (knowledge, skills, and abilities) were identified for development of curricula and learning modules (Units).

This student workbook attempts to discourage rote learning and to bring about necessary flexibility in offering of courses, necessary for breaking the sharp boundaries between different subject areas. The workbook attempts to enhance these endeavours by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups and activities requiring hands-on- experience. We hope these measures will take us significantly further in the direction of a child- centred system of education outlined in the National Policy of Education (1986).

The success of this effort depends on the steps that school Principals and Teachers will take to encourage children to reflect their own learning and to pursue imaginative and on-the-job activities and questions. Participation of learners in skill development exercises and inculcation of values and creativity is possible if we involve children as participants in learning, and not as receiver of information. These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table would be a necessity to maintain the rigor in implementing the activities and the required number of teaching days will have to be increased for teaching and training.

Acknowledgements

We acknowledge the contributions of the following persons in development and review of the content of the student workbooks:

- Professor R. B. Shivagunde, Joint Director, PSS Central Institute of Vocational Education (PSSCIVE), Bhopal for guidance.
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About Your Workbook

The student workbook contains sessions which will help you to acquire relevant knowledge and skills (generic and domain-specific skills) related to the job role. Each session is small enough to be easily tackled and digested by you before you move on to the next session. Animated pictures and photographs have been included to bring about visual appeal and to make the text lively and interactive for you. You can also try to create your own illustrations using your imagination or taking the help of your teacher.

Let us now see what the sections in the sessions have for you.

Section 1: Introduction

This section introduces you to the topic of the Unit. It also tells you what you will learn through the various sessions covered in the Unit.

Section 2: Relevant Knowledge

This section provides you with the relevant information on the topic(s) covered in the session. The knowledge developed through this section will enable you to perform certain activities. You should read through the information to develop an understanding on the various aspects of the topic before you complete the exercise(s).

Section 3: Exercise

Each session has exercises, which you should complete on time. You will perform the activities in the classroom, at home or at the workplace. The activities included in this section will help you to develop necessary knowledge, skills and attitude that you need for becoming competent in performing the tasks at workplace. The activities should be done under the supervision of your teacher or trainer who will guide you in completing the tasks and also provide feedback to you for improving your performance.

Section 4: Assessment

The review questions included in this section will help you to check your progress. You must be able to answer all the questions before you proceed to the next session.

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SECTOR: MEDIA & ENTERTAINMENT

NSQF Level 4 (CLASS XII)

UNIT 2:

Basics of Video and Sound Editing

Student Workbook

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INTRODUCTION

SESSION 1: INTRODUCTION TO ADOBE PREMIERE PRO

SESSION 2: EDITING VIDEO

SESSION 3: INTRODUCTION TO ADOBE SOUND BOOTH

SESSION 4: EDITING SOUND

Introduction

Like any other skill, editing has some basic rules that help us to understand what the filmmaker and editor wants to say. Take some time to study films and TV so you can learn these. What you add to the image and sound after it is filmed can hugely influence a film. You must have noticed in movies that tension is indicated by music and close up shots on actors. Different camera angles break the scene down and make it interesting by leading the viewer's eye to what is important. The way you cut between these, i.e. fast or slow, is also telling the audience more information about the story. The editors can alter everything about the film with their skills.

Understanding modern techniques of editing is the key to the success of the film, if your audience is to follow what you mean with your edits. Watch lots of movies and examine how cuts are made. How do scenes end, what does a cut to black signify or a slow dissolve mean? Editing styles can alter the feel of your film. Short snappy cuts give the film a tense, fast pace. Long gaps between cuts allow time for the audience to relax into the scenes. Clever editing can create illusions; just the sound of a helicopter creates the illusion that there really is a helicopter just out of shot. Editing can also help smooth over problems, you can edit around a difficult interview by cutting out bits. If you need to show more than one aspect of a scene, you can film the scene several times from different angles and in the edit cut between those angles.

Montage is the principle underlying all editing. The audience is trying to interpret your film as they watch, create meanings from the images and sounds you play them. If for example, you put together a politician's speech without sound, followed by images of war, then the politician is assumed to be talking about war. Montage creates a new meaning from two independent images. Similarly you can lead the audience this way, show separate images of two people walking down a street and the audience will assume the two will eventually meet.

In this Unit, you will learn about the working procedure of a video editing software known as Adobe Premiere Pro and a sound editing software known as Adobe Sound Booth.

Session 1: Introduction to Adobe PremierePro

In this session you will learn about the use of tool box of Adobe Premiere Pro.

Relevant Knowledge

Adobe Premiere Pro is a video editing software that can capture, edit, perform special effects, add graphics and titles, all the way to final production. Using the Adobe Premier Pro you will learn a series of steps for creating, editing and fine-tuning various video pieces.

About Workspaces

When you work with Adobe Premier Pro, it presents a virtual workspace on the screen. You can move windows around, close some items and open others.

To begin, start by launching Adobe Premier Pro, Click Start All Programs → Adobe Premier Pro, then click on the New Project.

Adobe video and audio applications provide a consistent, customizable workspace. Although each application has its own set of panels (such as Tools, Properties, Timeline, and so on), you move and group panels in the same way across products.

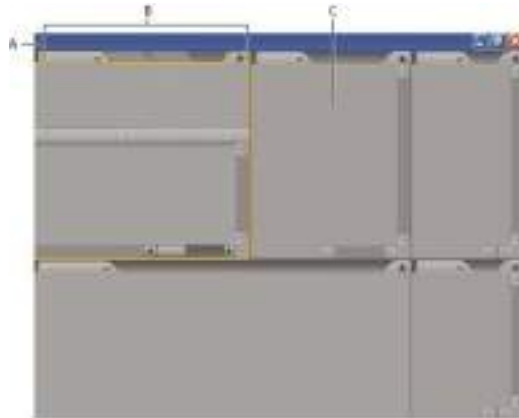
The main window of a program is the application window. Panels are organized in this window in an arrangement called a workspace. The default workspace contains groups of panels as well as panels that stand alone.

You customize a workspace by arranging panels in the layout that best suits your working style. You can create and save several custom workspaces for different tasks—for example, one for editing and one for previewing.

You can drag panels to new locations, move panels into or out of a group, place panels alongside each other, and undock a panel so that it floats in a new window above the application window. As you rearrange panels, the other panels resize automatically to fit the window.

You can use floating windows to create a workspace more like those in previous versions of Adobe applications, or to place panels on multiple monitors.

Example of Workspace



A. Applicationwindow

B. Grouped panels

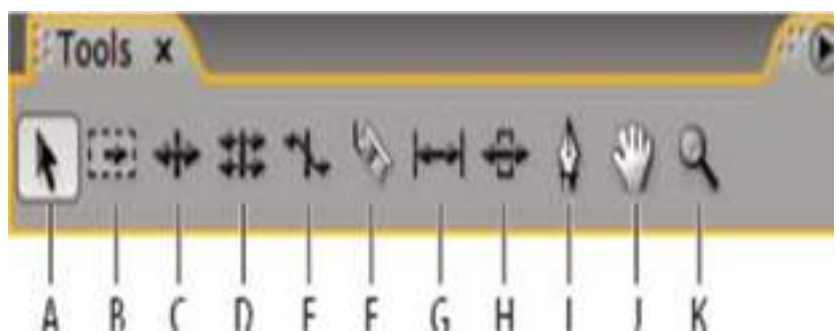
C. Individual panel

Tools

The Tools panel contains a number of tools for editing sequences in the Timeline panel. When you select a tool, the pointer changes shape according to the selection. For example, when you select the **Razor** tool and position the pointer over a clip in the Timeline panel, the icon changes to a razor. However, the Selection tool icon may change to reflect the task currently being performed. In some cases, pressing a **modifier key** (such as Shift) as you use a tool changes its function, and its icon changes accordingly. Select tools from the Tools panel, or use a keyboard shortcut. You can resize the Tools panel and orient it vertically or horizontally.

Note: The Selection tool is the default tool. It is used for everything other than specialized functions. If the programme is not responding as you expect, make sure that the Selection tool is selected.

Toolbox



A. Selectiontool

B. Track Selection tool

C. Ripple Edit tool

D. Rolling Edit tool

E. Rate Stretch tool

F. Razor tool

G. Slip tool

H. Slide tool

I. Pen tool

J. Hand tool

K. Zoom tool

About Projects

Every project includes a Project panel. This acts as a storage area for all files used in the project. You can organize a project's media and sequences using bins in the Project panel.

Within a single project file, you can edit individual segments as separate sequences, and then combine the segments into a finished programme by nesting them in a longer sequence. Similarly, you can store multiple variations of a sequence in the same project.

Note: There's no need to save copies of a project when creating different segments or versions of the same video programme. Simply create new or duplicate sequences within a single project file.

Adobe Premiere Pro does not store video, audio, or still image files in the project file—it stores only a reference to each of these files based on its filename and location at the time you imported it. If you later move, rename, or delete a source file, Adobe Premiere Pro cannot find it automatically the next time you open the project. In this case, Adobe Premiere Pro displays the Where Is The File dialog box.

Create a Project

In most cases, you can start a project simply by using one of the presets provided in the New Project dialog box. The presets included with Adobe Premiere Pro include common project types. Preserve editing quality by using a preset that conforms to the specifications of your original assets. For example, if your project uses footage mostly in DV format, use a DV preset. If you need to specify lower quality settings for output (such as streaming web video), do not change your project settings—instead, change your export settings later.

If your computer has a capture card compatible with Adobe

Premiere Pro, its own optimized presets may appear in the available Presets list.

The project settings must be correct when you create the project file. Once a project is created, some project settings, such as the time base settings, are locked. This prevents unwanted inconsistencies that could result from changing project settings later.

Either choose New Project on the Welcome screen that appears when Adobe Premiere Pro starts up or, after the application is open, choose File > New > Project.

Do one of the following:

To apply a preset, select it from the Available Presets list.

To customize settings, choose the preset that most closely matches your source footage, click Custom Settings, and then select your specific project settings. For Location, specify where you want to store the project on disk.

Type the name of the project, and then click OK.

Note: Whenever possible, specify a location and name that you will not have to change later. By default, Adobe Premiere Pro stores rendered previews, conformed audio files, and captured audio and video in the folder where you store the project. Moving a project file later may require moving its associated files as well.

Exercise

Open the interface of Adobe Premiere and try to understand the workspace. Practice use of tools on saved projects. Write a report on your understanding of the features.

Assessment

I. Short answer questions

1. What is Workspace?

2. Name the editing Tools of Adobe PremierPro

3. Describe the procedure for creating a project in Adobe PremierPro

II. Fill in the blanks

1. Montage is the principle underlying all _____, as it creates a new meaning from two independent images.
2. Adobe video and audio applications provide a consistent, customizable _____.
3. The default workspace in Adobe Premier Pro contains groups of panels as well as panels that _____ alone.
4. You customize a workspace by arranging _____ in the layout that best suits your working style.
5. You can _____ panels to new locations, move panels into or out of a group, place panels alongside each other, and undock a panel so that it floats in a new window above the application window.
6. The _____ panel contains a number of tools for _____ sequences.
7. Every project in Adobe Premier Pro includes a _____ panel. This acts as a storage area for all files used in the project.
8. Adobe Premiere Pro does not _____ video, audio, or still image files in the project file—it stores only a reference to each of these files based on its filename and location at the time you imported it.

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the following:

1. Grouped panels and Individual panel
2. Different tools of Adobe Premier Pro

Part B

Discussed in class thefollowing:

- 1. Workspace
- 2. Creating a project on Adobe PremierPro

Part C

Performance Standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Demonstrated the knowledge of using workspace on Adobe Premier Pro		
Demonstrated the knowledge of the various tools in the Tool Box of Adobe Premier Pro		
Created a project in Adobe Premier Pro		

Session 2: Editing Video

In this session, you will learn about how to edit the video.

Relevant Knowledge

Editing Workflow

You create your project in Adobe Premiere Pro by assembling clips into a sequence. The workflow you choose depends on your preferences and the needs of your project. Here is a common editing workflow:

1. View and trim source clips in the Source Monitor

Use the Source Monitor to view clips that you have captured and added to your project. As you view the clips, you can set In and Out points for the portion of each clip that you want to use in the sequence.

2. Assemble clips into a sequence

Drag each clip individually to the Timeline panel, or automatically assemble clips selected in the Project panel. As you add individual clips, you can decide whether to add video, audio, or both to your sequence.

3. Retrim clips in a sequence

If you did not set precise In and Out points for a clip, or you decide to change them, you can retrim the clips in a Sequence tab of the Timeline panel.

4. Adjust clip attributes if necessary

As you assemble your sequence, you may want to change the duration or the speed at which the clip plays.

5. Rearrange clips

After clips are placed in the Timeline panel, you can rearrange how they appear in the sequence. You might need to split a clip to use different effects, or extract or move a clip and close any resulting gaps in the sequence.

Source Clips, Clip Instances, and Sub clips

You can use clips as source clips, clip instances, sub-clips, or duplicate clips. You can edit all types of clips in sequences in the same way. The clip types differ in the following ways:

Source (master) clip: The clip is originally imported into the Project panel. It is listed in the Project panel only once by default. If you delete a source clip from the Project panel, all of its instances are also deleted.

Clip Instance: It is a dependent reference to a source clip, used in a sequence. Each time you add a clip to a sequence, you create another instance of the clip. A clip instance uses the name and

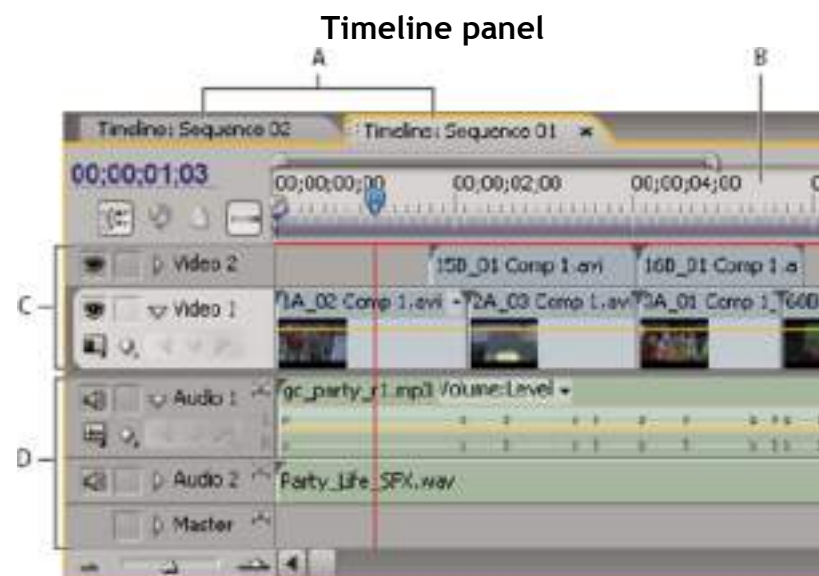
source file reference used by its source clip. While clip instances are not listed in the Project panel, they are differentiated in the Source Monitor menu if you open instances there. The Source Monitor menu lists instances by name, sequence name, and In point.

Subclip: A section of a master clip that references the master clip's media file. Use subclips to organize and manage your projects, especially when you need to use only sections of long master clips.

Duplicate clip: An independent copy of a source clip, which you create manually using the Edit > Duplicate command. You can also create a duplicate clip by importing the same file more than once. Unlike a clip instance, a duplicate clip maintains its own reference to the original clip's source file on disk and exists as an additional clip in the Project panel. A duplicate clip is not deleted when you delete its original from the Project panel. Master and duplicate clips can be renamed independently.

Timeline Panel Overview

You assemble and rearrange sequences in the Timeline panel, which represents a sequence graphically, showing clips, transitions, and effects. A sequence can consist of multiple video and audio tracks running parallel in the Timeline panel.



A. Sequencetabs

B. Timeruler

C. Videotracks

D. Audiotracks

Each sequence in a project can appear as a tab in a single Timeline panel, or in a separate Timeline panel. A sequence must contain at least one video track and one audio track. Multiple

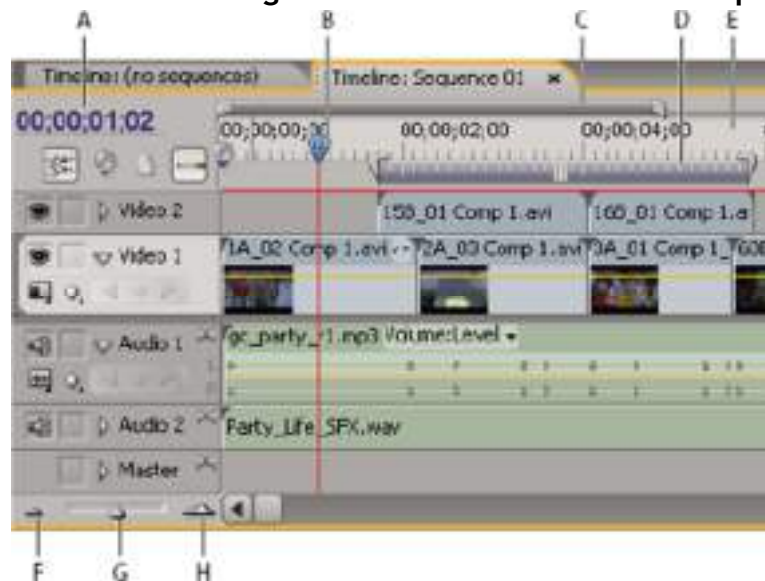
video tracks are used to superimpose clips.

Sequences with audio tracks must also contain a master audio track, where the output of regular audio tracks is directed for mixing. Multiple audio tracks are used to mix audio. You can specify the type of audio channels supported by each audio track and decide how they are sent to a Master audio track. To achieve even greater control over the mixing process, you can create submix tracks.

Navigate in the Timeline Panel

The Timeline panel contains several controls for moving through the frames of a sequence.

Time navigation controls in the Timeline panel



- A. Current-time display
- B. Current-time indicator
- C. Viewing area bar
- D. Work area bar
- E. Time ruler
- F. Zoom out
- G. Zoom slider
- H. Zoom in

Time ruler measures sequence time horizontally, using the counting method specified in the project settings (although you may toggle to a counting method based on audio samples). Tick marks and numbers indicating the sequence time are displayed along the ruler and change according to the level of detail at which you view the sequence. The time ruler also displays icons for markers and the sequence In and Outpoints.

Current-time indicator (CTI) Indicates the current frame displayed in the Program Monitor. The current frame displays in the Program Monitor. The current-time indicator is a light blue triangle in the ruler. A vertical line extends from the current-time indicator to the bottom of the time ruler. You can change the current time by dragging the current-time indicator.

Current time display Shows the time code for the current frame in the Timeline panel. To move to a different time, click in the time display and enter a new time, or place the pointer over the display and drag left or right. You can change the display between time code and the simple frame count by Ctrl-clicking (Windows) or Command-clicking (Mac OS) the current time in either a monitor or the Timeline panel.

Viewing area bar Corresponds to the visible part of the sequence in the Timeline panel. You can change the size and position of the viewing area bar to quickly view different parts of the sequence. The viewing area bar is located just above the time ruler.

Work area bar Specifies the area of the sequence that you want to preview or export. The work area bar is located in the lower portion of the time ruler.

Zoom controls Change the scale of the time ruler to increase or decrease the number of frames visible within the current viewing area. The zoom controls are located at the bottom left of the Timeline panel.

Work with Tracks

The video and audio tracks in the Timeline panel are where you arrange clips, edit them, and add special effects. You can add or remove tracks as needed, rename them, and determine which can be affected by a procedure.

Add Tracks

New video tracks appear above existing video tracks, and new audio tracks appear below existing audio tracks. Deleting a track removes all clips in the track but does not affect source clips listed in the Project panel.

Note: You can add any number of tracks, limited only by your system's resources.

With the Timeline panel active, choose **Sequence > Add Tracks**.

In the Add Tracks dialog box, do any of the following:

To add tracks, type the number of tracks you want to add in the Add field for video, audio, and audio submix tracks.

To specify the placement of added tracks, choose an option from

the Placement menu for each type of track added.

To specify the type of audio track you want to add, choose an option from the Track Type menu for audio and audio submix tracks.

Click OK.

Note: An audio track can accept only audio clips that use the matching channel type—mono, stereo, or 5.1. If you are not sure what kind of audio your clips use, select the clip in the Project panel and read its information in the preview area.

Exercise

1. Import a video in Adobe Premiere Pro and edit it using tools, effects and transitions. Write down the steps followed.

Assessment

Fill in the blanks

1. You use the Source _____ to view clips that you have captured and added to your project.
2. After clips are placed in the _____ panel, you can rearrange how they appear in the sequence.
3. Clip _____ is an independent reference to a source clip, used in a sequence. Each time you add a clip to a sequence, you create another instance of the clip.
4. Sub-clip is a section of a _____ clip that references the master clip's media file.
5. _____ clip is an independent copy of a source clip, which you create manually using the Edit > Duplicate command.
6. A duplicate clip is not deleted when you delete its original from the _____ panel.
7. Master and duplicate clips can be _____ independently.
8. Each sequence in a project can appear as a _____ in a single Timeline panel, or in a separate Timeline panel.
9. A sequence must contain at least one _____ track and one audio track.
10. Multiple _____ tracks are used to superimpose clips.
11. Time ruler measures sequence _____ horizontally, using the counting method specified in the project settings.
12. -time indicator (CTI) Indicates the current frame displayed in the Program Monitor.
13. The video and audio tracks in the _____ panel are where you arrange clips, edit them, and add special effects.

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the following

Source Clips, Clip Instances, and Sub clips

Part B

Discussed in the class the following:

1. Editing Workflow
2. Timeline panel
3. How to work with tracks?

Part C

Performance Standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Edited a video using common Editing Workflow in Adobe Premiere Pro		
Listed the functions of Timeline panel in Adobe Premiere Pro		
Demonstrated the application of Timeline panel in Adobe Premiere Pro		

Session 3: Introduction to Adobe SoundBooth

In this session you will learn about the various features and applications of Adobe Sound Booth for editing sound.

Relevant Knowledge

Adobe SoundBooth

Before opening Adobe Sound Booth, make sure that all of your files are organized. First, create a folder in which to save your sound (.wav) files as well as your Adobe Sound Booth project file. This is your –project folder. Always keep a Sound Booth project file and its associated .wav files in the same project folder. The project folder IS your project. If parts of your project should happen to get lost (.wav files, for example) your Adobe Sound Booth file may not work.

Using the Workspace

Start Adobe Sound Booth. Unless you modified the workspace, the application should automatically open in the Default workspace. The upper-left corner of the default workspace contains the Tools panel. The Tools panel contains the most frequently used tools in Sound booth: the Time Selection tool, the Frequency Selection tool, the Marquee tool, the Lasso tool, the Hand tool and the Zoom tool (see Figure 1).



Figure 1: Tools Panel

In the upper-right corner of the interface is a Workspace pop-up menu. This menu contains the Default workspace, along with two other preset workspaces, Edit Audio To Video and Edit Score To Video. Choosing one of these different workspaces changes the panel arrangement to suit that particular task. Choose Edit Audio To Video to see how the panels are arranged in this workspace.

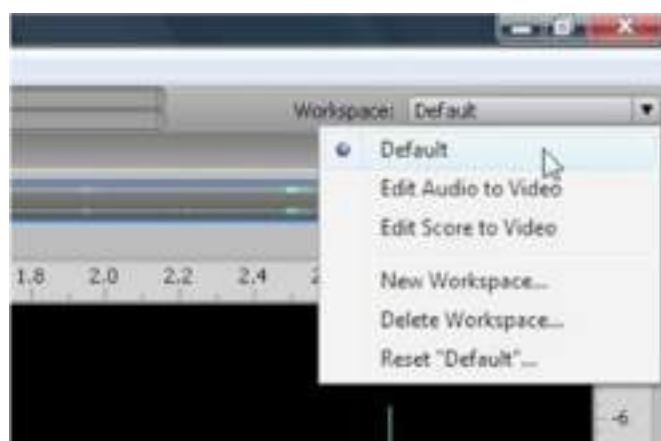


Figure 2: Workspace Menu

The Workspace menu contains options for creating new workspaces as well as deleting workspaces. To customize your workspace, you usually start by moving panels. To move a panel, click the panel's tab and drag the panel to a different location. As you move the panel, purple areas called *drop zones* appear where you can drop the panel and snap it into the interface.

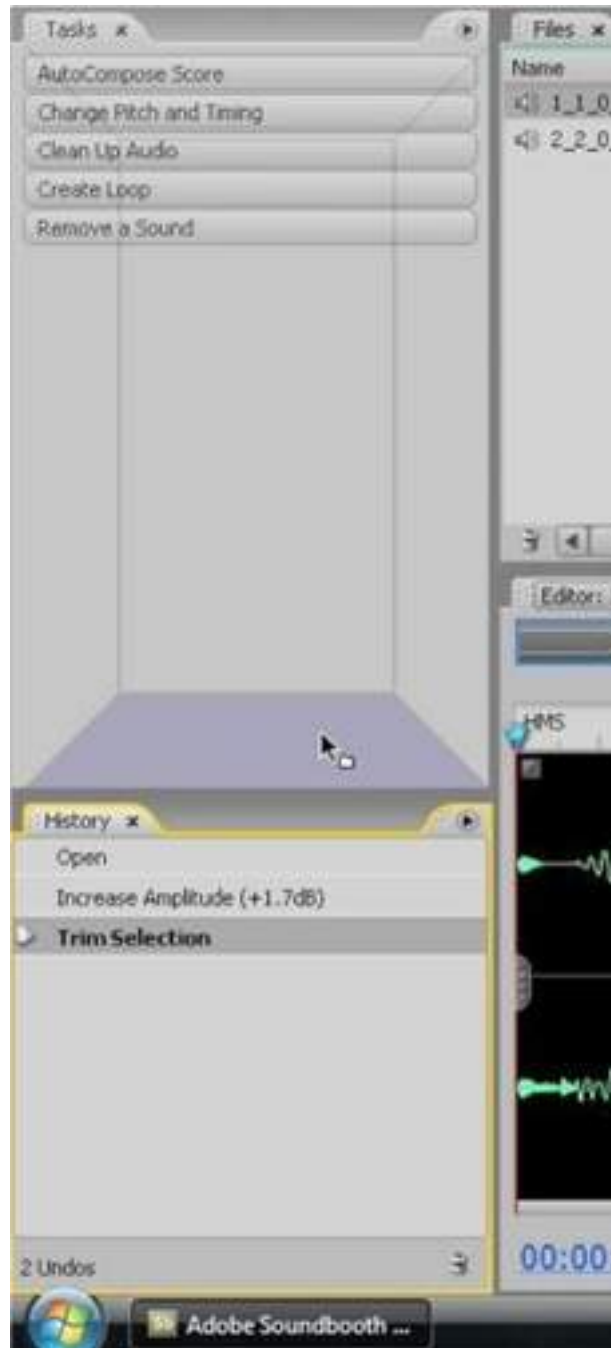


Figure 3: Move the History panel into the Tasks panel and drop zones appear where the panel will be placed after you release your mouse.

When you are satisfied with the workspace, choose **New Workspace** from the **Workspace** pop-up menu. Type a name for

your workspace in the New Workspace dialog box and click OK. Your custom workspace then appears in the Workspace pop-up menu.

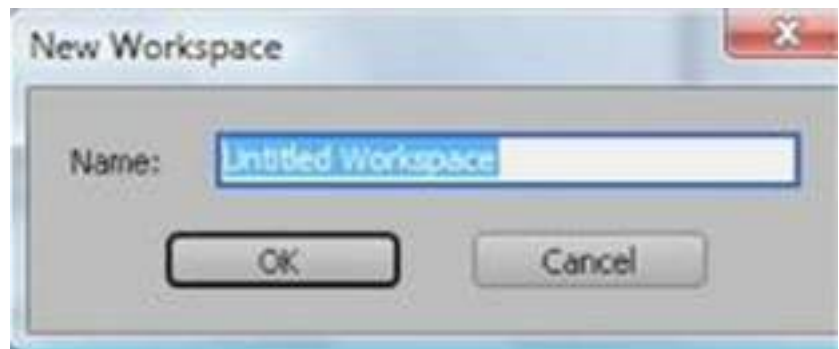


Figure 4: The New Workspace Dialog Box.

Switch back to the default workspace by choosing Default from the Workspacemenu.

Choose File > Open and open 1_1_0_Part2_I_2.wav. Open files appear in the Files panel. The Files panel is located in the upper-left corner of the default workspace. The waveform of the file also appears in the Editor panel in the middle of the workspace.

Choose File > Open and open 2_2_0_End_e_4.wav. When you have two files open, you can switch between them by double-clicking the file name in the Files panel or choosing the file name from the pop-up menu at the top of the Editor panel. Display the new file by double-clicking the name in the Files panel.



Figure 5: Files Panel

Below the Files panel is a group of three panels: Task, Effects, and Markers. The Tasks panel contains frequently used tasks, such as Auto Compose Score and Change Pitch, and Timing. Choose Remove A Sound to see the task's menu. Notice that the Editor panel switches from the default waveform view to spectral

display of the audio track, which makes it easier to remove specific frequencies from the sound. You can reopen the waveform view by clicking and dragging the split bar downward.



Figure 6: The Remove A Sound task opens the spectral display in the Editor panel.

The Effects panel is the next panel in the group. When you add effects, you are essentially creating a set of effects that are listed in this panel.

The Markers panel allows you to add markers (known in Adobe Flash as cue points) at any point in your sound file. This is particularly useful when you are exporting to Flash Video, because this panel lets you embed event and navigation markers that can be read in Flash.

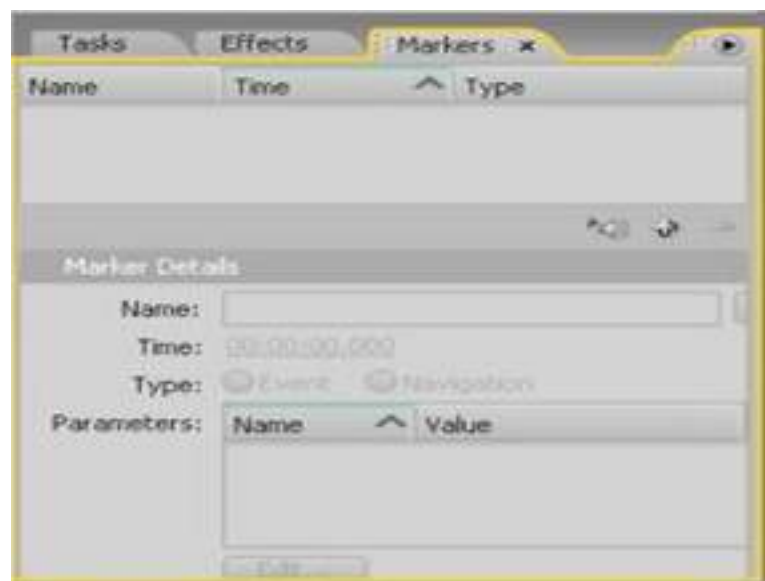


Figure 7: The Markers panel

Below the Tasks, Effects, and Markers panel group is the History panel. The History panel is similar to the History panels found in other Adobe applications. It contains a list of all of the actions performed since the file was opened. Click on an action to return the file to that state. Press Delete to delete a selected action.

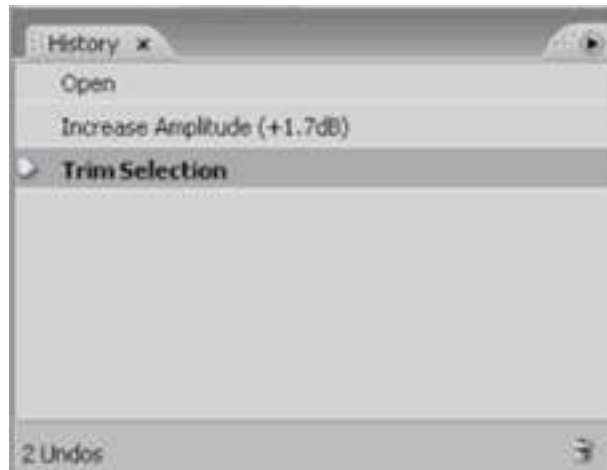


Figure 8: The History panel

The main panel in the workspace is called the Editor panel. You can switch between any of the sound files you have opened by choosing the file from the pop-up menu in the upper-left corner of the panel. The zoom navigator, is located directly below the pop-up menu and provides a view of the entire waveform. You can use the main Editor window to zoom in on just a range of the waveform in greater detail. To zoom in or out, press the + (plus) or - (minus) keys. To return to 100% view, click the Zoom OutFull button to the right of the zoomnavigator.



Figure 9: Zoom in on a portion of the audio track using the + and - keys

Click and drag over a portion of the waveform. Notice that a menu pops up allowing you to increase or decrease the volume of the range. Click and drag the underlined number to the right or left to increase or decrease this setting. Click anywhere in the Editor panel to deselect the range.



Figure 10: Increase or decrease the amplitude of a range by using the volume pop-up menu.

The Set Fade In <<icon> and Set Fade Out buttons in the upper left and right corners of the Editor window allow you to set up fades at the beginning and end of the audio clip. Click and drag the Fade In Point to the right to set up a fade in the beginning of the audiotrack.

Trim handles are located on either side of the Editor window. Click and drag the right trim handle to the left to create a new end point for the audiotrack.

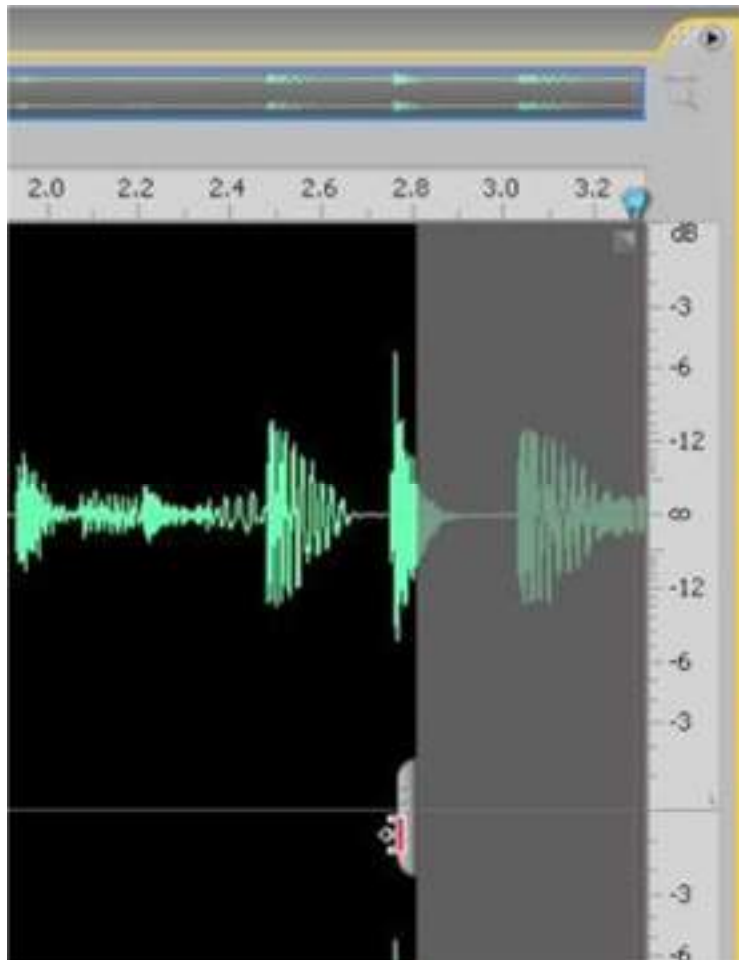


Figure 11: Drag the trim handles to edit the beginning or end of an audio track.

At the bottom of the Editor panel is a numeric Time slider, Previous and Next Marker buttons, Stop and Play buttons, Loop Playback, Record Open Dialog, Fade In and Fade Out buttons, a volume adjustment feature for the entire track, and a Louder button to make certain parts of the audio louder.

Try experimenting with some of these controls. When you are finished, you may have a better idea about how to customize the Soundbooth workspace to best accommodate your own particular workflow.



Figure 12: The Editor panel controls

Exercise

Visit an animation or sound studio and study the procedures adopted for sound recording and editing. Also study the various equipment and accessories and the software available with the studio.

Assessment

Fill in the blanks

1. In Adobe Sound Booth, the upper-left corner of the default workspace contains the _____ panel.
2. The Tools panel contains the most frequently used tools in _____ booth, the Time Selection tool, the Frequency Selection tool, the Marquee tool, the Lasso tool, the Hand tool and the Zoom tool
3. In the upper-right corner of the interface is a _____ pop-up menu.
4. The _____ panel allows you to add markers (known in Adobe Flash as cue points) at any point in your soundfile.

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the following:

Different panels of Adobe Sound Booth.

Part B

Discussed in class the following:

Features and advantages of Adobe Sound Booth.

Part C

Performance Standards

The performance standard may include, but not limited to:

Performance Standards	Yes	No
Edited a sound track using Adobe Sound Booth		
Tabulated a chart depicting functions of different panels of Adobe Sound Booth		

Session 4: EditingSound

In this session you will learn about how to increase or decrease the length of the range by clicking and dragging the start and end points of the audio track. You will also learn how to edit the sound track.

RelevantKnowledge

EditingAudio

Choose File > Open and open Interview.wav. This sound file is an excerpt from an interview. You can see the waveform of the file in the Editorpanel.



Figure 1: The waveform of the audio clip is visible in the Editor panel.

Click the Play button <<icon>> at the bottom of the Editor panel to play the file.

This audio clip has some problems, namely the cell phone ringing near the beginning. These issues are covered in the tutorial on screening and restoring audio. For now, you'll focus on some of Soundbooth's more basic editing capabilities.

The first important skill to learn is how to select a specific portion or range of the waveform. To select a range, choose the Time Selection tool <<icon>> in the toolbar and then click and drag across the waveform in the Editor panel with your mouse. Any changes you make are applied only to the selected range.



Figure 2: Select a range of the waveform using the Time Selection tool.

Select a range and click the Play button <<icon>>. Notice that the clip starts to play from the beginning of the range.

You can modify the selected range by dragging the start and end points in the time ruler of the Editor panel. Move them closer together to shorten the range or farther apart to lengthen the range.

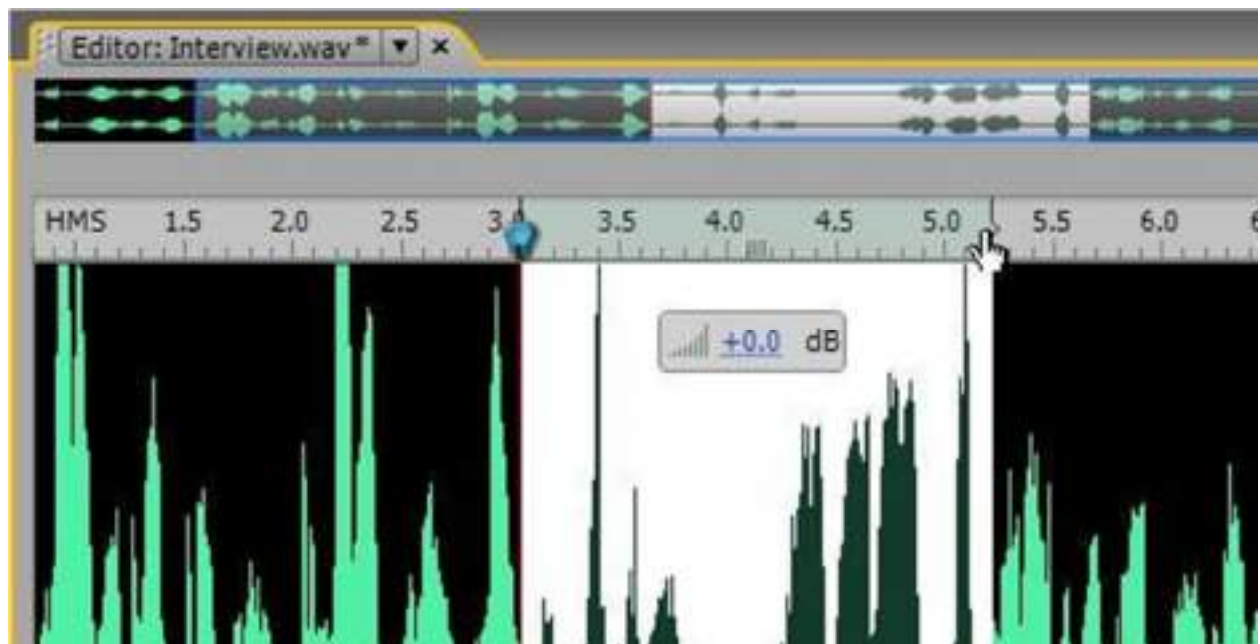


Figure 3: Increase or decrease the length of the range by clicking and dragging the start and end points in the time ruler.

Click the Loop Playback button <<icon>> at the bottom of the Editor panel to hear the selected range repeat when you click the Play button.



Figure 4: Click the Loop Playback button to loop a selected range when you press Play

If you have trouble making a very precise range selection, you can zoom in on the waveform. To zoom in or out, press the + (plus) or - (minus) keys on your keyboard or use the Zoom tool <<icon>> in the Tools panel. The Zoom tool works similarly to the Zoom tool in Adobe Photoshop CS3. You click and drag on the area you want to zoom in on or click the mouse to zoom in on an area. Hold down Alt (Windows) or Option (Mac OS) and click to zoom back out. If you have a mouse with a scroll wheel, scroll forward to zoom in and scroll backwards to zoom out.

The zoom navigator is located at the top of the Editor panel. You can see your entire waveform, navigate through the time line, and zoom in and out on different parts of the waveform.

To navigate to a different area of the waveform, hover your mouse over the highlighted area in the zoom navigator until it switches to the Hand tool and then drag to the left or right. The new highlighted area appears in the main window.



Figure 5: Hover over the highlighted area in the zoom navigator until the cursor switches to the Hand tool and drag to the right or the left to move to a different point in time.

Click and drag the edges of the range in the zoom navigator in or out to zoom in or out on the waveform displayed in the main window.

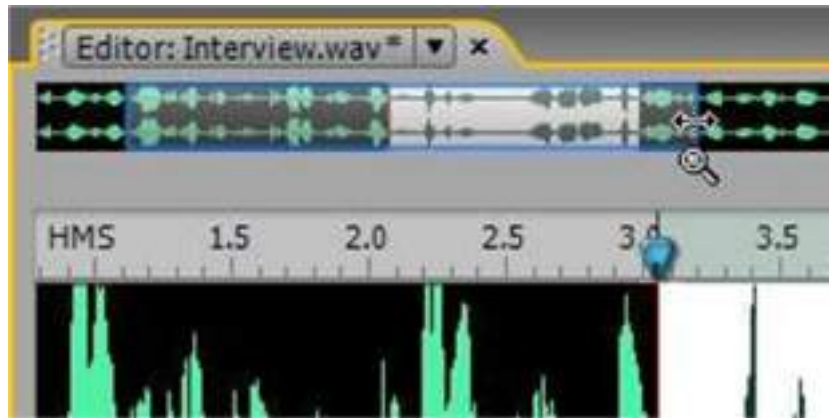


Figure 6: Move the end points in the zoom navigator to zoom in or out on the clip displayed in the main window.

To view the entire waveform in the main window, click the Zoom Full button <<icon>> to the right of the zoom navigator.

After you select a range, the workflow is similar to having text selected in a word processing program, that is, you can edit, cut, copy, paste it, and so on. To access these options, press Control and right-click on the selected range, use the standard keyboard commands (for instance, Control+X to cut), or use the Edit menu.

To delete a selected range, press the Delete key on your keyboard. Select 00:00:01.20 through 1.50 (this is the word *drink* when the interviewee says –energy drink company) and press Delete. Press Play to review youredit.

Press Control+Z (Windows) or Command+Z (Mac OS) to undo the deletion.

Select 00:00:07.25 to 8.75, where the waveform looks a little shorter. Press Play to hear the interviewee say –When I first saw her arrive, I was... This section of the waveform is shorter because it is quieter than the rest of the clip.



Figure 7: Select the range from 00:00:07.250 to 08.750

To make the selection louder, go to the Volume pop-up bubble and change the underlined number to increase the value and the volume or amplitude of the selected range (to about +2.6 dB). Notice that while you are dragging your mouse, a ghost image of the modified waveform appears in the window, showing you how the range will compare to the surrounding audio.

Note: Volume changes are measured and made comparatively, so the decibel value returns to 0.0 when you release your mouse, so that you can make further adjustments.



Figure 8: Drag the underlined numbers in the Volume pop-up bubble to change the volume of the selected range

Click the Play button to hear the difference the change made to the selected range.

You may have noticed that the same volume icon is located at the lower-right corner of the Editor panel.

You can use it to adjust the volume of range, as you just did, or to adjust the overall volume of the sound file.

If you are attempting to make the entire clip louder, consider using the Louder button <<icon>> just to the right of the volume. The first time you click it, Soundbooth normalizes the entire file, meaning that the entire clip is equally amplified. With each subsequent click, the Louder button adds 3 dB to the clip, but also uses a hard limiter, which amplifies the quieter parts of the clip more than the louder parts. This helps to ensure that you don't end up distorting your audio clip.

Click the Louder button once to make the entire Interview.wav clip louder and then click it again to amplify the quiet sections of the file. Notice that the Applying Hard Limit dialog box flashes on the screen. If you are familiar with other audio editing programs, where you have to change multiple filters and settings to achieve the same results, the Louder button will seem like a real time saver.

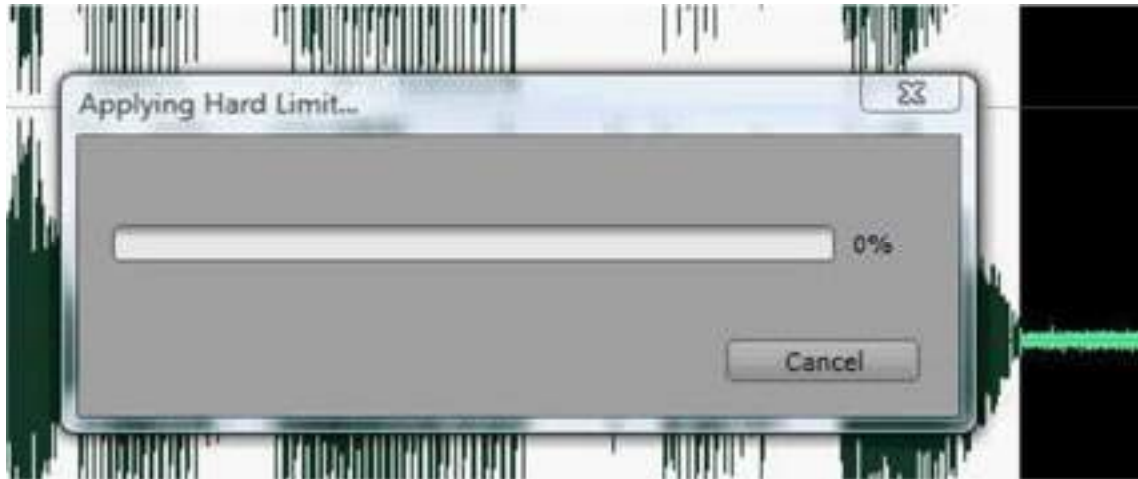


Figure 9: Clicking the Louder button adds 3dB to the overall volume of the clip while applying a hard limit to keep the sound normalized.

Press Control+Z (Windows) or Command+Z (Mac OS) twice to return the clip to its normal volume.

Another editing feature in Soundbooth is the ability to add fades to the beginning and end of audio clips using visual markers. To do so, make sure the beginning of the waveform is in focus in the main window of the Editor panel. Notice the black box located in the upper left corner of the window. This box is in the Fade In handle. Click and drag the handle to the right to add a fade. Continue dragging to lengthen the fade. Notice that as you drag, the portion of the waveform affected in the fade immediately shortens to reflect the decrease in volume.



Figure 10: Drag the Fade In handle to the right to create a fade at the beginning of the clip.

Drag the Fade In handle down to change the curve of the fade line. This allows you to keep the overall length of the fade, but the sound builds more drastically. Drag the Fade In handles up to make the fade more gradual.

The Fade Out handle at the opposite end of the waveform works in exactly the same manner



Figure 11: Drag the Fade In point up to produce a more dramatic fade

To remove a fade, drag the Fade In Or Out handle back to the beginning or end of the waveform.

In addition to fading the beginning and end of your sound files, you can also trim them using the trim handles found in the center of either side of the main window. Drag the trim handle at the end of the audio clip to the left to remove the last few seconds or even minutes from the clip. Drag the trim handle at the beginning of a clip to the right to trim the beginning of a clip



Figure 12: Drag the trim handles inward to trim the beginning and end of clips

Save Your Work

Saving your work in Sound Booth All project-oriented editing programs such as Sound Booth are taxing to a computer. This means Sound Booth can crash without warning and you can lose all of your work. Goto—File and Choose—Save As. In the—Save As field, give your project a relevant name. Then, in the —Devices area, choose your thumb drive. Navigate to and select your project folder. Your Soundbooth project file will be saved as an .asnd (—Adobe Sound Document) to this folder. Click —Save.

Exercise

Start Adobe Sound Booth. Open a file and edit using various commands. Note your observations and the problems that you faced while editing the file.

Assessment

Fill in the blanks

1. While editing audio in Sound Booth, you can see the waveform of the file in the _____ panel.
2. To view the entire waveform in the main window, click the _____ Full button <<icon>> to the right of the zoom navigator.
3. After you select a range, the workflow is similar to having text selected in a word processing

program, that is, you can edit, cut, copy, paste it, and so on. To access these options, press

_____ and right-click on the selected range, use the standard keyboard commands or use the _____ menu.

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the following:

1. Fade in and fadeout
2. Zoom in and zoomout

Part B

Discussed in class the following:

1. How to add fades to the beginning and end of audio clips using visual markers?
2. How to zoom in and out on different parts of the waveform?
3. How to select a specific portion or range of the waveform?

Part C

Performance Standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Edited a video using different editing commands in Adobe Sound Booth		
Demonstrated the knowledge of fade in and fade out in Adobe Sound Booth		

Checklist for AssessmentActivity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the following:

1. Title safe zone and action safezone
2. Crosshair tool and the Zoomtool

Part B

Discussed in the class the following:

1. Current timeIndicator
2. Safe zone, Grids, Guides andRulers

Part C

Performance Standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Demonstrated the knowledge of Current time Indicator		
Demonstrated the knowledge of Grids, Guides and Rulers		
Demonstrated the knowledge of time selection tool, the frequency selection tool, the marquee tool, the lasso tool, the hand final output		

Glossary

Activewindow	The window in front of all other open windows, on a graphical user interface. For example, the Internet browser window you are using to read this web page is considered the activewindow.
Animation	A medium that creates the illusion of movement through the projection of a series of still images or ‘frames’. The term is also used to refer to the techniques used in the production of an animated film - in 3D animation, primarily those controlling the motion of the objects and cameras within ascene.
Animatic	A rough animation that is used by animators to give some idea about the timing of a sequence, used as a kind of animatedstoryboard.
Analog	Analog video and audio emit a steady wave of magnetic patterns that are interpreted as video and audio to be transferred to magnetic tape forviewing.
Action	The scene description, character movement, and sounds as described in ascreenplay.
AngleofView	This is calculated by the focal length of the lens and the size of the image sensor. The 35mm equivalents differ according to the sensor size.
Antagonist	A character in a story or poem who deceives, frustrates, or works against the main character, or protagonist, in some way. The antagonist doesn’t necessarily have to be a person. It could be death, the devil, an illness, or any challenge that prevents the main character from living –happily everafter.
AspectRatio	The ration of horizontal to vertical dimensions of an image. For example, 35mm slide film = 3:2, TV = 4:3, HDTV = 16:9, 4x5 Film =5:4
AutomaticExposure	The camera sets the shutter speed and aperture for the correct exposure according to thelight.
AutomaticFocus	The lens on the camera focuses automatically when the shutter is half pressed. The viewfinder normally has focussing points shown to assist the user in knowing what will be infocus
Bitmap	The method of storing information that actually maps an image pixel bit by bit. Formats include; .bmp, .pcx, .pict, .tif, .tiff, .gif. Most picture files are bitmapped
BitDepth	The number of bits used to define the shade or colour of each pixel in animage,a_bit‘beingthesmallestunitofmemoryorstorageona

computer. (One 'byte' is eight 'bits'.) A 1-bit image is black and white. An 8-bit image provides a 256-colour palette. A 24-bit image provides 16.7 million possible colours, a palette sometimes known as 'True Colour'. A 32-bit image provides the same palette, plus an 8-bit grayscale alpha channel.

CD-ROM	It stands for Compact Disk Read OnlyMemory
Consumables	Items that need to be replaced such as toners, ink cartridges, paper, blank disksetc.
CPU (Central Processing Unit)	A chip or chips on the main board containing the control unit and the arithmetic/logic unit that interprets and carries out the basic instructions that operate acomputer.
Compression	A technique for reducing the quantity of data required to make up a digital image. Compression techniques can be non-destructive ('lossless') or destructive ('lossy'), in which part of the data set is discarded permanently. Converting still images into JPEG format is one example of lossycompression.
CloseUps	For people this usually means the shot frames just the head.
Domain	The name of a particular Internetsite.
Diskdrive	The device that operates (reads and writes) to the floppy disk, HDD, DVD andCD-ROM.
Driver	Operating systems and applications use a general system call to operate hardware devices. The driver is a software routine that translates it into the specific instructions needed to control the hardwaredevice.
DVD (Digital Versatile Disc)	120mm optical disc with a capacity of 4.7 gigabytes.
DigitalVideo(DV)	A format for storing digital audio and video used by DV standard digital videocameras.
Dialog	Very simply, this is what people are supposed to say according to the script.
DigitalFilm	Quite simply a Solid state flash memory cards in place of emulsionfilm
Dolly	A small platform on wheels used for holding heavy objects, typically film or television cameras. A mechanism on which a camera can be moved around a scene orlocation
ExtremeClose	They are much tighter close up shots in which you get detail greater than the human eye might be able to normally perceive. An example of this shot might be of the mouth and eyestogether
ExtremeWideShots	They are act to establish thearea.
Health and safety legislation	Service providers have obligations to ensure that reasonable steps have been taken to ensure the health and safety of customers. Health and Safety legislation provides for different responsibilities according to the products or services that the organisation isoffering.

Hardware	The physical components of the computer system e.g., Keyboard, mouse, speakers etc.
Medium Shots	This is the most common shot and allows for hand gestures and motion.
Medium Close Up shots	It shows the subject in more detail and are often framed from just below the shoulders to the top of the head.
Operating system	An operating system or OS is a software programme that enables the computer hardware to communicate and operate with the computer software.
Rhythm	It is the sequence that is repeated in a period of time.
RGB	Color represented as red, green and blue components. Most computer monitors use RGB pixels to display an image.
Scene	An event that takes place entirely in one location or time.
Secondary storage	Hardware device used to record and retrieve data and instructions e.g. floppy disk, tape, CD-ROM
Storyboard	A storyboard is a view of the workspace, showing thumbnails of the clips in a video editing program. Storyboards also refer to sketches or descriptions of scenes to be shot in a movie before production gets underway.
Timeline Tracks	A view of the workspace that focuses on the timing of your clips. Timelines are divided into horizontal sections known as tracks. Clips are arranged in various tracks to adjust their timing relative to one another.
Wide Shots	It shows the entire person or area. They're great for establishing the scene and allow for good action of the characters. Sometimes this is known as the longshot.
Zoom	The lens on a camcorder ranges from wide angle through to telephoto. Currently camcorders come with anything from a 10x to a 22x optical zoom. All camcorders also have a digital zoom which magnifies pixels.

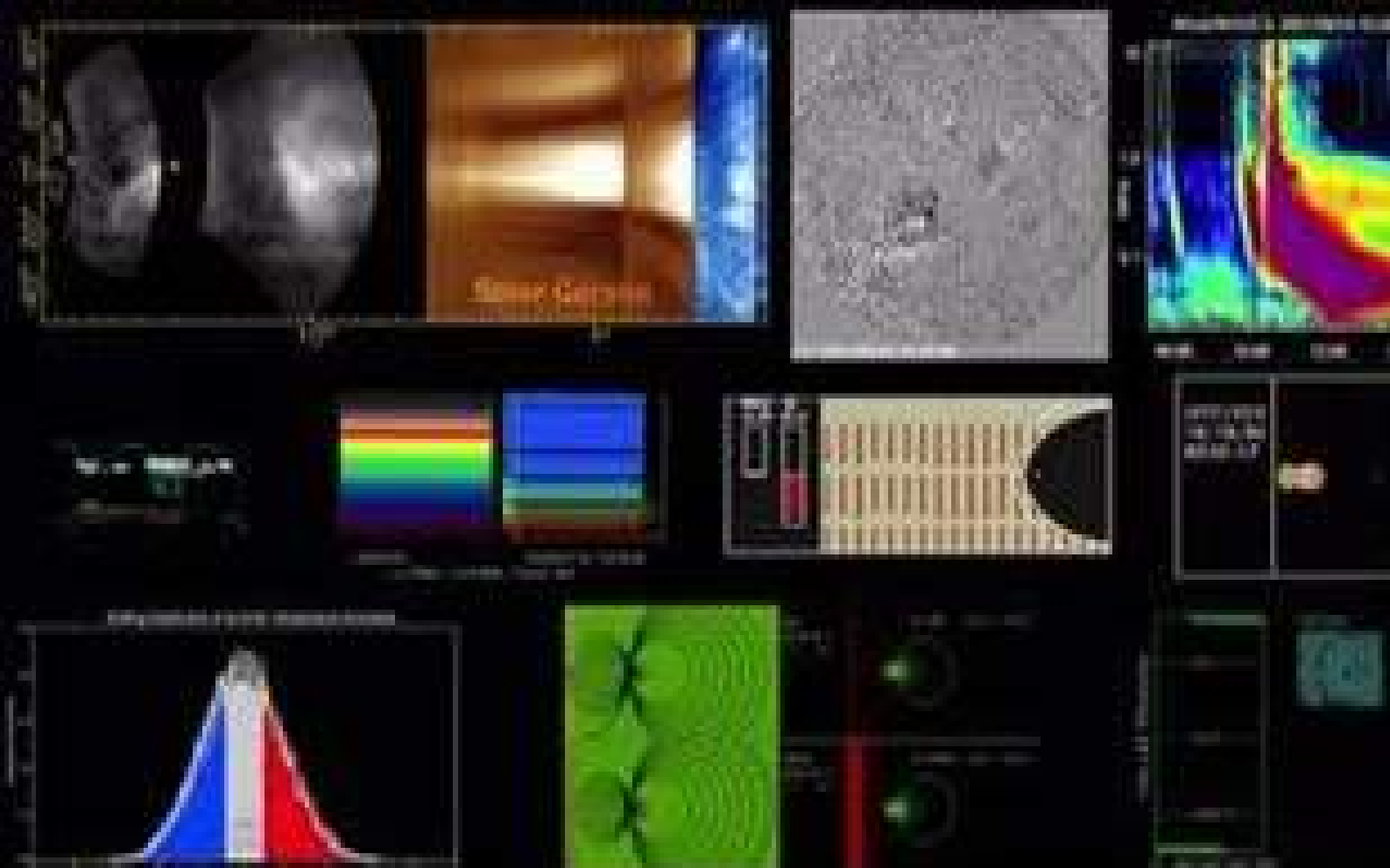
Suggested Reading

Books

1. Autodesk Maya User Guide.
2. DreamWorks Animation- Production Process
3. Adobe Sound Booth Help
4. Adobe Premiere Pro Help
5. Adobe Soundbooth CS3: Classroom in a Book
6. Adobe Premiere Pro CS3 Classroom in a Book

UNIT 3:

Basic Tools and Techniques of Animation in Autodesk MAYA



एन सी ई आर टी
NCERT

PSS Central Institute of Vocational Education
(A constituent unit of NCERT, Ministry of Human
Resource Development, Government of India)
Shyamla Hills, Bhopal

Course: Media and Entertainment

(Job Role: Animator, QP Ref. Id.: MES/Q0701)

Student Workbook

Class XII

PSS Central Institute of Vocational Education, Bhopal

(a constituent unit of National Council of Educational Research and Training, under
Ministry of Human Resource Development, Government of India)

UNIT 3:
Basic Tools and Techniques of Animation in Autodesk MAYA
Student Workbook
(Class 12; NSQF Level 4)

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ABOUT YOUR WORKBOOK

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GLOSSARY

SUGGESTED READING

Preface

The National Curriculum Framework, 2005, recommends that children's life at school must be linked to their life outside the school. This principle makes a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home, community, and the workplace.

The student workbook is a part of the qualification package developed for the implementation of National Vocational Education Qualification Framework (NVEQF), an initiative of Ministry of Human Resource Development (MHRD), Government of India to set common principles and guidelines for a nationally recognized qualification system covering Schools, Vocational Education and Training Institutions, Technical Education Institutions, Colleges and Universities. The NVEQF was subsumed in National Skills Qualifications Framework (NSQF) in 2013. It is envisaged that the NSQF will promote transparency of qualifications, cross-sectoral learning, and student-centred learning and facilitate learner's mobility between different qualifications, thus encouraging lifelong learning.

This student workbook, which forms a part of vocational qualification package for students who have passed Class X or equivalent examination, was created by a group of experts. The Media and Entertainment Sector Skill Council developed the National Occupational Standards (NOS) and the Qualification Pack (QP) for the job role. The National Occupational Standards are a set of competency standards and guidelines endorsed by the representatives of Industry for recognizing and assessing skills and knowledge needed to perform effectively in the workplace.

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), a constituent of National Council of Educational Research and Training (NCERT) has developed modular curricula and learning materials (Units) for the vocational qualification package in Media and Entertainment sector for Class XI. Based on NOS, occupation related core competencies (knowledge, skills, and abilities) were identified for development of curricula and learning modules (Units).

This student workbook attempts to discourage rote learning and to bring about necessary flexibility in offering of courses, necessary for breaking the sharp boundaries between different subject areas. The workbook attempts to enhance these endeavours by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups and activities requiring hands-on-experience. We hope these measures will take us significantly further in the direction of a child-centred system of education outlined in the National Policy of Education (1986).

The success of this effort depends on the steps that school Principals and Teachers will take to encourage children to reflect their own learning and to pursue imaginative and on-the-job activities and questions. Participation of learners in skill development exercises and inculcation of values and creativity is possible if we involve children as participants in learning, and not as receiver of information. These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table would be a necessity to maintain the rigor in implementing the activities and the required number of teaching days will have to be increased for teaching and training.

Acknowledgements

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About Your Workbook

The student workbook contains sessions which will help you to acquire relevant knowledge and skills (generic and domain-specific skills) related to the job role. Each session is small enough to be easily tackled and digested by you before you move on to the next session. Animated pictures and photographs have been included to bring about visual appeal and to make the text lively and interactive for you. You can also try to create your own illustrations using your imagination or taking the help of your teacher.

Let us now see what the sections in the sessions have for you.

Section 1: Introduction

This section introduces you to the topic of the Unit. It also tells you what you will learn through the various sessions covered in the Unit.

Section 2: Relevant Knowledge

This section provides you with the relevant information on the topic(s) covered in the session. The knowledge developed through this section will enable you to perform certain activities. You should read through the information to develop an understanding on the various aspects of the topic before you complete the exercise(s).

Section 3: Exercise

Each session has exercises, which you should complete on time. You will perform the activities in the classroom, at home or at the workplace. The activities included in this section will help you to develop necessary knowledge, skills and attitude that you need for becoming competent in performing the tasks at workplace. The activities should be done under the supervision of your teacher or trainer who will guide you in completing the tasks and also provide feedback to you for improving your performance.

Section 4: Assessment

The review questions included in this section will help you to check your progress. You must be able to answer all the questions before you proceed to the next session.

SECTOR: MEDIA AND ENTERTAINMENT

**Module 1: Animation:
Windows and Editor**

**Student Workbook
(Class XII)**

Table of Contents

INTRODUCTION

SESSION 1: DOPE SHEET

SESSION 2: ANIMATION CONTROL AND INTERFACE

SESSION 3: NONLINEAR ANIMATION

SESSION 4: ANIMATION LAYER EDITOR

Introduction

Maya animation provides you with the powerful tools you need to bring the characters and objects in your scenes to life. These tools give you the freedom to animate any attribute of an object and the control you need to successfully transform joints and bones, IK handles, and models over time.

Graph editor, trax editor and dope sheet, these are the main animation editors in Maya. The Dope Sheet is another animation editor in Maya that is similar to the Graph Editor. Instead of displaying curves, the Dope Sheet displays key times as coloured rectangles and lets you edit event timing in blocks of keyframes and synchronize motion to a soundfile.

Trax editor mainly helps the animator to do nonlinear animation. You can import and export animation clips using trax editor.

In this unit, you will learn about the animation windows and editor.



Session 1: DopeSheet

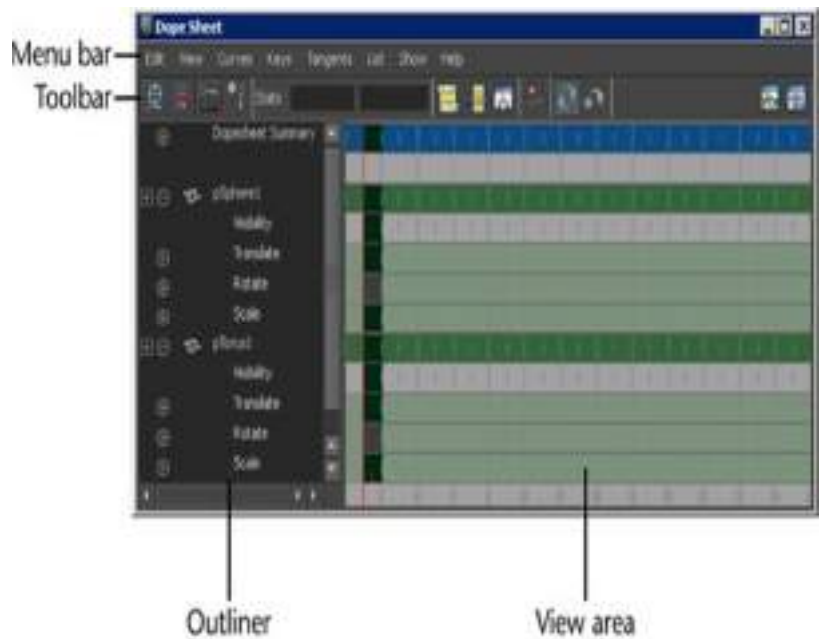
In this session, you will learn about the pre- and post-infinity animation curves options change rotation intern and dope sheet.

Relevant Knowledge

The Dope Sheet

The Dope Sheet is another animation editor in Maya that is similar to the Graph Editor. Instead of displaying curves, the Dope Sheet displays key times as coloured rectangles and lets you edit event timing in blocks of keyframes and synchronize motion to a sound file.

In the main menu bar: **Window > Animation Editors > Dope Sheet** In scene view: **Panels > Panel > Dope Sheet** (in Graph Editor window)



Dope Sheet menu bar

Edit menu

Many of these menu items appear and behave in a similar fashion to the main Edit menu in the scene view. However, as the Dope Sheet works directly with animation curves and attributes, there are no hierarchy options available within the settings windows for the edit functions.

Note: The Dope Sheet, the Edit > Keys menu selection, and Time Slider all share a common keys clipboard. Keys copied or cut to the clipboard using one tool are available to the other tools.

Undo/Redo

Undo cancels the last operation. Redo does the last undone operation again.

Cut: Cut removes existing keys from a selected attribute and places a copy of that information on the keys clipboard. If a curve segment is selected in the graph view, this area will be removed when you choose Edit > Cut. If no curve segment is selected, Cut will operate on the item selected in the Outliner portion of the Dope Sheet.

Copy: Copy copies existing keys from a selected attribute and places that information on the keys clipboard. If you select a curve segment in the graph view, this area will be removed when you choose Edit > Copy. If no curve segment is selected, Copy will operate on the item selected in the Outliner portion of the Dope Sheet.

Paste: Paste adds keys from the keys clipboard to an attribute. Pasted keys can be merged with existing keys, inserted at a time (displacing existing keys), or used to replace keys at a time.

Delete: Delete removes existing keys from a selected attribute. It works the same as Cut except it does not place a copy of the removed keys on the keys clipboard.

Scale: Scale operates on a selected range of keys, expanding or compressing the animation to correspond to a new time range. Note that Scale will operate on the entire range of keys if an attribute is selected in the Dope Sheet outliner and a curve segment is not selected.

Snap: Use Snap to force selected keys to snap in time to the nearest whole time units. Use Select Unsnapped to check for keys not at whole time units.

Select Unsnapped: Selects all keys from the selected channel. If no objects or attributes are selected, it selects any keys in the View Area.

View menu: This menu controls the layout of the Dope Sheet view area.

Note: When framing the desired range, the Dope Sheet may scale the area within the graph view horizontally and vertically to display the desired range.

Frame All: Frame All adjusts the graph view to fit all animation in the window.

Frame Selection: Adjusts the graph view to fit selected animation in the window.

Frame Playback Range: Frame Playback Range adjusts the graph view to fit the playback range in the window.

Centre Current Time: If you want to shift the view so the current time is in the middle of the editor, select Centre Current Time from the View menu.

Auto Frame: This adjusts the graph view to fit the display when new curves associated with a selected object are loaded into the Dope Sheet.

Note: Auto Frame works differently in the Dope Sheet than in the Graph Editor.

Dope Sheet Summary: This option loads the Dope Sheet Summary into the Dope Sheet outliner.

Scene Summary: This option loads the Scene Summary into the Dope Sheet outliner.

Curves menu: The Curves menu items are functions for processing animation curves.

Pre and Post Infinity animation curves options

In Maya, animation curves are extrapolated outside the first and last keys of the curve. Curves before the first key and after the last key will be flat (no change in value over time) unless you set the pre and post tangent control to anything other than constant. You can use these options to automatically generate specific types of repeating animation.

Note: If you want to create editable animation of a repetitious or cyclical nature, you can bake a channel with Infinity turned on.

Bake Channel: This operation calculates a new animation curve for an attribute using the input nodes that contribute to its properties.

Bake Channel is useful to:

- Edit a single animation curve instead of all the contributing attributes that affect the behaviour of a single attribute, for example, an object affected by a driven key or an Expression.
- Add keys to an existing curve

Change Rotation Interp

Let's change the rotation interpolation type of existing curves. You can change the rotation interpolation type only on rotation channels that have keyframes on all three channels (rotateX,

rotate Y, rotate Z). In addition, because the rotate X, rotate Y and rotate Z channels always share the same interpolation type, changing interpolation for a single channel such as rotate X, will automatically change rotate Y and rotate Z as well.

Simplify Curve

Use this operation to remove keys that are not necessary to describe the shape of an animation curve. Excess keys may accumulate on an animation curve as a result of adding keys manually or performing operations such as Bake Channel. You may need to remove keys from an animation curve to reduce the complexity of the graph view. You might also need to provide larger spans for adjusting curve tangents.

Resampling curves

You can resample dense data curves with the Curve > Resample Curves option in the Graph Editor or Dope Sheet. Resampling creates a periodic frame rate by placing keys at uniform intervals.

To resample a curve, you select a sampling filter, which is an algorithm defining how the keys in the curve are resampled. Tangent and curve values are ignored. The filter converts animation curves with keys at either uniform or non-uniform intervals to curves with keys at a uniform interval that you specify.

Tip: The resampling filters are designed to reduce the number of keys in dense data curves. It may not produce the desired results when used on curves with few keys.

Spreadsheet: This menu selection lets you edit the attributes of the selected animation curves in the Attribute Editor spreadsheet.

Non-Weighted and Weighted Tangents

Specify the tangent weighting for selected keys. The default setting is non-weighted tangents, which provide simple handles for manipulating the tangent's angle.

Weighted tangents represent the amount of influence at a tangent has on an animation curve segment. By turning on Free Tangent Weight, it is possible to simultaneously edit the influence and angle of the tangent quickly and intuitively. Users of desktop illustration packages will recognize the familiar Bezier-style behaviour when in this mode.

Keys menu

- Convert to Key Converts selected breakdowns to keys.
 - Convert to Breakdown Converts selected keys to breakdowns.
 - Add in between Inserts an in between at the current time.
-

- Remove in between Removes an in between at the current time.

Mute Key

Mutes the selected keys. Keys that are muted do not contribute to the animation on their channels.

When keys are muted, the following occurs:

A green symbol appears next to the names of the muted keys channels in the Dope Sheet Outliner. Mute channels with keys appear under the muted keys channels in the Dope Sheet.

Mute channels have the same number of keys as the muted keys animation channels, and their keys are positioned the same as those on the muted keys animation channels.

Unmute Key

Unmutes the selected keys. Keys that are not muted contribute to the animation on their channels. Unmuting keys disables their Mute channels (indicated by the red x symbol next to the names of the muted keys channels in the Dope Sheet Outliner) but does not remove them.

Tangents menu

Tangents describe the entry and exit of curve segments from a key. This menu operates on the shape of curve segments around selected keys. Note that these settings affect only existing animation curves segments' tangents.

Spline

Specifying a spline tangent creates an animation curve that is smooth between the key before and the key after the selected key. The tangents of the curve are co-linear (both at the same angle). This ensures that the animation curves smoothly enters and exits the key. When animating fluid movement, a spline tangent is an excellent place to start. You use a minimum number of keys to achieve your look.

Linear

Specifying a linear tangent creates an animation curve as a straight line joining two keys. If the in tangent type is linear, the curve segment before the key is a straight line. If the out-tangent type is linear, the curve segment after the key is a straight line. When animating the colour of a heating element on a stove, you would

use linear to achieve that gradual change in colour from charcoal gray to burning hot red.

Clamped

Specifying a clamped tangent creates an animation curve that has the characteristics of linear and spline curves.

The keys' tangents will be splines unless the value of two adjacent keys is very close. In this case, the out tangent of the first key and the in tangent of the second key will be interpolated as linear.

When animating a skeleton in a walk-cycle, you may notice a slipping of the pelvic and foot joint position. This occurs because the value of the keys on the curve are either the same or close to (within tolerance of) the value of the other. Maya assigns a default spline tangent to describe what occurs between these keys. This is why you get the joint positions slipping.

By setting the tangent type to clamped for these keys, the slipping is corrected and the tangents become a combination of linear and spline.

In the Maya environment preferences, Clamped is the default tangent type.

Stepped

Specifying a stepped tangent creates an animation curve whose out tangent is a flat curve.

The curve segment is flat (horizontal), so the value changes at the key without gradation.

The light from a strobe light turns on and off. To create a strobe-like effect, you would use a step tangent.

Stepped Next

FBIK animation keys use the stepped next tangent type by default. This tangent type differs from regular Stepped tangents in that its interpolation values jump immediately to that of the next key, rather than holding the value of the current key until the next key is reached.

Flat

Sets the in and out tangents of the key to be horizontal (with a slope of 0 degrees). When a ball reaches its ascent, it hangs in the air for a brief time before starting its descent. You can create this effect by using a flat tangent.

Fixed

Specifying a fixed tangent allows a key's tangents to remain unchanged as the key is edited.

When animating a ball, you may find the ball isn't falling from a desired height, yet its impact with the floor and everything else is perfect. Using a fixed tangent lets you change the height of the ball while retaining the tangent's angle.

This process is useful when you want to:

- Edit a single animation curve instead of all the contributing attributes that affect the behaviour of a single attribute, for example, an object affected by a driven key or an Expression.
- Add keys to an existing curve

Plateau

Plateau tangents ease animation curves in and out of their keyframes like spline tangents, but also flatten curve segments that occur between equal-valued keyframes like clamped tangents. The plateau tangent normally behaves like a spline tangent, but ensures that the minimum and maximum values along a curve are all at keyframes.

Plateau tangents are useful when you want the positions of your keyframes to be exact, because they ensure the maximum and minimum values ('hills and valleys') of the curve do not extend past their keyframes. For example, picture an animation of a ball rolling off a table, falling to the floor, and then rolling on the floor. With spline tangents, the ball falls through the floor, and then comes back up to the floor. With plateau tangents, the ball will not fall through the floor. The tangents guarantee that your animation will not wander beyond the values you keyframed.

To do this, if a spline tangent would produce a minimum or maximum between two keyframes, the plateau tangent flattens the keyframes in question. Keyframes at local minimum and maximum points along the curve are also flattened. Finally, the first and last keyframe along a curve are always flattened if they have plateau tangents.

In Tangent menu

It lets you specify a type of tangent for the In Tangent only. The In Tangent defines the type of curve segment that comes before a key.

Note You can also set the Default In Tangent for new keys in the Preferences window.

Out Tangent menu

Let's specify a type of tangent for the OutTangent only. The OutTangent defines the type of curve segment that comes after a key.

Exercise

1. Create a chain using basic polygons primitives.
2. Animate the chain showing follow through using dopesheet
3. Write a note on this exercise

Assessment

I. Answer the following questions

1. What is dopesheet?

2. Write a short description on dope sheet menubar.

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

Differentiated between the following:

1. Simplify curves and resampling curves
2. Pre and post infinity animation curves
3. Mute key and unmute key

Part B

Discussed in the class the following:

1. The dope sheet and its uses
 2. Dope sheet menubar
-

Part C

Performance standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Demonstrated their ability to composite scenes using dope sheets.		
Demonstrated the knowledge of using dope sheet menu bar		
Demonstrated simple exercises on spread sheet		

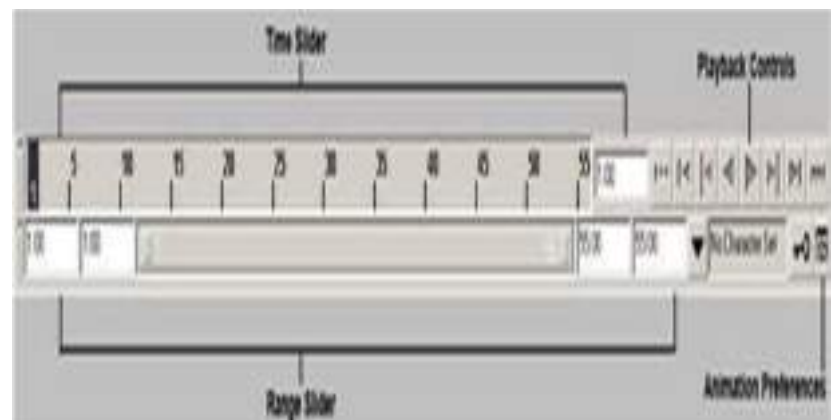
Session 2: Animation Control and Interface

In this session, you will learn about the animation control, time slider, different terms used in animation and how to animate an object along a surface.

Relevant Knowledge

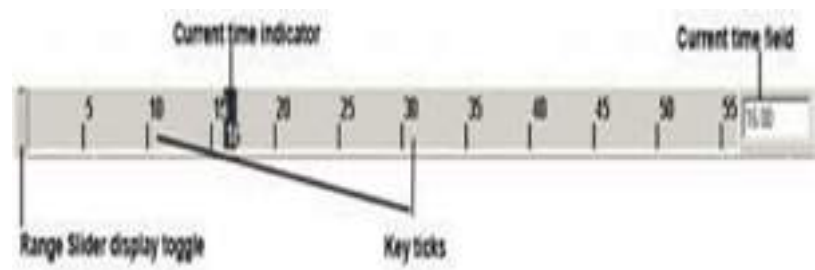
An animation control is a window that displays an Audio-Video Interleaved (AVI) clip. An AVI clip is a series of bitmap frames like a movie. Animation controls can only display AVI clips that do not contain audio.

Tool Bar



Animation Control

Between the Range slider and the Animation Preferences button are the current character control features and the **Auto Key** button.



Time Slider

Click in the Time Slider area and drag left and right to "scrub" the animation back and forward in time.



Range Slider

You can toggle whether the Range Slider is Displayed or hidden by selecting Display>UI elements>Range Slider.

Animation Start Time sets the start time of the animation.

Animation End Time sets the end time of the animation.

PlaybackStartTime This shows the current start time for the playback range. You can change it by entering a new starttime.

Playback End Time: This shows the current end time for the playback range. You can change it by entering a new endframe.

Range Slider Bar

This lets you control the playback range of your animation up to the limits of the Animation start/end settings.

You use the Preferences dialog box to change values for the animation timeline and playback. You can also set the total time for your animation, the size of the timeline, and other related features.

Terms in Animation

Frame Rate

Frame rate is the first aspect of animation. By default, Maya sets your animation to Film, which plays at 24fps. You use 30fps in the United States and 25fps in other countries.

Range

The range of an animation determines the total length in frames. Then, multiply the animation's length in seconds by the frame rate. For e.g. in this case you are using 24fps and animation length is of 2seconds.

$$24 \text{ fps} \times 2 \text{ secs} = 48 \text{ Frames}$$

Setting Keys

You can set a Key by selecting Animate >Set Key. The attributes set by this menu item depend on the set Key option settings.

Animation Types

There are following types to animate your scene.

Path Animation

In this method, you create a NURBS-based curve and then attach an object to it in your scene. The object then follows the curved path to simulate motion. You can choose at which time the object is positioned at any point along the path, so the object can reverse itself, pause, or oscillate, if you want. The object automatically rotates from side to side as the curve changes directions. If the object is geometry, it can also be automatically deformed to follow the contours of the curve.

Exercise

Make a chart containing various 2D animation processes with some examples.

Assessment

Answer the following questions

1. What is TimeSlider?

2. What is RangeSlider?

3. Describe the terms Frame Rate

Checklist for AssessmentActivity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between time slider and range slider

Part B

Discussed in class the following:

1. The timeline and keys
2. What is timeslider?
3. Animation control and interface
4. Nonlinear animation
5. Toolbar

Part C

Performance standards

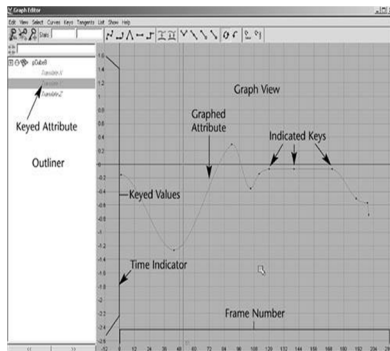
The performance standards may include, but not limited to:

Performance Standards	Yes	No
Demonstrate the knowledge and application of the time slider and range slider		

Session 3: Non-linear Animation

In this session, you will learn about the most advanced non-linear method of animation, graph editor component and trax editor.

Relevant Knowledge



Nonlinear Animation is a more advanced method of animation. Unlike keyframing, nonlinear animation is completely independent of time. You blend and layer animation sequences—called clips—to set up the motion for objects. You can also use this method to explore variations in parts of the animation without losing your previous work or affecting other parts of the animation. For example—you can make the walking part of the animation a clip and then adjust the leg motion without affecting the way the rest of the character moves.

Graph Editor

The Graph Editor is a helpful tool for tweaking values for keys you have set. It gives you a visual representation—a curved line—of the attributes that are animated. The animation time goes from left to right, and any keyed variable appears as a line that ramps up or down to indicate its value over time. It can help you visualize how things are changing and how fast. You can pan and zoom this panel like any other.

To use it as a free-floating window, simply open it from the Hotbox (Window > Animation Editors > Graph Editor).

Graph Editor's Components

Menu Bar

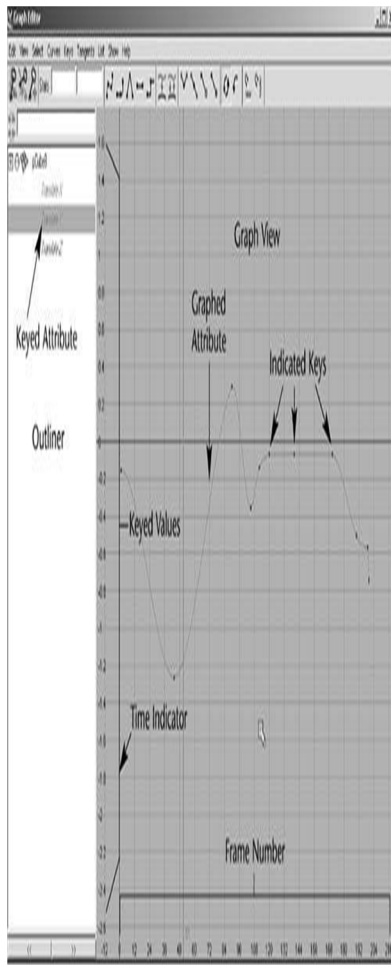
The Graph Editor menu bar contains tools and operations for manipulating animation curves and keys within the graph view of the Graph Editor. The Edit menu is similar to the one in text editors or word processors, except that you're reworking with keys instead of text.

The Edit Menu

The menu's items appear under the Edit menu and behave in a similar fashion to the main Edit menu in the modelling view.

The View Menu

This menu controls which components are visible, and therefore editable, in the graph view of the Graph Editor.



Graphic Editor

The Select Menu

These options control which component of an animation curve is available for selection and editing.

The Curves Menu

The Curves menu gives you control over how the curves are set up with the keys in your scene.

The Keys Menu

This menu includes Tangents which causes the manipulation of an in or out tangent handle.

The Tangents Menu

This describes the entry and exit of curve segments from a key.

The List Menu

This menu Loads the objects.

The Trax Editor

The **Trax Editor** is a high-level animation tool that lets you select and control characters and their animation clips, layer and blend animation sequences, synchronize your animation and audio clips, and drag-and-drop animation clips between mapped characters. The trax editor is an inbuilt component in Maya similar to a video editing software like Adobe Premier or FinalCut There are many ways to get to the trax editor - In the Panels tab - Panels - Saved Layouts - Persp/Trax - Windows - Animation Editor - Trax Editor

The Trax Editor window has four work areas:

- (i) **Trax menu bar:** Contains character and clip or object and geometry cache clip related options that let you perform all required actions for creating and editing your animation or deformations nonlinearly.
- (ii) **Trax toolbar:** Contains a selection of buttons that let you quickly access some of the functionality contained in the Trax menu bar.
- (iii) **Track control area:** Contains buttons that let you control the playback of each track's animation or deformations.
- (iv) **Track view area:** Contains all the tracks, animation clips, geometry cache clips, and audio clips for your loaded characters or objects.

Suppose you keyframed a character's walk and you now want to turn it into a walk cycle. You can create a clip for the keyframe animation sequence, *scale and trim the clip to get it to be right*

length and to have similar start and end poses, and then *cycle* the clip to create a proper walk cycle .If you wanted to change the walk cycle’s pace or rhythm, you can then create a *time warp* curve for the clip, or if you wanted to turn the walk into a *march*, you can manipulate the character and key into the clip directly. You can do all this to the character’s walk sequence without destroying the original key frame animation because you are working with clips.

Exercise

1. Open trax editor and import some animation clips
2. Edit the clips and manipulate them to get a required animation.

Assessment

Answer the following questions

1. What is trax editor?

2. Write a short description on visor and clip library.

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the various types of menus in Graph Editor.

Part B

Discussed in class the various windows of Trax Editor.

Part C

Performance standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Demonstrated the knowledge and application of nonlinear animation tools		

Session 4: Animation LayerEditor

In this session, you will learn about the Animation Layer Editor and Graphic Editor.





Relevant Knowledge








The **Animation Layer Editor** lets you manipulate animation layers and change the way they blend together to create your result animation. It includes three main menus:

- (i) **Layers menu**
- (ii) **Options menu**
- (iii) **Show menu**



The following table provides a brief overview of tasks using the **Animation LayerEditor**.





To...	Do this
Create an animation layer for selected objects.	Click  .
Create an empty animation layer.	Click  .
Change the animation layer mode.	Right  -click a layer and select Layer Mode , then select Additive, Override, or Pass through mode.
Extract animation from selected objects in the scene onto a layer.	Right  -click the Base Animation bar and select Extract Non-Layered Animation for Selected Objects .

Re-order layers in the stack.	Select the layer and  -drag it to a new position in the stack, or use the Move Up  and Move Down  buttons.
Parent layers.	Select the layer and  -drag it onto the layer you want as its parent.
Open the Relationship Editor to add and remove attributes to and from layers.	Select Layers > Membership from the menu bar.
Delete layers.	Select the layers you want to delete and select Layers > Delete from the menu bar.
Set a Zero key.	Click  .
Set and key the layer weight at 0.	Click  .
Set and key the layer weight at 1.	Click  .

Animation Layer toolbar



The following table describes the buttons found in the Animation Layer Editor toolbar.

	Zero Key Layer	Sets a key on the animation layer with zero offset from the original animation. This can help you demarcate a specific time range you want to edit on a layer.
	Set Weight to 0/Set Key	Sets and key frames the animation layer Weight at zero.
	Set Weight to 1/Set Key	Sets and keyframes the layer Weight at 1.
	Move Layer Up	Moves the selected layer(s) up in the Animation layer pane.

Animation Layer Editor menu bar

Layers menu

The **Layers** menu contains the following items.

Create Empty Layer

Creates an empty animation layer.

Create Layer from Selected

Creates an animation layer that (by default) contains all of the selected object's attributes.

Create Override Layer

Creates an empty animation layer set to **Override** mode.

Create Override Layer from Selected

Creates a new animation layer that (by default) contains all of the selected object's attributes, and sets the layer to **Override** mode.

Create Layer Options

The **Create Layer Options** let you set which modes new layers will use. Select from the following options:

Passthrough (Override Only)

Sets new **Override** layers to **Passthrough** mode.

Rotation Accumulation By Component

Sets new layers to use **By Component Rotation Accumulation** mode.

Rotation Accumulation By Layer

Sets new layers to use **By Layer Rotation Accumulation** mode.

Scale Accumulation Multiply

Sets new layers to use **Scale Multiply Accumulation** mode.

Scale Accumulation Additive

Sets new layers to **Additive Scale Accumulation** mode.

Add Selected Objects

Ads attribute of the selected object(s) to the selected animation layer(s).

Add Selected Objects

Opens the **Add Objects To Animation Layers Options**, letting you add groups of attributes to the layer. Select from the following options:

All keyable

Adds all of the selected object's keyable attributes to the selected layer.

From Channel Box

It lets you add attributes selected in the **Channel Box** to the selected layer. When this option is selected, you can select attributes in the **Channel Box** and use **Layers > Add Selected Objects** to add them to the selected layer.

All Keyable Except

Lets you add all keyable attributes except attributes of a certain type. Use the list to select which attribute types to exclude:

- Translate
- Rotate
- Scale
- Dynamic
- Boolean
- Enum

Remove Selected Objects

Removes all attributes of the selected object(s) from the selected layer(s).

Extract Selected Objects

Extracts the selected object from the selected layer and places it on a new layer. The new layer is named after the selected layer, plus the suffix `_extract`.

Select Objects

Selects all objects in the scene that have attributes assigned to the selected layer(s).

Copy Layer

Creates a duplicate of the selected layer(s), containing all of the same attributes and animation.

Copy Layer (No Animation)

Creates a duplicate of the selected layer(s) containing all of the same attributes (and none of the animation).

Merge Layers

Merges the selected animation layers.

Merge Layers

Opens the **Merge Layer Options**. Select from the following options.

Note

Several of the **Merge Layer Options** are the same as those in the **Bake Simulation Options** window.

Merge To

Set which direction you want the merge to occur in the stack. Select from the following options:

Top Selected Layer

Merges the selected layers to the selected layer that is highest in the stack. (The highest layer in the stack is the 'target' layer, all other layers are 'source' layers.)



Bottom Selected Layer

Merges the selected layers to the selected layer that is lowest in the stack. (The lowest layer is the 'target' layer; all other selected layers are 'source' layers.)

Layers Hierarchy

Sets whether child layers have to be selected to be included in the merge. Select from the following options:

Selected

Child layers must be selected to be merged.

Include Children

Child layers of any parent layer being merged are included, even if they are not selected individually.

Graphic Editor



- Supports many formats, including .ico, .gif, .avi, .cur, .ani.
- Preview your animations in real time while editing sprites - No need to stop working to watch your animation!
- Use multiple layers to make drawing and editing your art easier!
- Onion skinning allows you to see both previous and next frames while you draw!
- Output your animation frames onto a single spritesheet, output each frame to its own image file, or export the entire animation as a single .gif file. GraphicsGale's export options are flexible enough to be compatible with any workflow.
- Create work from scratch, or use GraphicsGale's TWAIN imaging support to import images from your scanner, camera, or other TWAIN-supported devices.
- GraphicsGale also has many pixel-art specific features to help you create your work quickly and easily, including palette control, selectively erasing colours, and tools for quickly replacing and trying new colours.

Exercise

Practise to understand the working procedure of animation layer editor.

Assessment

Answer the following questions

1. What is layereditor?

2. Explain the procedure of working with layereditor?

Checklist for AssessmentActivity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the various menus of the Animation Layer Editor.

Part B

Discussed in class the following:

1. Layertoolbar
2. Layer menubar
3. Applications of animation layereditor

Part C

Performance standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Demonstrated the knowledge and application of animation layer editor		
Demonstrated the knowledge and application of animation clip editing		

SECTOR: MEDIA AND ENTERTAINMENT

**Module 2: Basic Tools and Techniques
of Animation in Maya**

**Student Workbook
(Class XII)**

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Introduction

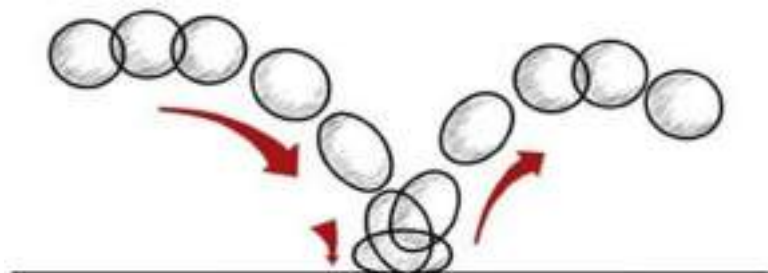
In this unit, we will discuss about the basic tools and techniques of animation in Maya. This unit will teach you the fundamentals of the way Maya animates.

Timeline and keys are the basic need for Maya keyframe animation. Keys store a value at a given time in animation. This time is measured in frames.

Most animations have 24 frames in a second, so, if at frame 1 there's a keyframe that says the value is 0, then on frame 24 there's a keyframe with the value of 5.

In the time-span of one second, that value changes from 1 to 5. The way this value changes is defined by tangents.

The bouncing ball includes many aspects of animation, such as the path of action, arcs, momentum, timing, key drawings, in-between drawings, weight, speed, and the substance of an object are included in this simple exercise. We will discuss about graph editor and bouncing ball animation as the first animation in Maya.



Squash & Stretch



Session 1: Timeline and Key

In this session, you will learn in details about Maya Timeline. You will also learn about the disadvantage of Auto keys and how to change settings in Maya Timeline.

Relevant Knowledge

The timeline is where the bulk of the animation process takes place. This is where you control the speed at which a movie element moves, when it enters and exits the scene, and its depth, or stacking order, in relation to other elements in the scene. Here you are able to set animation keys, scrub through the animation, and change the range of time in your animation. Notice the four boxes that comprise the Range Info. The two outer boxes (with values 1.00 and 48.00) are the start and end of your timeline. Think of these two numbers as representing the length of the whole timeline. The two inner boxes represent the start and end of the current section of the timeline. Many times, you will only want to edit keyframes on part of the timeline.



Keys

Keys store a value at a given time in animation. This time is measured in frames. Most animations have 24 frames in a second, so, if at frame 1 there's a key frame that says the value is 0, then on frame 24 there's a key frame with the value of 5. In the time-span of one second, that value changes from 0 to 5. The way this value changes is defined by tangents.

Maya uses "keyframes" for animation (we also refer to them in short as "keys"). A key frame is basically a marker used to specify an object's position and attributes at a given point in time. To set a keyframe on the ball at the current frame, select the ball and go to **Animate** → **Set Key** (or just hits). A red tick mark should appear on the timeline near the slider, indicating that you have "keyed" the ball on the current frame. You may also notice that the attributes in the Channel Box have turned pink, an indication that the object has been keyed.

AutoKey

Autokey automatically saves the changes you make to an object's keyframes. If the current frame already has a key, autokey will immediately update the key with your changes. If the current frame does not have a key, autokey will automatically create a keyframe based on your adjustments (this only works on objects with existing keys). However, be aware that with autokey it is easy to accidentally create stray keys on the timeline or make changes you did not intend. Though it is recommended you do not use autokey before fully familiarizing yourself with the animation workflow, you can

enable it by clicking the  icon below the playback settings. It will appear as  once turned on. You should make sure not to have "AutoKey" on because anytime you move or change something; it will automatically key it for you, which can be very annoying if you are not trying to make an actual key.

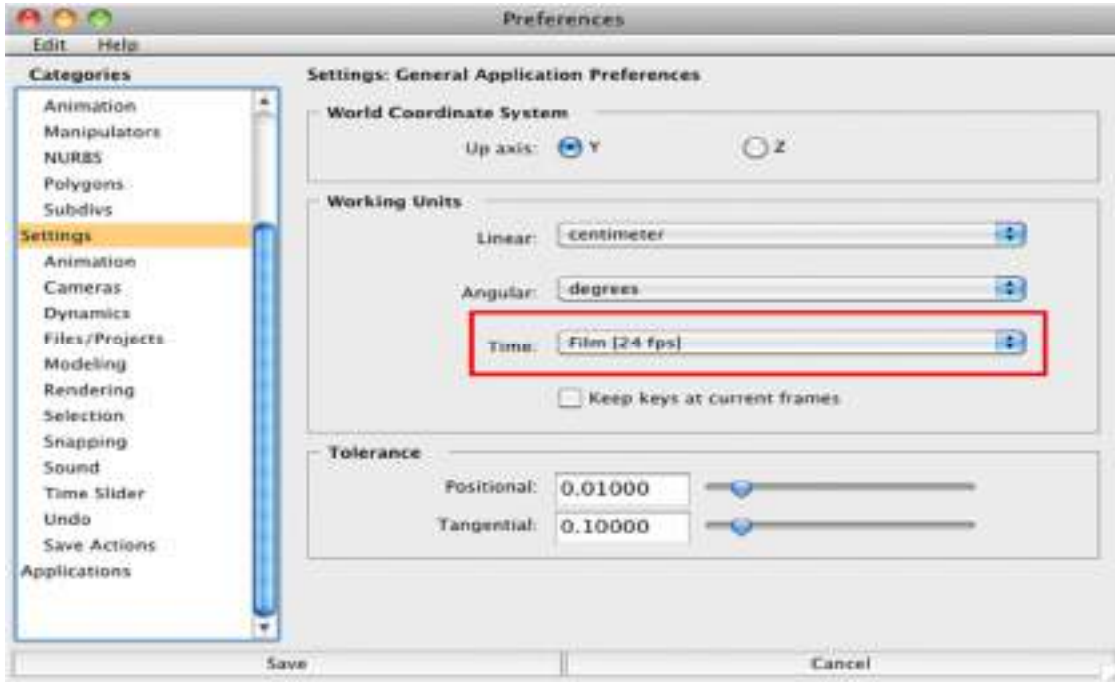


Figure1

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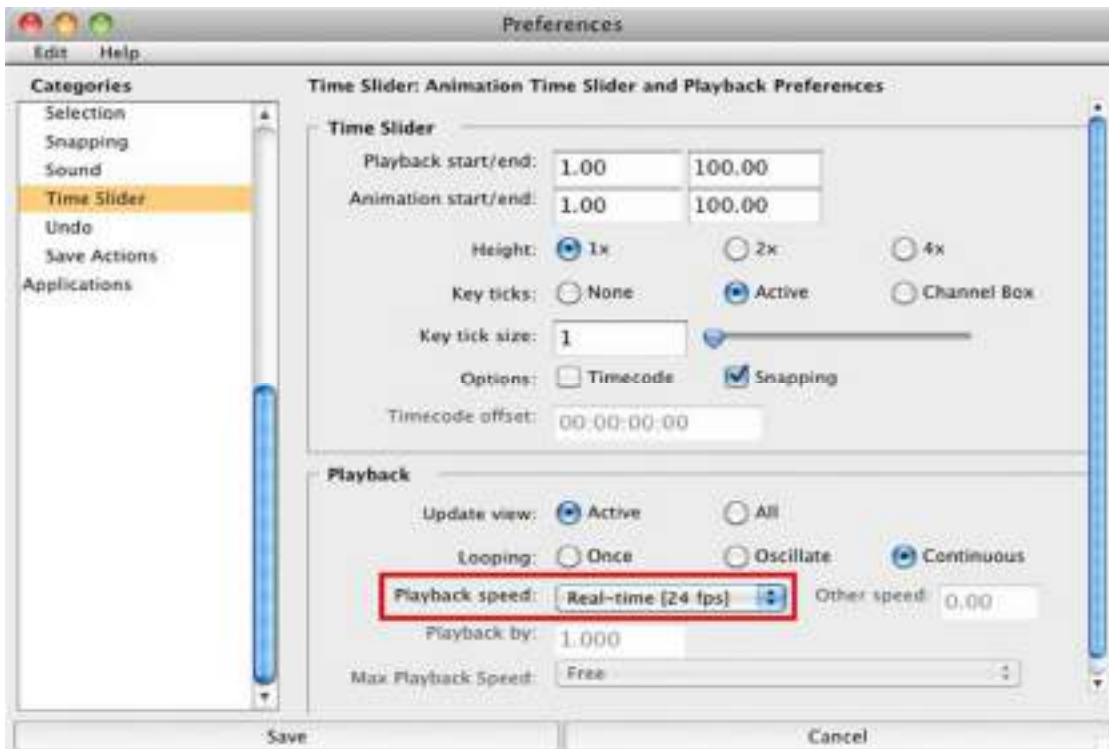


Figure2

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An important thing to before even starting to create your animations is to make sure your settings are correct in the options menu. It is very important to decide these settings before you work in groups to avoid problems when trying to merge projects together later on. We like to use 24fps for this course.

It is also good to generally keep the playback speed at "Real Time" so you can see what your motion will look like in the end.

Exercise

Animate the translate value of a sphere using timeline and keys.

Assessment

Answer the following questions

What is key frame?

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between key frame and auto key.

Part B

Discussed in class the following:

1. How to copy a keyframe?
2. Explain the importance of key line along with an example

Part C

Performance standards

The performance standard may include, but not limited to:

Performance Standards	Yes	No
Demonstrated the knowledge of keyframes and autokey in Autodesk Maya.		

Session 2: KeyFrames

In this session, you will learn about the concepts of setting Key Frames and importance of S keys.

Relevant Knowledge

When you set a keyframe (or key), you assign a value to an object's attribute (for example, translate, rotate, scale, colour, and so on) at a specific time.

Most animation systems use the *frame* as the basic unit of measurement because each frame is played back in rapid succession to provide the illusion of motion.

When you set several keys at different times with different values, Maya generates the attribute values between those times as the scene plays back each frame. The result is the movement or change over time of those objects and attributes.

In the following steps, you use key-frames to set the starting and ending positions of the ball's movement.

To set beginning and ending key frames

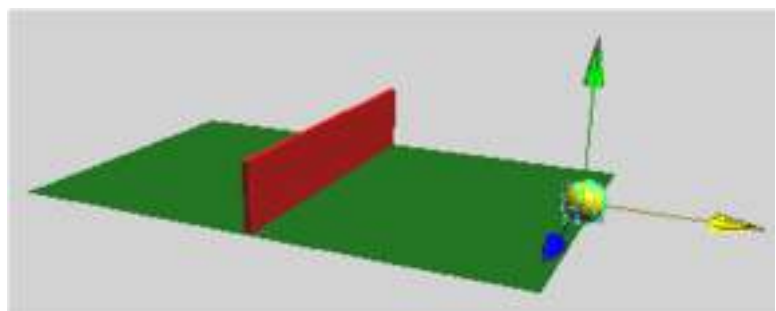
Click the rewind button to go to the start of the playback range. This changes the current frame to 1.

Select the ball, then select **Animate > Set Key**. (Keyboard shortcut: **s**).

This sets a key at frame 1 for all *transform attributes* of the ball. Transform attributes are the X, Y, Z move attributes. Although you animate only the translate X and Y attributes of the ball in this lesson, keying all transform attributes saves you time having to choose specific attributes to be keyed. In the Time Slider, notice the red marker at frame 1, known as a tick. This tick appeared when you set the key for frame 1. With the ball selected, ticks in the Time Slider indicate where you've set keys.

Go to frame 72. A convenient way to do this is to click the desired position in the Time Slider.

With the Move Tool, drag the ball's X-axis handle to position the ball at the right edge of the ground as shown in the image below.



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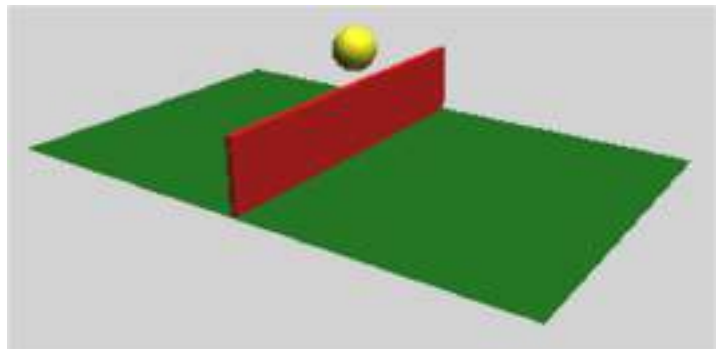
Set a key at frame 72. (Press s.)

1. Go to the start time and play the animation.
2. From the two keys you've set, Maya creates motion between the positions. By default, the animation plays in a loop from frame 1 to 72. The ball travels through the fence at this stage.
3. Press the Stop button on the playback control to stop the animation after you view a few repetitions.
4. You can drag the mouse back and forth (scrub) in the Time Slider to see the animation playback and for that the speed you drag the mouse.
5. If you were to display the scene with Panels > Layouts > Four Panes, only the active panel would show the ball moving.
6. To make the ball fly over the fence rather than pass through it, you need to position the ball above the fence and set a key there.

To set intermediate keyframes

1. Go to frame 33 or so—at the moment where the ball sits in the middle of the fence.
2. With the Move tool, drag the Y-axis handle of the ball until it sits slightly above the fence.

Tip: Throughout this lesson, tumble the perspective view or examine a front view to make sure the positioning is correct.



<http://download.autodesk.com/>

1. Set a key. (Press s.)
2. Play the animation.

The ball now flies off the ground, over the fence, and back to the ground in a smooth arc between the keyed start, middle, and end positions.

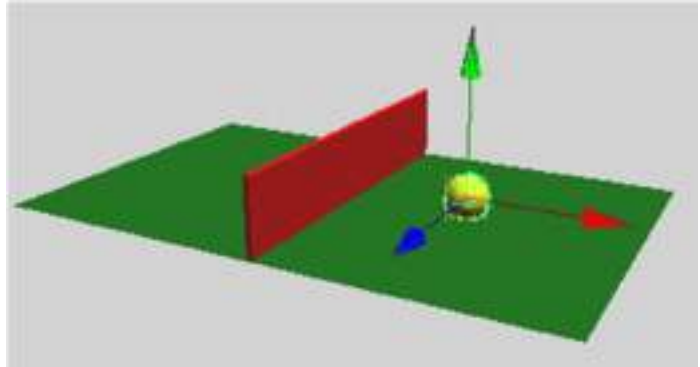
Press the stop button to end the playback.

In subsequent steps, play the animation after each key you set. It's generally useful to check your work in progress after each key, especially when you are learning.

In the next steps, you'll set keys to bounce the ball in the middle of the right half of the ground.

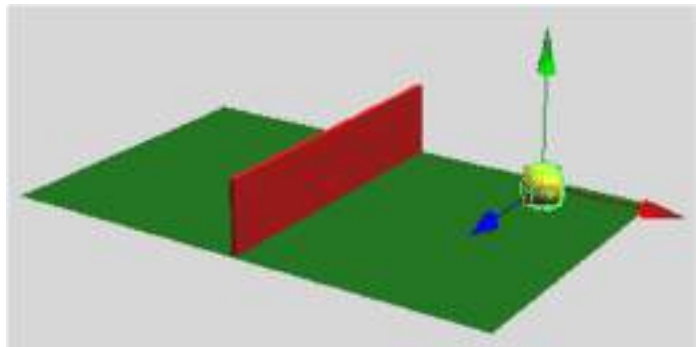
To set keyframes to make the ball bounce

1. Go to frame 50. At this moment, the ball sits in a position above the middle section of the right half of the ground.
2. Move the ball so it sits on the ground.



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1. Set a key.
2. Go to frame 60.
3. Move the ball up again, but not as high as its peak height above the fence.

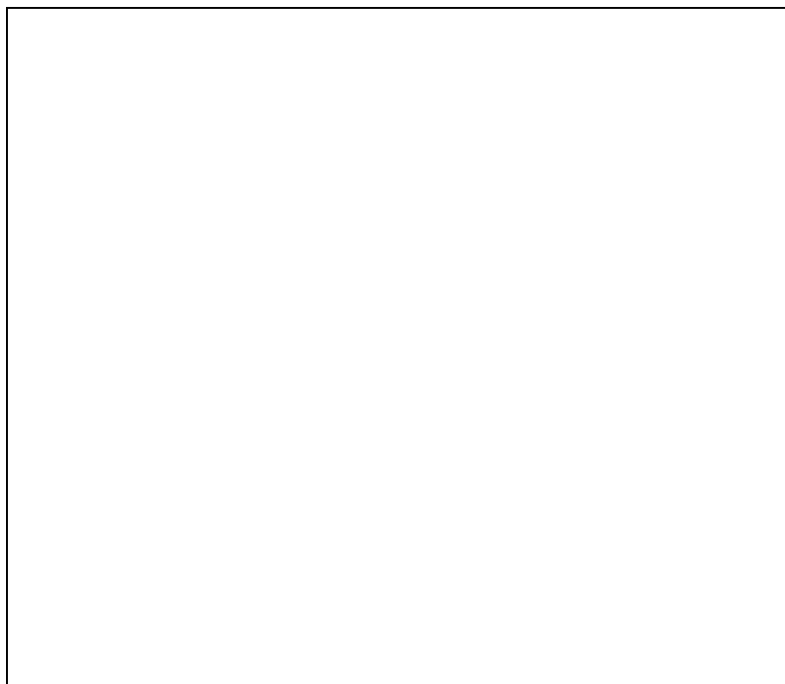


<http://download.autodesk.com/>

4. Set a key. When you play the animation, the ball travels over the fence and bounces on the other side.

If you have a fast computer, you might notice that the animation plays too fast. By default, Maya plays the animation as fast as it can be processed. Because this scene is simple, the animation might play faster than the default film rate (24 frames per second).

Do not be concerned that the animation plays with halting or jerky motion. When you render all the frames of your animation for final production, the animation will be smooth. If you want to preview the animation at the smooth production speed (or nearly so), use Window > Playblast.

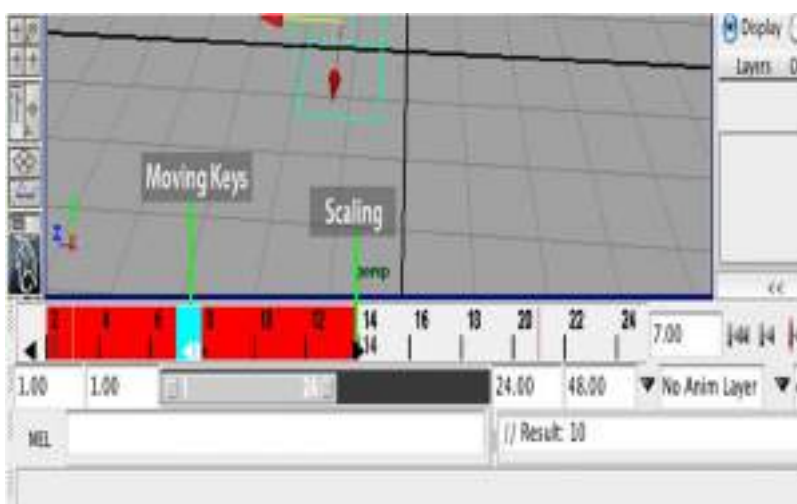


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Keyframes define "start" and "end" positions for an object and the computer fills in the rest.

A quick way to key an object is to select it and press S. Pressing S will set all the attributes of a particular object. If you would like to set an individual key, right click the property in the channel box and select "Key Selected".

When an object is selected, every frame that contains Key information for that object will have a red bar in it.



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For some quick and dirty editing of keyframes, you can select them in the timeline by holding shift and click-dragging the mouse across your desired area. It will be highlighted in red.

At this point, you can move and scale the keys with the arrows. There are also options such as "Delete Key" when you right click on the red area. Beware of scaling keys this way. If a key is scaled and lands between frames, your animation will not be very precise since it rounds your keys to integer values. A much better way to edit keys is through the graph editor.

Exercise

Animate the translate value of a sphere and add in between keys to make the sphere up in the middle.

Assessment

Fill in the blanks

1. Maya creates motion between the positions. By default, animation plays in a loop from frame 1 to _____.
2. Keyframes define "_____ " and "end" positions for an object and the computer fills in the rest.
3. If you want to preview the animation at the smooth production speed (or nearly so), use Window > _____.
4. Pressing S will set all the attributes of a particular object. If you would like to set an individual key, right click the property in the channel box and select "Key _____".

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the following:

1. Translate and rotate
2. Scale and colour

Part B

Discussed in class the following:

1. Describe the word tangents?
2. How to set keyframes to make the ball bounce

Part C

Performance standards

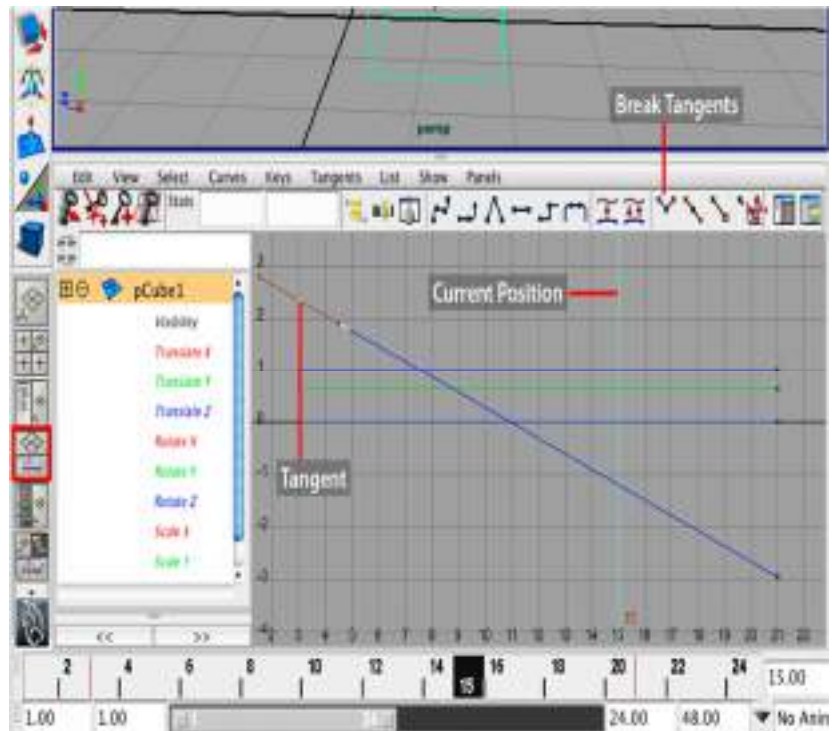
The performance standards may include, but not limited to:

Performance Standards	Yes	No
Set keyframes to make the ball bounce		

Session 3: GraphicEditor

In this session, you will learn about Graphic Editor and editing animation curves using graphic editor.

RelevantKnowledge



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This is your graph editor. It displays all information about the selected object in graph format.

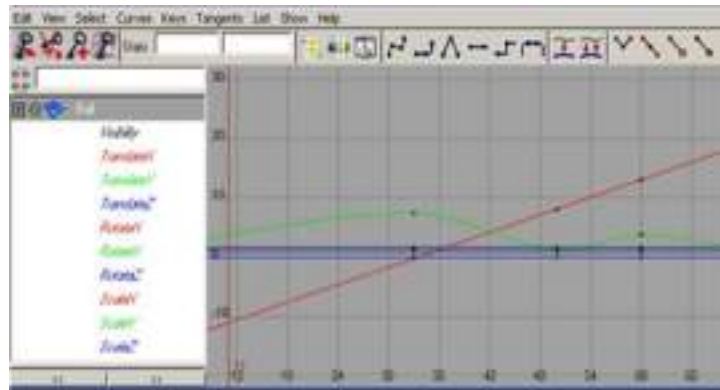
You define the "end points" of the movement, but how does the computer fill in the blanks? Answer: curves. Because there are curves, you can edit their curving behaviour.

Here you can move keys, scale them; edit the curve tangents, etc. You can break tangents to make sharp changes in direction (i.e. a ball hitting the ground).

To move around in the graph editor, you use the same controls as in the perspective view, which are listed below just in case you have forgotten * **Zoom**: Scroll the middle-mouse button * **Pan**: Command+Middle-mouse button * **F**: Focus in on the currently selected keyframes

To edit animation curves using the Graph Editor

With the ball selected, select Window > Animation Editors > Graph Editor.



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The Graph Editor displays several *animation curves*, one for each keyable attribute of the ball. The animatable attributes for the ball are listed in the left column. Specifically, it displays the attributes of the selected transform node of the ball.

Each curve graphs how an attribute changes value during the animation. The column of numbers at the left represents attribute values that can be animated, while the row of numbers at the bottom represent time (frame) values. At each point on the curve, you can see the value of an attribute at a particular time. The small black squares on the curves represent points where you've set keys.

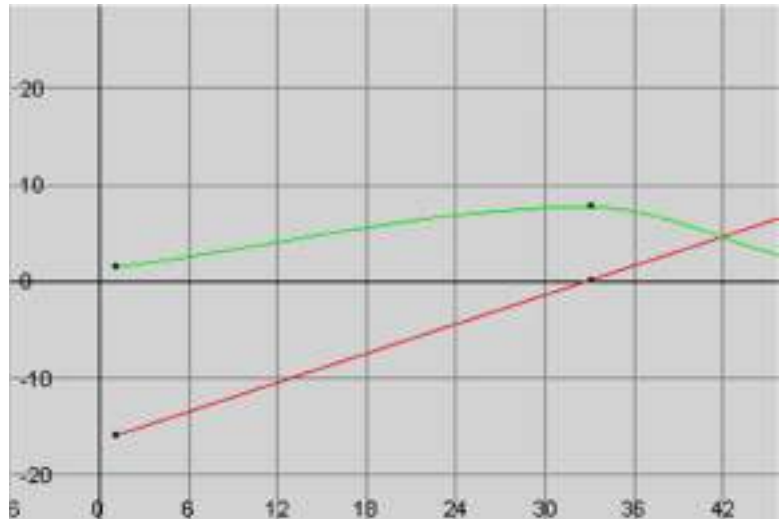
Shift-Select only the Translate X and Translate Y attributes in the left column of the Graph Editor.

Now only the animation curves for Translate X and Translate Y appear in the Graph Editor.

This simplifies the display. With too many curves present, it's hard to see specific curves. When you use the Graph Editor, you usually focus on one or a few curves.

To centre the display of the animation curves, select View > Frame Selection (in the Graph Editor window). If you want to see more detail in the graph, use your mouse to dolly and track the graph view.

The green curve represents Translate Y, while the red represents Translate X. The colour of each curve matches its attribute name. This colour scheme is consistent throughout Maya for X, Y, and Z (red, green, blue).



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If you have never used a graph editor before, the relationship between a curve's shape and the animation it represents might be hard to understand. With experience, you will quickly recognize how curve shape affects animation.

In the above graph, the straight curve of Translate X indicates that the ball moves horizontally across the ground at a constant rate overtime.

The wavy curve of Translate Y indicates that the ball increases its height steadily until frame 33, dips more quickly until frame 50, then rises and dips again until frame 72.

When the ball first bounces off the ground at frame 50, it seems to float and slip rather than rebound. The shape of the Translate Y curve illustrates why. Near frame 60, the curve is soft and rounded. The Translate Y values gradually decrease to the low point then gradually increase. The transition from decreasing to increasing values is smooth.

The Graph Editor's usefulness lies in the fact that you can edit the shape of the animation curves to edit the animation of any keyed attribute. To create a sharp bounce, you can edit the curves so that the transition from decreasing to increasing values is abrupt at frame 50. Specifically, you'll create a corner at that key point rather than a rounded curve.

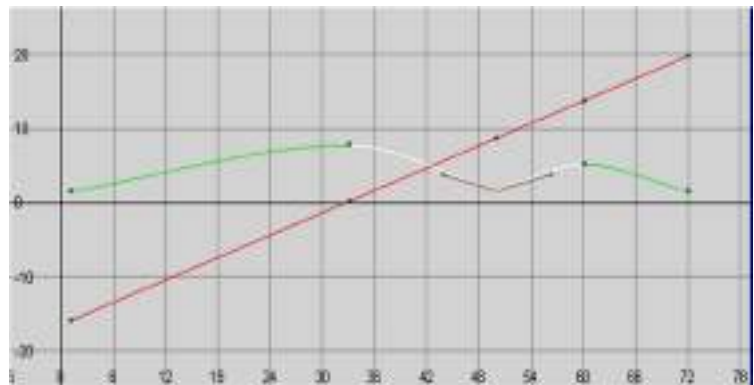
Select the point on the Translate Y (green) curve at frame 50. This causes a pair of tangent handles to appear at the point. Each end point of the newly displayed straight line is a tangent handle. The handles let you control the curvature near the key point.

Animation curves have a few control structures for curve editing. You can do any of these operations:

- a. Use the Move tool and middle mouse button to move a key point. You can alternatively use your keyboard to enter precise values for a selected key's frame and value in the boxes above the graph area.
- b. Use the Move tool and middle mouse button to drag the tangent handles and change the adjacent curvature. (You can shift-drag with the Move tool to constrain a move operation to a single direction.)
- c. Use the Scale tool and middle mouse button to scale selected key points closer together or further apart.
- d. Use the Graph Editor's Tangents menu items to change the adjacent curvature. This is the operation you'll use in the next step.

In the Graph Editor, select Tangents > Linear.

1. This changes the curvature around the key point from rounded to cornered. Specifically, the setting you select specifies how the key point tangent handles lie at this key point. This affects the type of interpolation between key points.

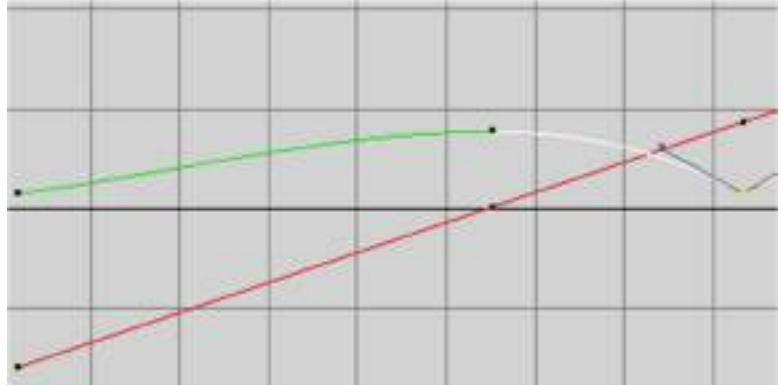


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2. Play the animation and you will see the ball bounce more sharply. To sharpen the bounce more, you need to edit the positioning of the tangent handle to steepen the curvature approaching the key point.
3. Select one of the tangent handles.
4. Use the Move Tool and the middle mouse button to drag it upwards a little so you can see how the curvature at the key point changes. By default, when a pair of tangent handles shares a key point, they work as a unit. Move one and you move the other in an opposing direction. This is often desirable in an animation curve, because it ensures the curvature at that point stays symmetrical. Symmetrical curvature often helps prevent unusual animation shifts. In this case, however, you want to steepen the curvature's approach toward the curve point in the same direction on

both sides. You therefore need to break the symmetrical interdependency between the two tangents.

5. Undo your previous move of the tangent handle.
6. Select the key point at frame 50 (not a tangent handle).
7. In the Graph Editor, select Keys > Break Tangents. This lets you move each tangent handle independently.
8. Select the right tangent handle and use the Move Tool to move it up a little. Do the same for the left tangent handle? Be careful not to select the keypoint.



This sharpens the bounce to simulate the effect of gravity and elasticity.

Exercise

Use graph editor to adjust the timing and weight of the previously done animation.

Assessment

Fill in the blanks

1. The Graph Editor displays several _____ curves, one for each keyed attribute of the ball.
2. The Graph Editor's usefulness lies in the fact that you can _____ the shape of the animation curves to edit the animation of any keyed attribute.
3. To create a sharp bounce, you can edit the curve so that the _____ from decreasing to increasing values is abrupt at frame 50.

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the following:

1. Tangent line and secant line
2. Tangent and slope to a tangent

Part B

Discussed in the class the following:

1. What is a graph editor
2. Describe the words tangents and linear.

Part C

Performance standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Demonstrated the knowledge of editing animation curves using the Graph Editor		

Session 4: Creating a Bouncing Ball

In this session, you will learn about the representation of different bouncing balls. You will also learn to use the middle mouse button.

Relevant Knowledge

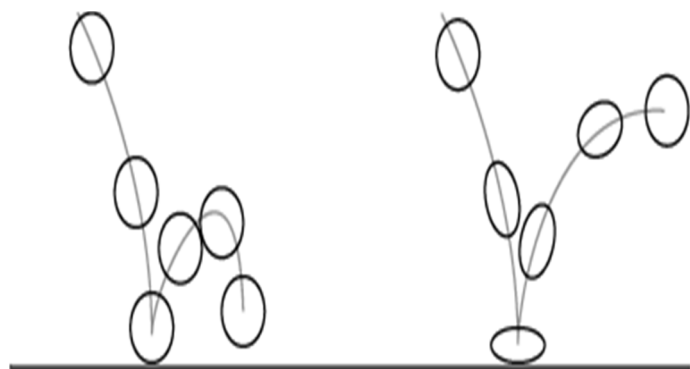
We could easily go through each button and short cut, but it is probably best to explain how to do things using an example.

You begin this lesson by placing in the basic key frames of the ball bouncing up and down. Then, you progress to having the ball move from one side of the screen to the other. Next, you layer in the rotations of the ball and end with the squash and stretch.

The bouncing ball exercise is a good place to start, because there aren't too many controller states to use in a 3D application and because it deals primarily with basic movement. You should have a good idea of what a bouncing ball looks like. Before beginning this exercise in Maya, it is best to look at a 2D drawing of what a ball actually looks like when it bounces.

Take for example a bouncing ball. A rubber ball bounces higher and squashes more upon impact than a hard league ball. The ease with which an object squashes and stretches defines the rigidity of the material making up an object. We will be imitating a rubber ball.

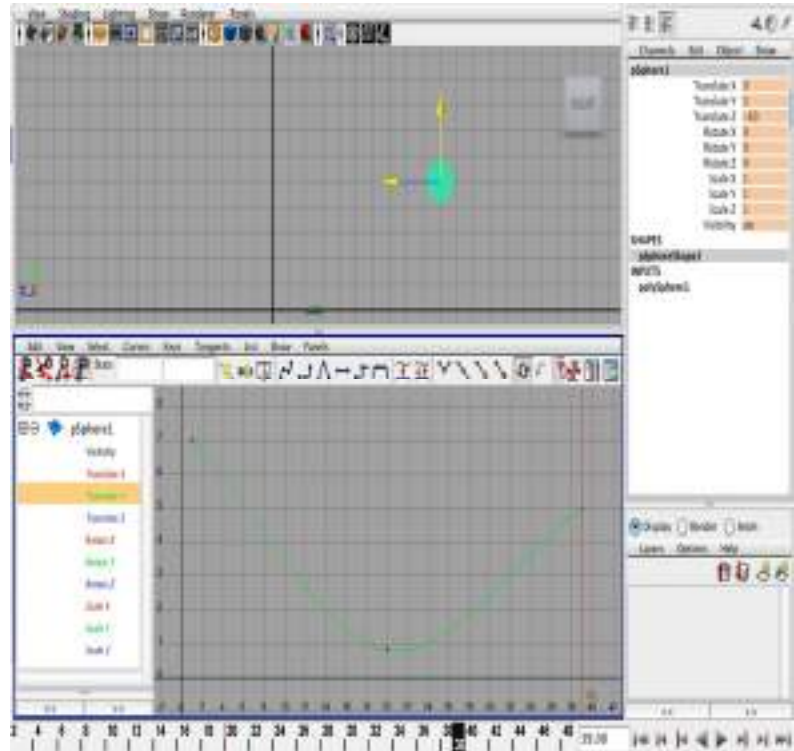
First create a ball by creating a simple polygonal sphere. If you do not remember how to do this, please refer back to the Introduction to Maya tutorial.



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You can change the view of the top panel to "side" view for the purposes of the exercise by going to Panel > Orthographic > Side.

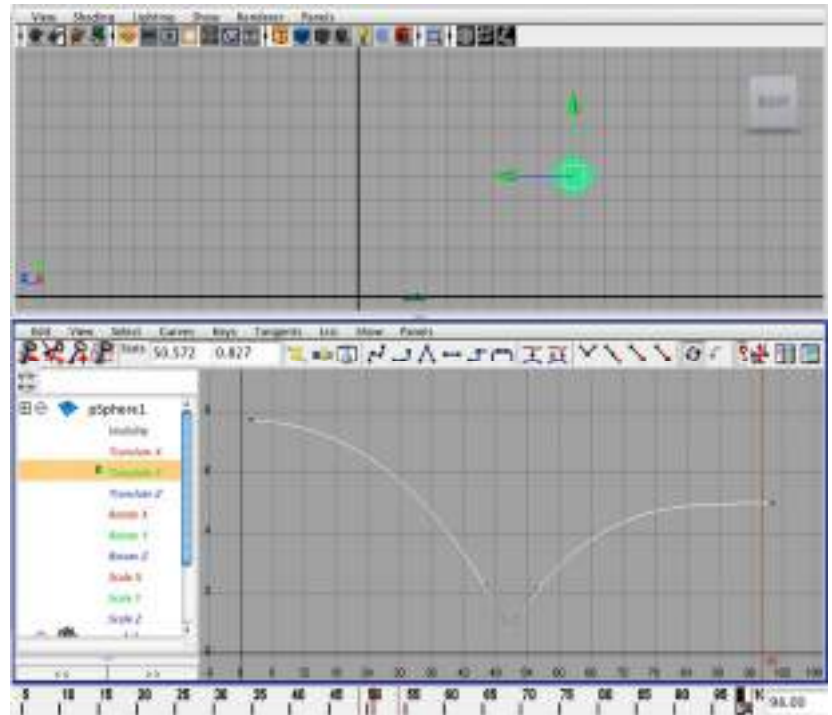


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To set the ball bounce, you can set three keys: high, low, and high. You position the ball where you want (either by moving with the

movetoolorbychangingvaluesinthechanneleditor)attheframe you would like (by selecting that frame on the timeline) and then hitting "S" to set key. For this exercise, it is best to place the keys over a span of about 100 frames to have the ball move more slowly for viewing purposes.

Looking at the graph editor, we can see the curves made by the computer are incorrect! Balls do not slow as it approaches the place it hits.



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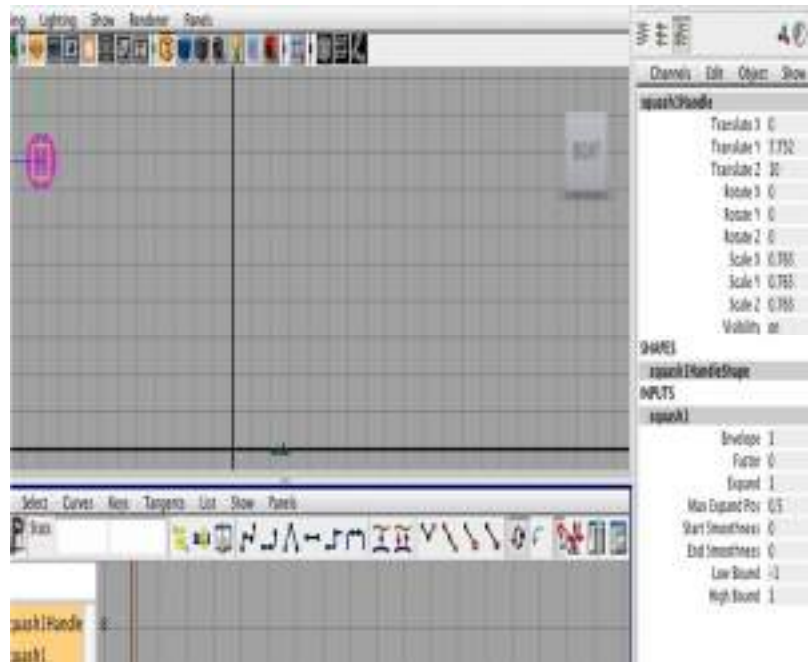
This is better! Let's see how we get our graph to look like this. As we see, the up and down movement of the ball is determined by the y-axis of the graph. We can view just this by selecting "Translate Y" in the graph editor.

We now must change the tangent angle of the low position. You do this by left-clicking the bottom point and selecting the "Break Tangent" button. This will separate the tangent line in two so the two sides are independently controlled. Select the endpoint of one side of the tangents, hit the **W** key (for the move tool) and use the **middle-mouse-button** to change the steepness of that angle. Do this for the opposite whisker. You can leave the two high points as they are, or adjust the angle **without** breaking the tangent of those as well.

You can now try hitting the "Play" button on the timeline to see what your ball looks like.

We can take this one step further by adding a deformer to the ball to create the "squash and stretch" attribute a rubber ball has. To do this, select "Animation" from the menu drop down, go to Create

Deformer > Nonlinear > Squash. Right now, the deformer is not attached to the ball so if you try to change its values it will not do exactly what we would like. In order to attach the deformer to the ball, we must first select the deformer in the outliner, command-click the ball, then go to Edit > Parent in the menu bar.



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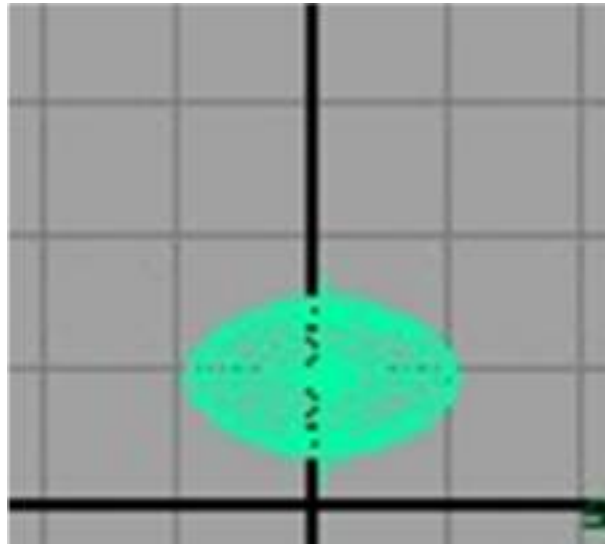
Now that we parented the deformer, we can see in the channel editor that the "squash" input is now available by clicking "Squash". If you select "Factor", you can play with the deformer in perspective view by moving the mouse while holding the middle-mouse-button.

In the first high position, we know that the ball will be (for the most part) a perfect sphere. At the initial frame position, we should right-click "Factor" and click "Key Selected".

Now go a few frames before the ball hits the low point and have the ball be taller.



Once the ball hits the bottom, it will be squashed.



You can repeat the steps for the following side, just in the opposite order.

You may notice that because of the squash, our ball no longer touches the ground! We easily fix this by going into our graph editor, left clicking the point, hitting W, and then using middle mouse button to move the point down.

Your ball bounce should now look something like this. We can now do even cooler things with the ball bounce.

Exercise

1. Create a bouncing ball animation.
2. Create three spheres and animate them separately, showing different weight.

Assessment

Fill in the blanks

1. Tangent angle of the low position can be changed by _____ -clicking the bottom point and selecting the "_____ Tangent" button.
2. To create the "squash and stretch" attribute, adding a deformer to the ball is to be done. To do this, select "Animation" from the menu drop down, go to Create Deformer > _____ > Squash.
3. Now that we parented the deformer, we can see in the channel editor that the "_____" input is now available by clicking "Squash". If you select "_____", you can play with the deformer in perspective view by moving the mouse while holding the middle-mouse-button.
4. In the first _____ position, we know that the ball will be (for the most part) a perfect sphere. At the initial frame position, we should right-click "_____" and click "Key Selected".

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

Differentiated between squash and stretch.

Part B

Discussed in class the following:

Describe the steps of creating a bouncing ball.

Part C

Performance standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Demonstrated the knowledge of creating bouncing balls through animation		

SECTOR: MEDIA AND ENTERTAINMENT

Module 3:

Camera and Motion Path Animation

**Student Workbook
(Class XII)**

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SESSION 1: CREATING CAMERAS

SESSION 2: ANIMATING THE CAMERA

SESSION 3: NORMAL

SESSION 4: CREATING A PATH ANIMATION

Introduction

Camera and Motion Path Animation

In this unit, we will discuss about the creating and animating camera, normal and motion path animation.

Camera animation is very important thing for an animation movie, because there is no sense of making an animated movie with a static camera, as cinematography said.

There are exciting camera angles, cut and transition in a movie is of the same importance as the animated character when animation is nothing but an art of good storytelling.

From this unit, you will learn how to use a camera according to a path, which will help you to communicate the audience better.

There is also a session about path animation, which will help you to animate any object according to a specific path decided by the animator. You can always modify the path later, when required.



Session 1: Creating Cameras

In this session, you will learn about the cameras and its functions. You will also learn about the path animation.

Relevant Knowledge

Create > Cameras > Camera

There are three types of perspective cameras in Maya. As with Maya's lights, you can change a camera to any other camera type in the Attribute Editor.

Camera

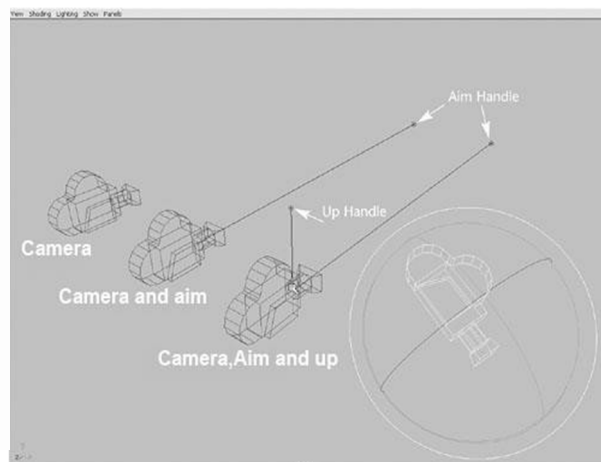
With this camera type, you see only the camera icon. In general, because this camera freely rotates and loses track of its "up" vector, you should use it only when you're linking the camera to another object for movement and animation, or when you are placing a camera in one fixed spot.

Camera and Aim

This camera includes a camera target and an aim handle for adjusting the camera target. In addition, this camera automatically stays level in relation to the horizon, so it is the one you will use most often. You can make this camera roll if you want, but by default, it stays level except at extreme straight-up or straight-down orientations.

Camera, Aim and Up

This camera type includes two handles: the aim handle, described for Camera and Aim, and an up handle for banking (levelling) the camera. This camera type is useful when you want to bank the camera during your animation.



<http://www.expertrating.com/>

Camera Settings

These are the key settings for cameras under the **Camera Attributes** section:

<http://www.expertrating.com/>

Camera Attributes

A camera's attributes describe various properties of the camera, including angle of view, focal length, and depth of field.

Controls In this drop-down list, you can quickly select the camera type you want.

Angle of View and Focal Length: It controls the amount of perspective exaggeration. Raising the angle of view attribute lowers the focal length attribute.

Camera Scale: You can change the **camera size** in relation to your scene, which affects scene objects when you render. Camera Scale is like a multiplier for the Angle of View setting. For example, decreasing Camera Scale to 0.5 halves the camera's view area, but makes objects in the scene look twice as large.

Clip Planes: Only objects located within the values specified for the camera's clip planes appear in the scene. If distant objects are not showing up in your scene, raise the Far Clip Plane value. If nearby objects seem to be appearing in cross-section or not appearing at all, lower the Near Clip Plane value.

Depth of Field Enable: The distance blurs with this attribute. It can be a render-intensive effect, but yields a nice cinematic result because objects close to and far away from the focus point are progressively blurred. You can view the calculated distance of the camera from the object and apply that value to the Focus Distance for the camera to achieve Depth of Field.

Background Colour: The background fill colour for images rendered from this camera; you can also use this section of the Attribute Editor to add an image or shader as the background.

Orthographic Views

Orthographic views are two-dimensional views of three-dimensional objects. Orthographic Projection is a way of drawing an 3D object from different directions. Usually a front, side and plan view are drawn so that a person looking at the drawing can see all the important sides. Orthographic drawings are useful especially when a design has been developed to a stage whereby it is almost ready to manufacture. There are two ways of drawing in orthographic - First Angle and Third Angle. They differ only in the position of the plan, front and side views. Below is an example of First Angle projection. You can create perspective cameras, rotate them into position, and then set them to orthographic to get a "flat" view for projecting textures onto an object.

Path animation allows you to animate an object along a path specified by a curve. In this way, the curve controls the motion of the object. With path animation, the motion for the object is defined by its location along the path curve.

Path animation is useful for animating objects such as trains, boats, airplanes, and moving cameras whose motion follows a set path. To animate an object to do this type of motion smoothly with keyframe animation would require you to laboriously create and edit many keys for the motion. By having the object move along a curve, you can easily adjust the object's path by editing the curve.

Exercise

1. Open one of your previously created scenes. Create a) camera, b) camera and aim, c) camera, aim and up.
 2. Make a chart differentiating the properties of these three camera options.
-

Assessment

Fill in the blanks

1. Attributes of camera include angle of _____, focal _____, and depth of field.
2. There are two ways of drawing in orthographic- _____ Angle and Third Angle.

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the following:

Angle of view and focal length.

Part B

Discussed in class the following:

What are the camera's attributes?

Part C

Performance standards

The performance standards may include, but not limited to:

Performance Standards	Yes	No
Demonstrate the use of camera settings and attributes in Maya		

Session 2: Animating the Camera

In this session, you will learn about the process of animating the camera, parametric length. You will also learn in detail about path animation.

Relevant Knowledge

When you first begin animating the camera, it helps to follow the rules of videography, such as avoiding jarring camera motions—rapid pans, zooms, or rotations of the camera. In addition, you should usually give the camera the impression of having mass.

The virtual camera, by default, starts and stops moving instantly, which looks unrealistic and abrupt to viewers. To avoid this problem, adjust the tangents for the camera position's start and stop keys in the Graph Editor so that motion begins and ends gradually. Do the same for the camera's aim point keys and any other animated camera attributes

Animate > Motion Paths > Attach to Motion Path

Places and links the selected object to the current curve. The current curve becomes the motion path.

Animate > Motion Paths > Attach to Motion Path >

Opens the Attach to Motion Path Options.

Start Time

Specifies the start time of the motion path animation. Only available when Start or Start/End in Time Range is on.

End Time

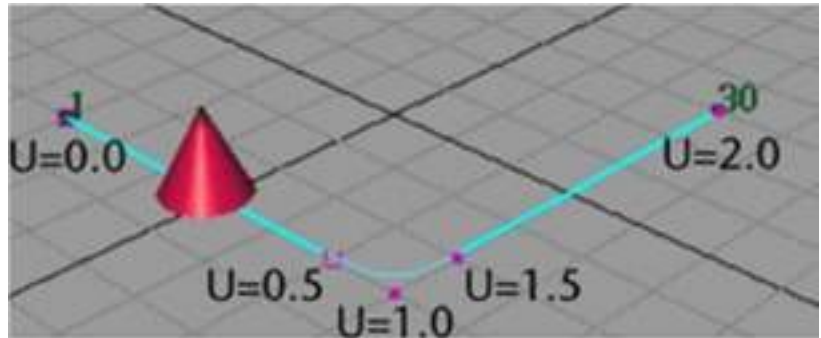
Specifies the end time of the motion path animation. Only available when Start/End in Time Range is on.

Parametric Length

Specifies the method Maya uses to position an object as it moves along a curve. There are two methods: the parametric space method and the parametric length method.

In the parametric space method, the markers represent positions in the U-parameter space of the curve. In the parametric length method, the markers represent positions as a percentage of the total curve length. The parametric length method is also known as the “fraction mode” method because the evaluation of the path is based on a fraction of the length of the path curve.

To understand the difference between the two methods, consider a curve that has uniform parameterization and unevenly spaced CVs.



<http://help.autodesk.com/>

The curve above was created with five CVs and uniform knot spacing. The beginning of the curve is at $U=0.0$ and the end of the curve is at $U=2.0$. The cone was animated with path animation from time 1 to 30.

If the path animation for the cone is created with the parametric length method, the cone will move evenly along the curve from times 1 to 30.

If the path animation for the cone is created with the parametric space method, the cone moves quickly from the first to the second CV, then slowly through the second to fourth CV, then quickly again from the fourth to fifth CV. This is because the second and fourth CVs are positioned at approximately $U=0.5$ and $U=1.5$ parameterization points of the curve. These points take up half the total parameterization of the curve.

In parameter space, the object moves smoothly from $U=0.0$ to $U=2.0$. In world space, there is little movement of the object from (roughly) times 8 to 23, which coincide with the large parameter distance that must be covered in the correspondingly small curve length.

The advantage of using the parametric space method is that if you have spent time adjusting the timing of the object's movement along the curve, CVs can be added to the beginning or end of the curve without affecting the timing of the motion on the existing part of the curve.

The advantage of using the parametric length method is that it is easy to obtain smooth timing of the object's motion without having to insert timing markers to refine the timing of the object along the path curve.

Turning off Parametric Length selects the parametric space method. Turning on Parametric Length selects the parametric length method

Follow

If on, Maya computes the object's orientation as it moves along the curve. It is on by default.

Maya uses a front vector and an up vector to compute the orientation of the object. Maya aligns the object's local axes with the front vector and the up vector so that it knows how the object should be pointing upwards and frontwards as it moves along the curve.

At any point along the curve, the front vector aligns with the tangent to the curve, pointing in the direction of movement. The up vector is perpendicular to the tangent, but you must still tell Maya which perpendicular direction from the tangent is the up direction that you want. To do so, you specify a world up vector with which the up vector aligns. Use the **World Up Type**, **World Up Vector**, and **World Up Object** options to specify the world up vector.

You need to tell Maya which of the object's local axes should be aligned with the front vector, and which should be aligned with the up vector. To view the object's local axes, select the object and select **Display > Component Display > Local Rotation Axes**. Next, specify which local axis aligns with the front vector with **Front Axis**. Also specify which local axis aligns with the up vector with **Up Axis**. Finally, you specify the type of world up vector (**World Up Type**) with which the up vector itself aligns.

The world up vector gives you the ability to control what the up vector considers to be the up direction. One benefit of this is that you can correct any sudden flipping problems as the object moves along the curve. For example, you can have the world up vector be the local axis of some other object such as a locator. You can then directly control the orientation of the world up vector by manipulating the locator.

Tip: When attaching an aimed camera to a curve as a motion path, turn off the Follow option.

Front Axis

Specifies which of the object's local axes aligns with the front vector. This specifies the frontward orientation of the object as it travels along the curve.

X aligns the local X axis with the front vector, specifying the X axis as the forward-facing axis of the object.

Y aligns the local Y axis with the front vector, specifying the Y axis as the forward-facing axis of the object.

Z aligns the local Z axis with the front vector, specifying the Z axis as the forward-facing axis of the object.

Up Axis

Specifies which of the object's local axes aligns with the up vector. This specifies the upwards orientation of the object as it travels along the curve. The up vector aligns with the world up vector specified by the **World Up Type**.

X aligns the local X axis with the up vector, specifying the X axis as the upward facing axis of the object.

Y aligns the local Y axis with the front vector, specifying the Y axis as the upward facing axis of the object.

Z aligns the local Z axis with the front vector, specifying the Z axis as the upward facing axis of the object.

World Up Type

Specifies the type of world up vector that the up vector aligns with. Selections include **Scene Up**, **Object Up**, **Object Rotation Up**, **Vector**, and **Normal**.

Scene Up

Specifies that the up vector try to align with the scene's up axis instead of the world up vector. The world up vector is ignored. You can specify the scene's up axis in the **Preferences** window. The default scene up axis is the world space positive Y-axis.

Object Up

Specifies that the up vector try to aim at the origin of a specified object instead of aligning with the world up vector. The world up vector is ignored. The object whose origin the up vector tries to aim at is called the world up object. You can specify the world up object with the **World Up Object** option. If no world up object is specified, the up vector tries to aim at the origin of the scene's world space.

Object Rotation Up

Specifies that the world up vector is defined relative to some object's local space instead of the scene's world space. The up vector tries to align with the world up vector after transforming it relative to the scene's world space. The object whose origin the up

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

Differentiated between the following:

Object up and object rotation up

Part B

Discussed in class the following:

1. Object RotationUp
2. ObjectUp
3. SceneUp

Part C

Performance standards

The performance standard may include, but not limited to:

Performance Standards	Yes	No
Demonstrate the knowledge of application of concepts and processes in camera		

Session 3: Normal

In this session, you will learn about the normal, world up vector, world up object and bank scale.

Relevant Knowledge

Normal

A normal is a theoretical line, perpendicular to the surface of a polygon. In Maya, normals are used to determine the orientation of a polygon face (face normals), or how the edges of faces will visually appear in relation to each other when shaded (vertex normals).

Face Normal

The front of a polygon's face is graphically represented using a vector called the polygon's normal. The order of vertices around the face determines the direction of the face (whether a side of the polygon is the front or the back). For example, if you place vertices in a clockwise direction, the face normal points downward. If you place vertices in a counter-clockwise direction, the face normal points upward. When you shade or render polygons, the normals determine how light reflects from the surface and the shading that results.

Vertex Normals

Vertex normals determine the visual smoothing between polygon faces. Unlike face normals, they are not intrinsic to the polygon, but rather reflect how Maya renders the polygons in smooth shaded mode. Vertex normals appear as lines projecting from the vertex, one for each face that shares the vertex.

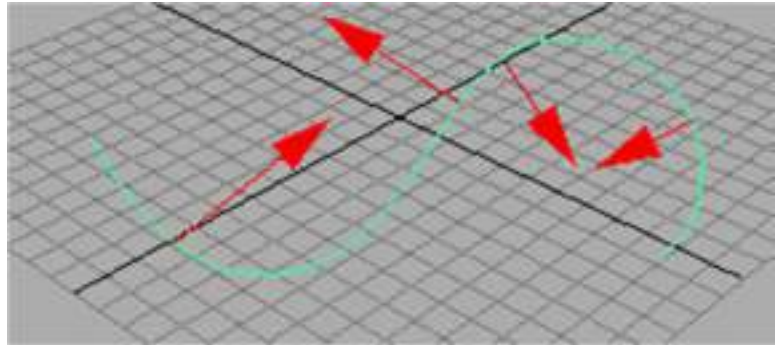
Normal in Maya are invisible unless you explicitly change your display settings to reveal them. The easiest way to see which way a model's normals are facing is to go to the Lighting menu at the top of the workspace and uncheck Two-Sided Lighting.

With Two-Sided Lighting turned off, reversed normals will appear black.

Specifies that the axis specified by Up Axis will try to match the normal to the path curve. The interpretation of the curve normal is different depending on whether the path curve is a curve in world space, or a curve on surface curve.

If the path curve is a curve in world space, then the normal of the curve is the direction that points to the centre of curvature of the curve at any point on the curve. This is best illustrated by the

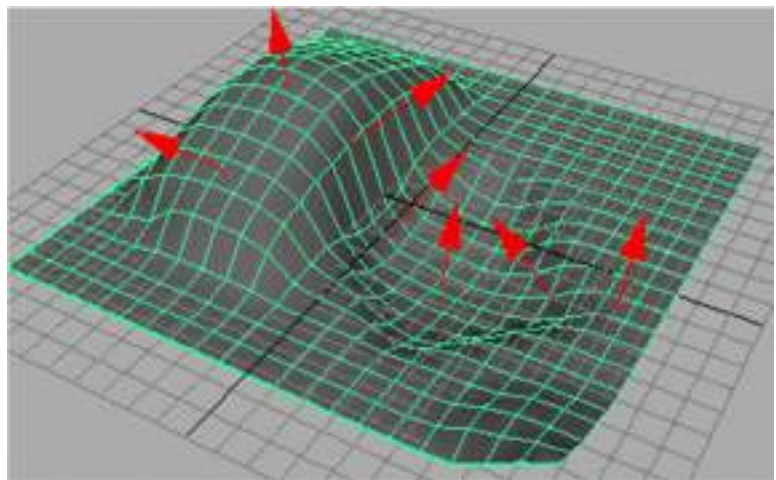
arrows in the diagram below, which indicate the normal to the curve at various points:



<http://help.autodesk.com/>

Note that the normal to a curve will flip 180 degrees when the curve changes from a convex to concave (or vice versa) shape. This makes the Normal option for the Up Direction not very desirable when using a world-space curve in your path animation.

If the path curve is a curve-on-surface, then the normal to the curve is the normal to the surface at that point on the curve. The Normal option will give the most intuitive results when the path curve is a curve-on-surface.



<http://help.autodesk.com/>

World Up Vector

It specifies the direction of the world up vector relative to the scene's world space. Because Maya's world space is "Y-up" by default, the default world up vector points in the direction of the world space's positive Y-axis (0.0000, 1.0000, and 0.0000).

World Up Object

It specifies the object the world up vector tries to align with if WorldUpType is set to ObjectUp or ObjectRotationUp. For

example, you could specify the world up object as a locator that you can rotate as needed to prevent any sudden flipping problems as the object moves along the curve.

Inverse Up

If this option is on, Up Axis tries to align itself with the inverse of up vector.

Inverse Front

Reverses the frontwards direction an object is pointing along the curve. This is especially useful when you are trying to orient a camera so that it points frontwards along a curve. For example, you have got the camera pointing backwards along the curve, but are having difficulty getting the camera to point frontwards. By clicking Inverse Front on, you can have the camera point forwards along the curve as desired.

Bank

Banking means the object will lean in towards the centre of the curvature of the curve that it travels along (like a motor cycle going around a corner). The bank option is only available if the Follow option is on, as banking also affects the rotations of the object.

The path animation automatically computes how much banking should occur depending on how curved the path curve is. You can adjust the banking using Bank Scale and Bank Limit.

Bank Scale

If you increase the Bank Scale, then the banking effects will be more pronounced. For example, if the Bank Scale is set to 2, then the object will bank twice as much as the default that is computed.

Bank Limit

The Bank Limit lets you restrict the amount of leaning. For example, the Bank Scale may be increased to obtain pronounced effects, but then this may cause the object to lean too much where the curve is much curved. This option will limit the leaning to the given amount.

Note

You can enter a negative number for Bank Scale. This will cause the object to lean out, away from the centre of the curvature of the curve, rather than in towards the curvature. For example, you could use this in animating a character thrown from side to side in a roller coaster.

Exercise

1. Animate the bank value of the previous exercise.
2. Note down the U and Bank values with respect to the time.

Assessment

Answer the following questions

1. A normal is a theoretical line, _____ to the surface of a polygon.
2. In Maya, normals are used to determine the _____ of a polygon face (face normals), or how the faces will visually appear in relation to each other when shaded (vertex normals).

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between face normal and vertex normal.

Part B

Discussed in class the following:

What is normal?

What is the difference between face normal and vertex normal.

Part C

Performance standards

The performance standard may include, but not limited to:

Performance Standards	Yes	No
Demonstrated the knowledge of face and vertex normals		

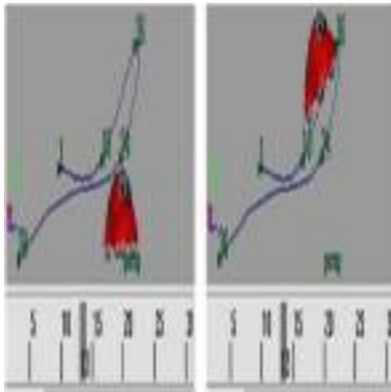
Session 4: Creating a Path Animation

In this session, you will learn how to create a path animation.

Relevant Knowledge

A path animation controls the position and rotation of an object along a curve. A NURBS curve cannot be designated as a motion path. An object must first be attached to the curve for it to become a path curve. You can also generate motion paths by animating objects using motion path keys.

The following procedure uses **Animate > Motion Paths > Set Motion Path Key** to create a motion path animation. Alternately, you can also use **Animate > Motion Paths > Attach to Motion Path** to create motion path animation.

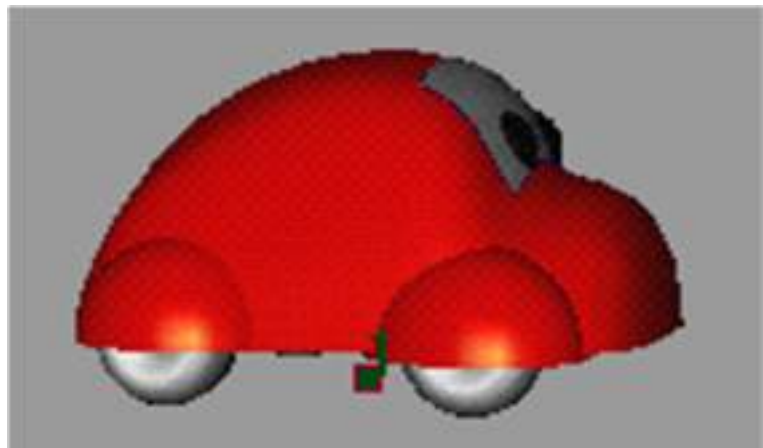


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To create a path animation

1. Select the object you want to animate with the motion path and move it to its starting position.
2. Set the current time to the start time of your path animation.
3. Select **Animate > Motion Paths > Set Motion Path Key**.

A single-CV curve is created with a position marker at the time specified start time.

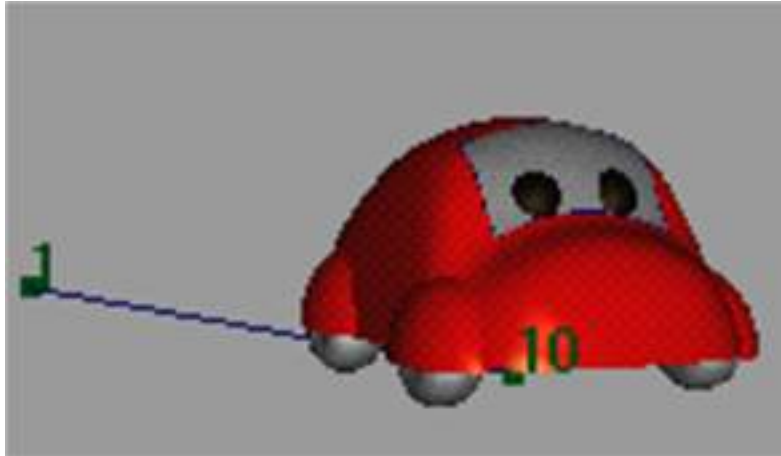


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Increase current time and move the object to a new position.

Select **Animate > Motion Paths > Set Motion Path Key** again.

A single-span curve is drawn from the marker at the start time to the current position of the object, where a new marker is placed.



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Continue changing the time and position by selecting **Animate > Motion Paths > Set Motion Path Key** for as long as you wish to animate the object's position.

The time at which the last motion path key is set is end time of your motion path animation.

Note that once you have created a path animation using the **Animate > Motion Paths > Set Motion Path Key**, you can use all of the other path animation tools as described in the previous sections to refine the basic path animation.

Similarly, you can select the object that was animated along a pre-existing path curve, and extend the length of its animation (and thus the path curve) by using **Animate > Motion Paths > Set Motion Path Key**.

Tip

If you decide you don't like the position of the object at a particular marker time, then change the current time to that marker's time, and move the object to its new position. Select **Animate > Motion Paths > Set Motion Path Key**, and the shape of the curve will change so that the marker is now at the object's new position.

You can change the shape of an existing path curve by changing the current time, moving the object to a new position, and selecting **Animate > Motion Paths > Set Motion Path Key**. An example of animation before and after this menu item follows:

Exercise

1. Create a low poly car, and attach it to a motion path.
2. Adjust the speed and bank value according to the path.
3. Note down the U and Bank values.

Assessment

A path animation controls the _____ and rotation of an object along a curve.

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity.

Part A

Differentiated between the following:

Creating a motion path by attaching an object to a curve and creating a motion path by using motion path keys.

Part B

Discussed in class the following:

1. How to position the object on a path curve?
2. How to animate an object along a surface?

Part C

Performance standards

The performance standard may include, but not limited to:

Performance Standards	Yes	No
Demonstrate the knowledge of employing techniques to create a motion path by attaching an object to a curve		

Glossary

2D Animation	The rapid display of a series of drawings in a two-dimensional environment, such as through traditional cel animation or via animation software. The illusion of motion is achieved by slight progressive changes in each drawing or "frame."
3D Animation	The animation of objects in a three-dimensional, digital environment.
Active listening	It is a process of analyzing and evaluating what another person is saying in an effort to understand the true meaning of the message.
Animation	The process of creating a progressively altering image that gives the appearance of continuous motion.
Anticipation	Anything a character does to prepare for an action; a device to prepare the viewer for the action. For example: pulling your character's arm back before he punches someone in the face.
Aspect Ratio	The ratio of the width to height for any frame or film format, used when discussing screen size standards such as a 4:3 aspect ratio for web or television, or 16:9 for widescreen. (A 4:3 ratio would be a 640 x 480 pixel-sized Flash document.)
Autodesk Maya	It is commonly shortened to Maya, it is 3D computer graphics software that runs on Windows, Mac OS and Linux.
Cel ("Celluloid")	A cel is a transparent sheet of plastic upon which traditional animation artwork was transferred, laid over a background and filmed. Early cel animation was done on nitrate cels, which were highly flammable. Safer and more durable acetate cels became the industry standard.
Driven keys	Driven Keys are used to drive the attributes of one object to another object.
Effects animation	The animation of non-character elements such as explosions, smoke and rain.
Ergonomics	An applied science that studies the interaction between people and the work environment. It focuses on matching the job to the worker.
Extremes	Poses at the extreme end of any motion.

Frame	A single image out of the sequence comprising an animation.
Frame Rate	The measurement of the number of consecutive images (frames) in an animated movie. Framerate is most commonly expressed in frames per second (FPS).
Health	The World Health Organization has defined health as more than just the absence of disease. Rather, it is a state of complete physical, mental and social wellbeing.
In-Between(or "Tween")	Successive frames of animation added between key poses to create fluid transitions. Flash software features "shape tweening" and "motion tweening" processes, whereby the user defines two key frames, and in-between frames are automatically generated
Joints	Points of articulation between the bones in a character rig.
Key Frame	A single still image representing a key pose in an animated sequence.
Layout	The art or process of arranging printed or graphic matter on a page.
Lip Sync	The process of synchronizing a character's mouth to sounds in the dialogue soundtrack to give the illusion that the character is speaking or generating sounds.
Melting Point	The temperature at which a solid changes to a liquid. For mixtures, a range of temperatures may be given.
Model sheets	Model sheets are also used for references in 3D modelling. It usually is used as reference material so as to allow proper proportions in 3D modelling.
Ones, Twos and Threes	Techniques for drawing fewer frames: drawing a new picture for every frame ("animating on the ones") is much more time-consuming than animating on the twos or threes. Most 2D cartoons are successfully animated on the twos, with only occasional ones.
Persistence of Vision	Phenomenon where the eye's retina retains an image for a split-second after the image was actually seen, creating the illusion of motion when viewing images in closely-timed sequence to one another.
Pivot	To cause to rotate, revolve, or turn.
Pixel	Short for Picture Element, a pixel is the smallest element of an image displayed on a monitor or TV screen. It is a single point in a raster image.
Rendering	The last step when animating by computer, rendering creates computer-generated images from a series of mathematical calculations defined by a user's specifications. To "render" a digital scene, the software program would composite the various settings as viewed by virtual "cameras" into a final image or video.
Rhythm	It is the sequence that is repeated in a period of time.
Rigging	The process of preparing a character model for animation, including setting up an underlying skeleton, complete with constraints, controllers and kinematic systems, and linking it to the mesh of the character model.
Stop-Motion Animation	Animation produced by arranging real objects, taking a picture of them, repositioning the objects minutely, then taking another picture of them to create a sequence of consecutive images that create the illusion of motion. One of the most common forms of stop-motion animation is Claymation. "Go- Motion" is stop-motion animation in which motion blur is added to each frame to reduce the staccato effect of traditional stop-motion animation.

Story Boarding	A panel or series of panels of rough sketches outlining the scene sequence and major changes of action or plot in a production to be shot on film or video.
Timeline	The frame-by-frame layout of all animation occurring in linear order from beginning to end. Timelines may be numbered by frame, by second (or other interval of time), or both.
Vector Animation	Animation whose art or motion is controlled by vectors rather than pixels. Vector animation is often cleaner and smoother because images are displayed and/or resized using mathematical values instead of stored pixel values. One of the most commonly used vector animation programs is Flash.
Vector Image	A vector-based image is made up of points and bezier curves. Vector images have no fixed size or resolution and thus scale easily.
Walk Cycle	The animation of a character's side-angle walk, which can be looped for longer walking scenes.

Suggested Reading

Books

1. Autodesk Maya UserGuide.
 2. Animating with Flash 8 by AlexMichael
 3. Macromedia Flash 8 Bible by RobertReinhardt
 4. Adobe Photoshop CS6 Bible by Brad Dayley
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PSS Central Institute of Vocational Education, Bhopal

**(a constituent unit of National Council of Educational Research
and Training, under Ministry of Human Resource Development,
Government of India)**