Animating in VR Course Instructor's Guide

(O3. Animating in Virtual Reality Course)

ANIMATION WITH VIRTUAL REALITY

AIM OF THE ACTIVITY: With the development of technology, to increase the awareness of Virtual reality applications, to provide students with awareness about animation production with "Virtual reality technology", to inform them about Virtual reality hardware and to make them aware of what innovation can add to the animation industry in terms of innovation.

LEARNING OUTPUTS: Participants;
• They will be able to see what advantages Virtual reality technology can offer in terms of content production in the animation industry.
• Increased awareness of what virtual reality technology and hardware are and their usage areas.

MATERIAL: Illustrated PDF file presentation with projector
(R1_TR_SANAL_GERCEKLIK_VE_UYGULAMA_ALANLARI.pdf)
(R1_EN_InTech_UnderstandingVirtualRealityTechnology.pdf)
(EK_1A_TR_ Sanal-Gerçeklik-Donanim ve Kurulum-Talimatlar Kilavuzu)
(EK_1A_EN_ Virtual-Reality-Setup-Instructions-and-Troubleshooting-Guide)
(**https://www.lib.ua.edu/wp-content/uploads/Virtual-Reality-Setup-Instructions-and-Troubleshooting-Guide.pdf**)

Duration: 150 mins (3 hours).

PROCEDURE:(Since the virtual reality that we use is the only type of basic hardware and software, similar expressions can be used in terms of device introduction with other virtual reality hardware lessons.)

1. To students; With the development of technology, virtual reality is said to open new possibilities in the digital world and the following narration is made behind it;

* Virtual reality, also known as "virtual reality", is a rapidly developing and popularizing technology. This technology, which is human and computer interactive, which creates Fields with computer technologies and makes them feel as if they are inside, started to be developed on the idea that human senses can be misled. Virtual reality has some basic features. The first is that, first of all, it gives its users the feeling of being real. The user should be able to go wherever he wants in this Field created by computers, that is, he should feel that the control is in his hands. This can only be achieved through interaction. Thus, the user will be able to interactively determine the destination and direction in which he is looking. It is possible to walk in computer-generated Fields by combining a number of position-tracking devices with such glasses. The sense of sight can undoubtedly be extended to include the ability to move, touch, feel the physical characteristics of the objects in the virtual Field and hear the sounds in the Field. Naturally, these possibilities are possible with some special gloves, three dimensional sound concept and similar technological tools. Of course, it should not be forgotten that the Fields mentioned are unrealistic, computer-generated worlds. In a VIRTUAL REALITY system, powerful computers are required to move in real time. Here computers will act as image creators. It will run application programs to enable access to databases of three-dimensional geometries of objects and to coordinate all the sensory sensing instruments and hardware mentioned so far. These features are necessary for us to fully experience virtual reality.
Virtual Reality, which has many application areas from the world of Entertainment-Cinema-Education to complex scientific experiments in Medicine, is a three-dimensional analogy model that gives its users the feeling of realism, and enables the opportunity of mutual communication with a 3D dynamic Field created by computers**;**

2. "R1_TR_SANAL_GERCEKLIK_VE_UYGULAMA_ALANLARI.pdf "document is opened in the projection device and information is given about the hardware and the areas of use and the verbal presentation of the vr technology. The basic hardware and features of virtual reality (using the installation booklet) are explained with the PDF presentation..

(EK_1A_TR_ Sanal-Gerçeklik-Donanim ve Kurulum-Talimatlar Kilavuzu)

(EK_1A_EN_ Virtual-Reality-Setup-Instructions-and-Troubleshooting-Guide)

During the presentation;

Virtual reality enhancements are promoted by supporting them;
Virtual reality is a set used device. Basically, it consists of headset, controllers (special joystick for vr), sensors, PC connection cables, battery, (hdmi, usb) connection cables. This set should be used by connecting to a PC capable of running its own software.

Figure 1. Virtual Reality Equipment
It is the device named HEADSET which we need to know first of its hardware. The user should use it by adjusting the sharpness according to his own eyes and adjusting the position on his head with the adjustment strips on this device.

Figure 2. OculusRift Virtual Reality Headset

Figure 3. Example of using VR Header

Then, after the user connects the sensors to the required ports and attaches the hardware cables to the connections on the pc, he connects the controllers' batteries and integrates the hardware with the pc.

Figure 4. Other equipment of VR set (sensors-Controllers-battery-adapter)

As a last step, by preparing the necessary vr software, it prepares the vr hardware.
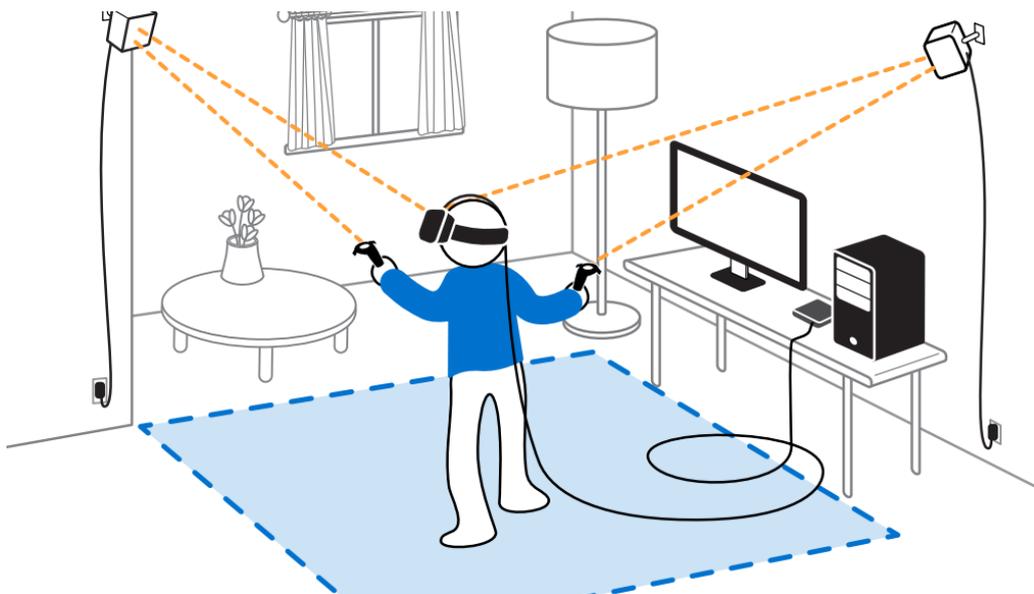
Figure 5. Basic installation form of the VR Header

After the students are informed about the general setup; Students are given brief information about the usage areas of virtual reality and their ideas about what to do in their fields are taken.

Use in education
With the education sector, which is one of the most productive areas of VR technology, distance education has become a better quality. Students' ability to comprehend the lessons practically with the created Field has facilitated lessons such as physics and geography where three-dimensional Fields are important.

Use in the field of health
One of the first and most important uses of virtual reality technology is the health sector. With the three-dimensional presentation of the human body, practical gain increased in various and especially risky surgical applications.

Use in architecture
The use of virtual reality technologies is also very important in the architecture and construction industry, which is one of the areas where Figureity is the most necessary. This technology, which will provide customers realistically ready to use the houses that are still under construction, to enable customers to move around the rooms of the house, provides many facilities for the construction industry.

Use in the field of Culture and Tourism
It is now possible to present natural beauties, historical places and museums in a 3-dimensional and realistic Field with virtual reality technologies without going to the place where they are located. The fact that it is an application that can be very useful in promoting countries abroad increases its importance in this sector.

Use in the entertainment field
In the entertainment industry, which is the most widely used area of VR technology, games, movies, various broadcasts can be developed in a way that enables the user to feel really in that Field with virtual reality glasses. It would not be wrong to say that one of the sectors that adapt fastest to virtual reality technology is the entertainment industry..

In order to understand how much knowledge and experience they have about students' readiness with "VIRTUAL REALITY" technology; "Whether they have experienced Virtual reality game or application in any way before and what kind of applications they have tried" are asked and based on these experiences, they are asked how they can use "Virtual Reality" in the animation area and feedback is received. (Considering that they learned animation in previous periods)

At this stage, students are asked to discuss whether virtual reality can be used for auxiliary, developer purposes in areas such as modeling, animation and rigging that they have previously learned.

ACTIVITY 2(2. WEEK)

ACTIVITY NAME: Installing Virtual Reality and Animation Software and Introducing the Hardware

OBJECTIVE: To provide students with a physical understanding of VR Hardware and to understand how to install and install VR software to be used in VR Field.

LEARNING OUTPUTS: students;
• They learn how to install virtual reality equipment.
• Learn which software to use in virtual reality hardware and how to calibrate the hardware by installing these software.

MATERIAL: Video Presentations describing the installation of software
Projector
Internet connection
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A sufficient (2x2 meters) wide classroom area to set up and use the Oculusrifti
R2. EK_1A_TR_Sanal-Gerçeklik-Donanim ve Kurulum-Talimatlar Kilavuzu
EK_1A_EN_Virtual-Reality-Setup-Instructions-and-Troubleshooting-Guide
https://www.lib.ua.edu/wp-content/uploads/Virtual-Reality-Setup-Instructions-and-Troubleshooting-Guide.pdf
Additional narration videos

DURATION: 150 mins(3 hours).

PROCEDURE:
1. The equipment required to use the OCULUS RIFT equipment is presented to the students by showing them physically;
Devices in the class are shown respectively:

What we need to use the OCULUS RiFT equipment;
    1 set of OCULUS RiFThead
    1 sufficient PC (or laptop)
    4 AA size batteries
    Internet connection
    And it is called oculusrift software.
2. After these enhancements are shown, students are asked to physically examine and observe the enhancements. (At this stage, students may be asked to wear the vr hood and put the joysticks in their hands);
3. Then, the names and basic features of the software to be installed are explained;
Respectively;
Oculusrift basic software is the basic software required to use the vr device.
www.oculus.com/setup

After the PC is opened and the internet connection is checked, the projection connection is opened, allowing the students to see the pc screen and;

1. Students are told that before installing the vr software, we need to test the pc by running the required software to check whether the hardware features of the pc will be sufficient. "A control pc compatibility OculusCompatCheck" program in the annex file is run by double clicking.
    After starting this tool, whether the pc is sufficient or not is verified as shown in the reference video. **(Reference video available in supplementary files "1_oculus_pc_uygunluk_test_araci").**
2. Open a blank Internet Explorer page on PC, go to "www.oculus.com/setup" and click on Download OculusRift Software to start downloading the software. **(Reference video available in supplementary files "2_oculus_adresten_indirme").**
3. After the download is finished, open the "Oculus" application in the downloads folder and click Install Now. **(Reference video available in supplementary files "3_indirilen_yazilimi_kurma"and "4_indirilen_yazilimi_kurma_").**
4. After the "Oculus" software is installed, the second phase of the installation is passed and the students are told that we need to create an oculus account so that we can use the software and following the instructions in the additional video, an oculus account is created.. **(Reference video available in supplementary files "5_Hesap_olusturma)**
5. 5. After completing the account creation phase successfully, the vr device setup is completed by following the instructions in the installation videos numbered 6-7-8.. **(Reference video available in supplementary files "6_Kurulum_yonergeleri-7_Kurulum_yonergeleri-8_kullanim_alani_belirleme)**
6. After the general software installation is completed, students;
    Since the experiences in the VR device are virtual Fields, it is said that they should take safety precautions to avoid injuries by hitting the objects in their Field from time to time, and the "**9_kullanim_guvenliği_alani_belirleme**" instructions in the supplementary file is removed and the objects that will cause injury in the Field are removed.
7. After the completion of the installation phase, Students;
    The software required for us to use the VR hardware is finished installing and we can now experience the hardware, so that every student wears the VR glasses and experiences basic oculusrift menus.

ACTIVITY 3(3. WEEK)

ACTIVITY NAME: Installing virtual reality and Animation Software and using hardware

OBJECTIVE: To provide students to understand how to install 3d Animation software that they will use with VR Hardware.

LEARNING OUTPUTS: students;
• Learn which 3D software should be installed and how to install it in virtual reality hardware.
• They experience the innovative aspect of using "3D software" at "BASIC LEVEL" in a virtual reality Field.

MATERIAL:
Projector
Internet connection
Video Presentations describing the installation of software
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A sufficient (2x2 meters) wide classroom area to set up and use the Oculusrifti

DURATION: 150 mins(3 hours).

PROCEDURE:

1. After the projector is turned on and connected to the PC, students are explained by following the installation video of the "**AutodeskMaya**" software required to use the OCULUS RIFT hardware and asked to apply it to their PCs.

Respectively;;

- " EK_3_A_Autodesk maya indirme videosu" in the additional files is opened on the projection device and the students are asked to follow the instructions in the video in order.

- • By opening a blank Internet Explorer page, go to www.autodesk.com/education/free-software/maya.

- • Students complete their registration process at www.autodesk.com/education/free-software/maya according to the instructions in the " EK_3_A_Autodesk maya indirme video.

- • Students can then start the downloaded Autodesk maya software on their PC by completing the installation phase by following the instructions in the "EK_3_B_Autodesk maya installation video.

2. After the basic 3D software installation is completed;

In order to use 3d animation software together in VR Field, it is said that the plug-in software named "MARUI" should be installed and the installation is explained in the following order.

- The students will be asked to follow the instructions in the video, respectively, by opening the "EK_3_C_A_MARUI_plugin_indirme_videosu 4 video narration" projection device in the additional files.
- A blank Internet Explorer page is opened to www.marui-plugin.com/download/trial/request.php.
- Students complete their membership process at www.marui-plugin.com/download/trial/request.php according to the instructions in "EK_3_C_B_MARUI_plugin__kurulum_videosu".
- Then, students can start their PC by completing the installation phase by watching the downloaded "MARUI" software "EK_3_C _MARUI_plugin installation video". (Updated installation address **https://www.marui-plugin.com/documentation-installing-activating-starting/**)

3. After the installation of the software is completed,;

- It is said that the "MARUI plug-in" installed in order to be able to use the 3d animation program in the VR Field should be activated before the application and the projection "EK_3_D_MARUI_plugin kurulum" video is watched and asked to apply on their own pc.

4. 4. After students activate MARUI plugin in Autodesk maya program;

- Each student is asked to open the AutodeskMaya program and experience it at a basic level by wearing the VR header (It is assumed that they have taken Autodesk maya lesson before and have their readiness.).

5. After students experience the basic Autodeskmaya program in VR Field;

- The student is asked to ask "How was the idea of the first experience in producing 3D content in the VR Field" and received feedback.

ACTIVITY 4(4. WEEK)

NAME OF THE EVENT: Using Virtual Reality Joysticks with 3d Interfaces

OBJECTIVE: To provide students to understand the animation interface in VR Field according to the learning and the PC Field..

LEARNING OUTPUTS: students;
• They learn how to use the "VR IN" version of the 3d software they will use in virtual reality hardware with VR joysticks.
• Understand the advantages and disadvantages of the usage of 3d software tools in traditional methods at a basic level in the virtual reality Field.

MATERIAL:
Projector
Internet connection
Video Presentations describing the use of software
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A class space sufficient (2x2 meters) wide to use Oculusrifti
Video Source https://www.marui-plugin.com/support/
https://apps.autodesk.com/MAYA/en/Detail/HelpDoc?appId=265209227563613977&appLang=
en&os=Win64

DURATION: 150 mins(3 hours).

PROCEDURE:
   1.To students; (It is observed that they have experienced "animation" in the pc Field before.)
      It is stated verbally in the pc Field that "they need to learn different tools and shortcuts (VR joystick and Marui interface) in order to use the software they use with the MOUSE and keyboard in the Vr Field.;

Explanation of the keys in the Oculus Rift joysticks;

     MARUI supports three different types of control: HTC VI's "wand" style controllers, OculusRift "Touch" controllers, and Windows MR controllers.
While each of these have different shapes and functions, the basic interaction is the same in all three.
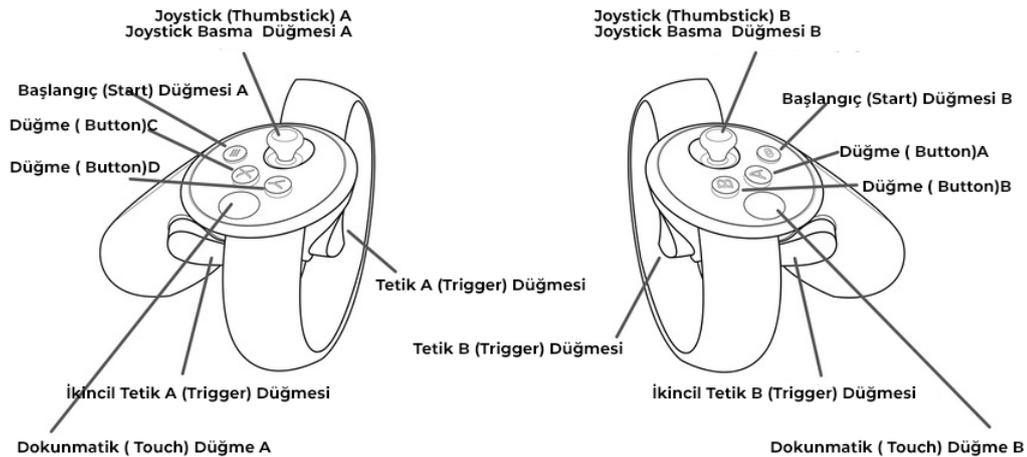

Figure 1.Oculus rift joystick Buttons

   Trigger Buttons (Trigger)

The button under the index finger is called "Trigger" (similar to the trigger of the gun) and is the same function of the left mouse button. That is, it is used to select objects, drag objects and move windows.

It can be used in two ways: a "click" and a "drag".

"Click" is short-term "press and release" on the trigger, similar to "clicking" with the mouse, without moving the controller too much.

For example, you can "click" to select them in VR objects, you can use your mouse to select the way you use it in Maya.

To drag, simply hold down the trigger while moving the controller.

For example, by holding the trigger and "dragging", you can draw a selection box to select multiple objects, just as you draw a selection box with your mouse by holding the left mouse button in Maya.

Grip Buttons

The keys (operated by the middle finger) on the side of the shaft of the controllers are called the "grip" or "shoulder" buttons. In MARUI, these are used to change your perspective on the stage. To change the camera position in Maya, you hold down the Alt key and change your perspective. Similarly, in MARUI, you hold down the shoulder buttons to change the perspective of objects in VR.

By holding down the shoulder buttons on both controllers and changing the distance between the controllers, you can "zoom in and out" to make your Maya scene appear on a larger or smaller scale. Note that this does not organize your scene in any way. This just changes the way you see the scene in VR.

Thumb Buttons (A-B-Oculus-X-Y Buttons)

Various VR controllers have buttons on the top to be operated with a thumb. On OculusRift "Touch" controllers, these are the buttons (A) (B) (X) and (Y). HTC Vive and Windows MR controllers each have a "Menu" controller.

In MARUI, the default menu assigns circular menus (marking menus) to these buttons. If you hold down the button, a menu will appear at the end of the controller.

You can select items in the menu in two ways. Move the controller to place the red arrowhead on the item you want to select (a tooltip text describing the icon will appear) and release the button you pressed to open the menu. Alternatively, instead of releasing the menu button, you can also press the trigger button of the controller (in addition to holding down the menu button "click"). This is especially useful if you need to trigger a menu item multiple times.

Thumb (ThumbStick)

The OculusRift and Windows MR controller also have small joysticks on the top that will be operated by the thumb. MARUI assigns additional menus to tilt the bar in one of four directions: forward, backward, left and right. On "Thumb forward" Press the thumb bar forward to open the menu. The same goes for pushing the adjustment knob left or right or pulling backwards. Each direction opens a different menü.

Navigating mouse style maya viewport;

In Maya, you usually use the mouse to rotate the camera around a selected object. If you prefer this type of interaction, select the "Maya-mouse style" navigation function in the settings. To do this, select the Maya mouse style from the marui setting window;
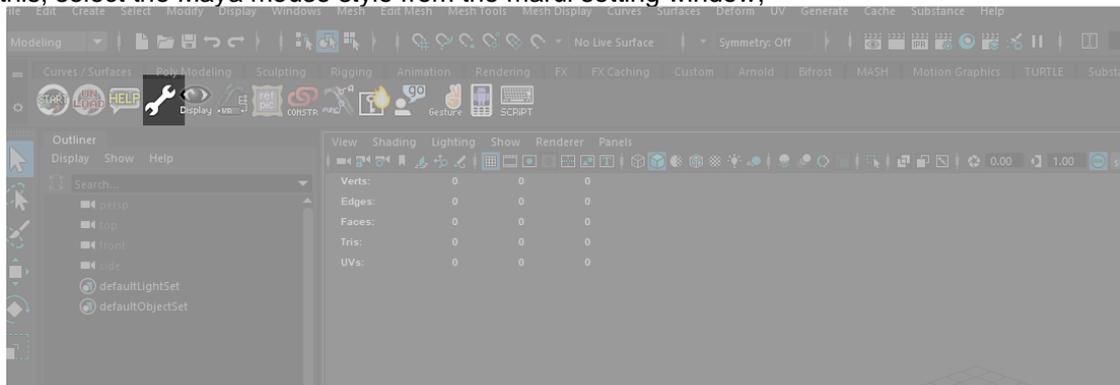
**Figure 2. Marui settings**
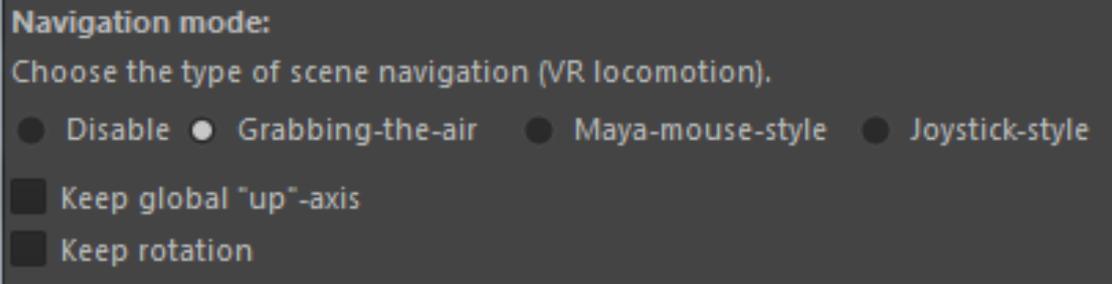
Figure 3. Marui Mouse settings

While this mode is enabled, holding down the navigation button allows you to rotate your perspective around the selected object, it will be narrated and then;

Students are asked to watch the video opened on the projector and take notes and experience the interface on the VR device individually;
- The video titled "**EK_4_A_VR ortaminda Autodesk maya ara yüz kullanimi**" in the additional files is opened and the instructions in the video are taken notes to the students.
- While watching the video, it is asked whether there is a feature in the VR interface that they cannot understand or want to ask according to the traditional PC Field; According to the feedback, the parts explained in the video can be explained and explained again.

2. After watching Autodesk maya interface video,;
- After the video presentation, from the students; By wearing the VR cap, they are asked to experience it individually with the instructions described in the video with the Maruiplugini in the Autodesk maya program.
- During this experience, the pc screen image used for watching students to see the experience is reflected on the projection and the students who experience the title can be verbally helped about the shortcut and usage.

3. After students experience the Autodesk maya program with a basic level of MARUi interface in VR Field;
- The student is asked to evaluate the experiences of using MARUI interface in VR Field according to their experience in the pc Field, and they are asked to realize and interpret the advantages and disadvantages of producing 3D content with VR.

ACTIVITY 5(5.WEEK)

NAME OF THE EVENT: Virtual Reality Animation Principles Project Management
OBJECTIVE: To provide students to comprehend the "Project management (preparation)" required for "12 principles in animation" in VR Field.
LEARNING OUTPUTS: students; • Understand how they will make preparations such as Project set-up, foldering, naming, calling the character, recording the scene, preparing the animation interface etc. • Users realize the advantages and disadvantages of the use of 3d software tools in traditional methods in the virtual reality Field at the production level by applying the principles of animation.
MATERIAL: **Projector** **Internet connection** **Video Presentations describing the use of software** **1 Oculusrift hardware (4 batteries AA size)** **1 pc with sufficient hardware,** **A class space sufficient (2x2 meters) wide to use Oculusrifti** **R.6 (PAGE 58-60)** **R.5 (PAGE 35-38)**
DURATION: 150 mins(3 hours).

PROCEDURE:
 	
    1.To students;
        It is stated verbally that the first stage required for the application of Animation principles in the virtual reality Field is the preparation of the project management flow.
      * It is said that the previously prepared 3d character, the texts to be used with this character, the assets to be used on the stage should be prepared as a Project set and the Autodesk maya interface should be turned into an animation module;
 	
Project Set Up in Autodesk Maya program;
Project window window opens from Maya File menu,
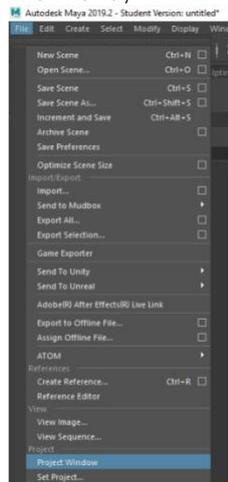 	
Figure 1.Maya file menu
 	
Then click the new (New) Tab from the opened Project Window window.
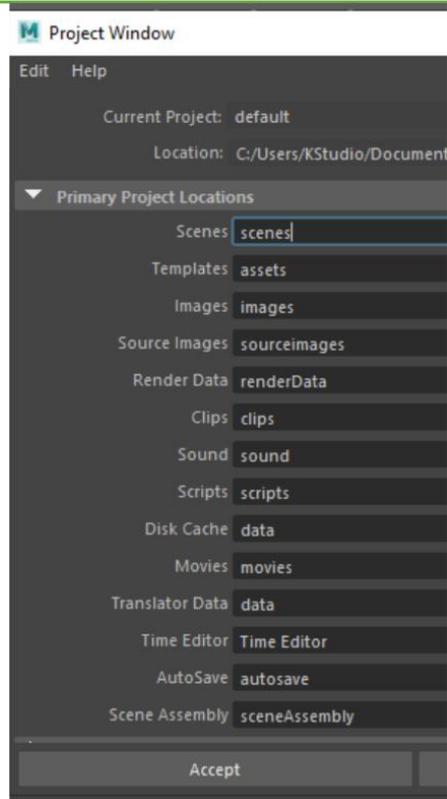
Figure 2. Project Window

In the activated panel menus, the project name, project folder addresses and other necessary addresses are made and the accept button is pressed..
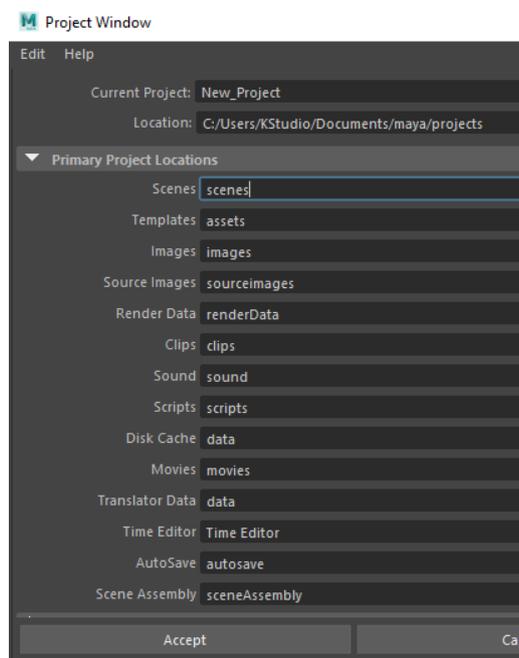
Figure 3.Project window

After this addressing process is finished, the folder process is completed by copying the characters, images and assets used in the addresses specified in the Windows explorer.
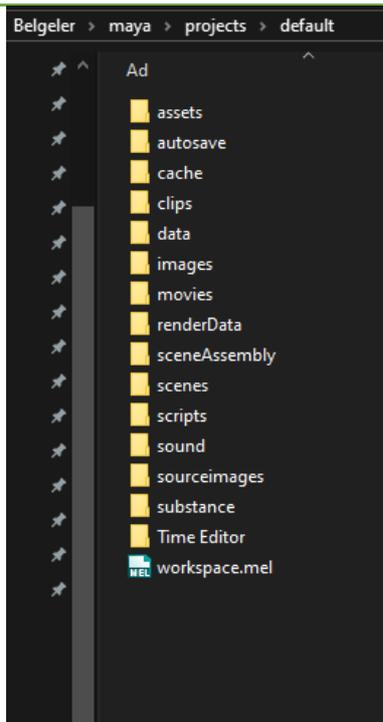
Figure 4. Files

After this foldering process is completed, a blank stage is opened in the maya, and the required characters and assets (scene additions) are called to the stage by clicking on the reference method "Createreference (create reference)", then the animation module is opened, the basic animation scene is named and saved, and the first stage preparation that we need to apply the animation principles is completed.
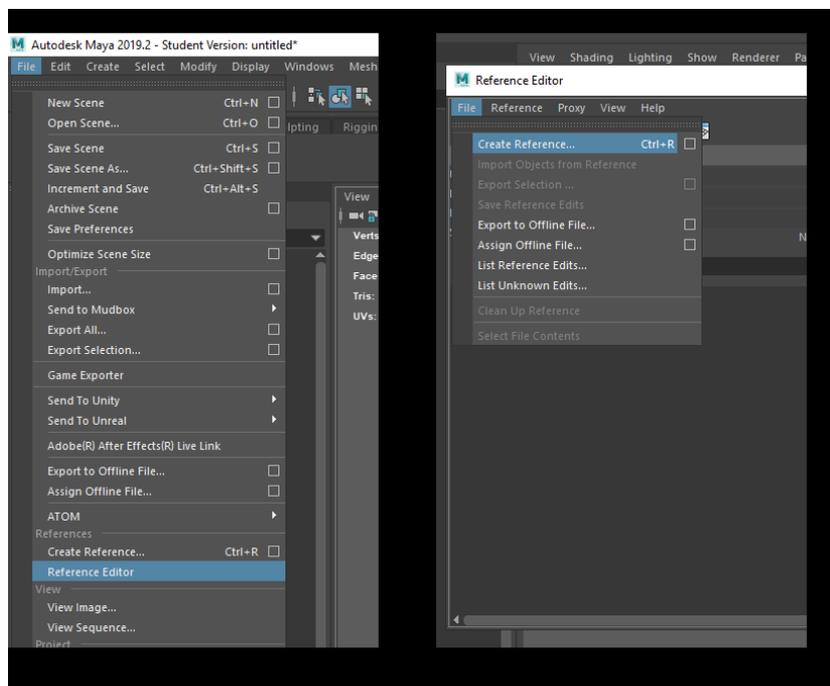
Figure 5.Create reference editör
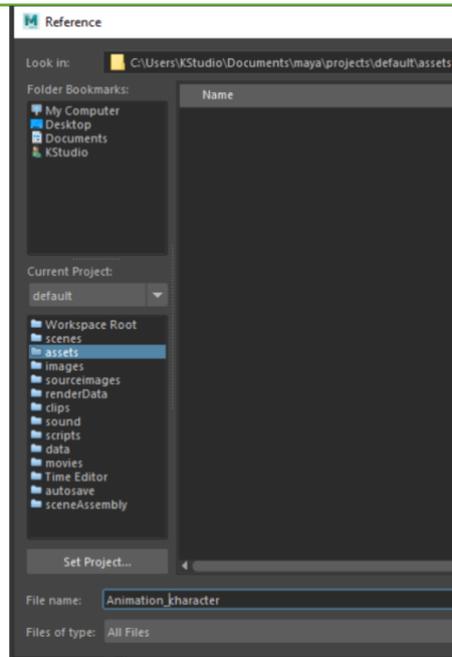
Figure 6.Createreferenceeditor

Students are asked to watch the video opened on the projector and take notes;

- The video titled "Preparation of Autodesk Maya project workflow in EK_5_A_VR Field" in the supplementary files is watched and the instructions in the video are taken into consideration.
- While watching the video, it is asked whether there is a question that they cannot understand or want to ask about "project workflow preparation" in VR Field compared to the traditional PC Field; According to the feedback, the parts explained in the video can be explained and explained again.

2. "After watching the video of "Autodesk maya project workflow preparation" in EK_5_A_VR Field, students are asked to apply project management on vr device individually;

- After the video presentation, from the students; By wearing the VR cap, they are asked to perform the applications described in the video individually in the Autodesk maya program.
- The PC screen image used for viewing the experience of the students watching during this application is reflected on the projection and the students who experience the title can be verbally helped about the application..

3. After the students have done "Autodesk maya project workflow preparation application in VR Field;

- • The student is asked to compare the "Autodesk maya project workflow preparation application in VR Field" according to their experience in the pc Field, and they are asked to interpret the advantages and disadvantages of producing 3D content with VR.

ACTIVITY 6(6.WEEK)

Learning the SquashandStretch (compression-stretch) Principle of Virtual Reality and Animation from 12 Principles

OBJECTIVE: To provide the students to comprehend the "Squashandstretch (compressing-stretching)" principle, which is the first of the 12 basic principles of animation in VR Field.

LEARNING OUTPUTS: students;
• They learn the "Squashandstretch (compression-stretch)" principle from the basic 12 principles of animation that are accepted worldwide.
• "They understand the advantages and disadvantages of the use of 3d software tools in traditional animation methods in the virtual reality Field.

MATERIAL:
Projector
Internet connection
Video Presentations describing the application of principles
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A class space sufficient (2x2 meters) wide to use Oculusrifti
R.7
R.9 (chapter 1)

DURATION: 150 mins(3 hours).

PROCEDURE:

1. In this course, students are told that we will experience 12 basic animation principles in virtual reality hardware different from traditional PC Field. According to the PC Field, they are asked to comprehend the advantages and disadvantages of the virtual reality Field and then;

It is said that there are 12 basic principles in animation and the description of the principles is explained with illustrated Figures;

The basic animation principles are 12;
1-Squash and stretch (sikiştirmak-esnetmek)
2-Anticipation (Önceden yapma, hazirlik pozu)
3-Staging (Sahneleme)
4-Straight aheadandposetoposeanimation (düz pozlama-pozdan poza)
5-Follow throughandoverlappingaction (takip pozlama-üst üste binen hareket)
6-Slow--outandslow--in(ivmelenme -yavaşlama)
7-Arcs (hareket yaylari)
8-Secondary action (ikincil hareket)
9-Timing (zamanlama)
10-Exaggeration (abartma)
11-Solid drawing (key poz oluşturma)
12-Appeal (çekicilik)

After the animation principles are said as items, the first principle, "SQUASH AND STRETCH", is explained.

SQUASH AND STRETCH(SIKIŞTIRMAK-ESNETMEK)
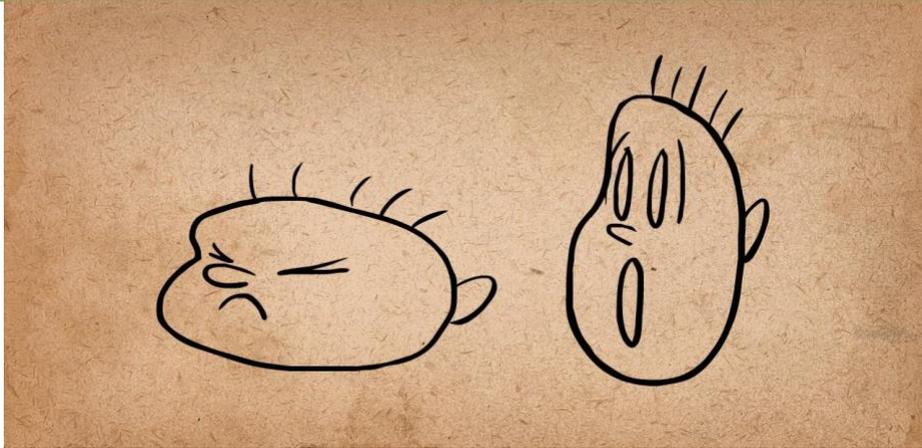
Figure 1.Squash ve Stretch (sikiştirmak-esnetmek) principle

It is one of the most important of the basic principles. In real life, solid objects retain their physical form as they move. But organic and living objects, no matter how boned they are, change significantly in their shape during movement. As an example of this, when we tighten our arms and stretch straight, the form change in the biceps muscle can be given. While talking, chewing, laughing, our face changes shape and form never acts as a solid hard object.

The Squash pose is a stuck pose showing the form under pressure. Stretch pose, on the contrary, is the stretched and stretched form of the form. The change between these poses has formed the basis of the animation, making it possible for objects that can display live, variable forms, rather than simple lines that move.

With the discovery of these techniques, animators pushed the limits of squash and stretch in their continuous trials. They tried to create more interesting and strong poses and movements by using these principles at the values closest to the limits.
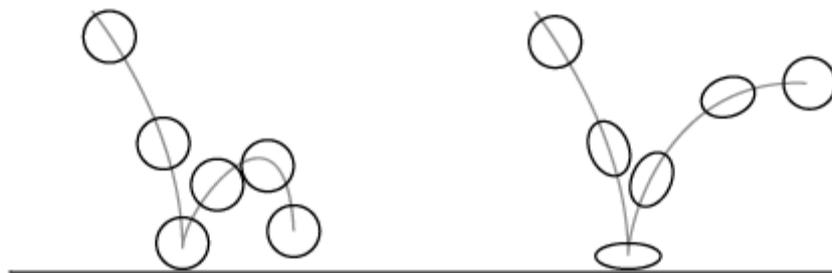
Figure 2. Squash ve Stretch principle

While using these techniques, a half-full flour sack sample was developed to prevent objects from losing their clear form. When the sack is dropped on the ground, it remains in the position to be the most "squash". It is in the pose that it will be the most "stretch" when it is held by its upper edges. But in both positions it continues to look like a sack of flour because its volume never changes.
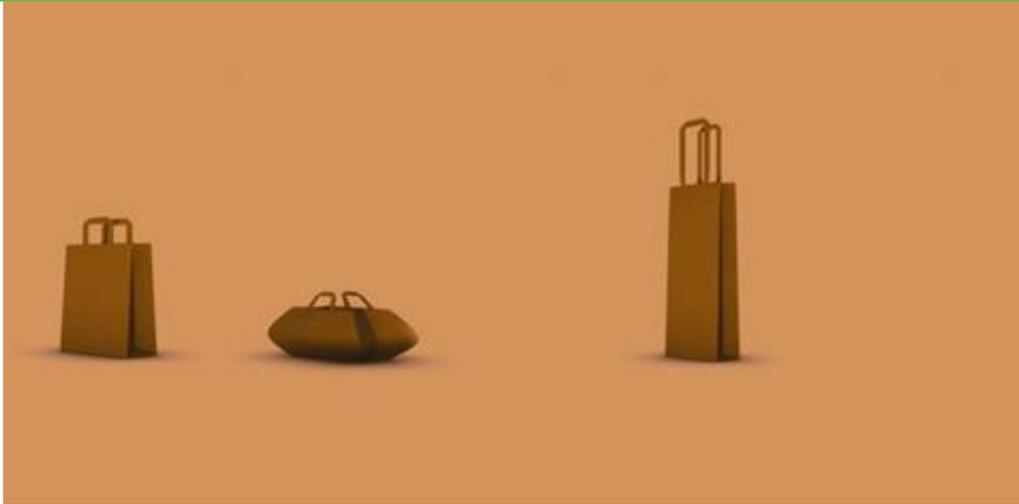
Figure 3.Squash ve Stretch principle

It was even noticed that a simple sand sack figure could gain a character when portrayed in different poses, it was noticed that complex characters and drawings were not needed to give the desired emotion, and the desired effect could be given in the simplest and direct way.

After the explanation of the principle of "Squashandstretch (compression-stretch)", the students are asked to watch the video opened in the projector and take the necessary notes;

- The instructions in the video are watched by watching the video titled "Explaining the principle of" Squashandstretch (compressing-stretching) with Autodesk maya in EK_6_A_VR Field "in the supplementary files.
- While watching the video, it is asked whether there is a question that they do not understand or want to ask, according to the feedbacks, the parts explained in the video can be shown again by showing.

2." After watching the video of "Squashandstretch (compression-stretch) principle" with Autodesk maya in EK_6_A_VR Field, students are asked to experience the Squash and Stretch principle individually on the VR device with a ready character.;

- The PC screen image used for viewing the experience of the students watching during this application is reflected on the projection and the students who experience the title can be verbally helped about the application.

3. After applying the Squashandstretch (compressing-stretching) principle to students in VR Field;

- The student is asked to compare the "Squashandstretch (compression-stretch) principle" application according to their experience in the pc Field, and to interpret the advantages and disadvantages of producing 3D content with VR.

ACTIVITY 7(7. WEEK)

Learning the principle of Anticipation (Pre-making, preparation pose) from 12 principles of animation with virtual reality

OBJECTIVE: To provide students to comprehend the "Anticipation (Pre-do, Preparation Pose)" principle from 12 basic principles of animation in VR Field.

LEARNING OUTPUTS: students;
• They learn to apply the "Anticipation (pre-make, preparation pose) principle from the 12 principles of animation in a virtual reality Field.
- Understand the advantages and disadvantages of the use of 3d software tools in traditional animation methods in a virtual reality Field..

MATERIAL:
Projector
Internet connection
Video Presentations describing the application of principles
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A class space sufficient (2x2 meters) wide to use Oculusrift
R.8
R.9 (chapter 2)

DURATION: 150 mins(3hours).

PROCEDURE:

1. In this course, students are told that we will experience the principle of "Anticipation (Pre-make, preparation pose), which is the second of the 12 basic animation principles, in virtual reality hardware different from the traditional PC Field, and it is explained in the following order;
   The second of the 12 basic animation principles, "Anticipation" is said to be a pre-making, preparation pose:

   In order for the viewer to clearly perceive the actions in an animation scene, they must see a planned sequence that prepares the character for that action. They should prepare for the next move and sense it before it happens. This is done by giving clues to what will happen to the audience with a different movement before the main movement. This "anticipation" can take place in a variety of ways, from a minor change in facial expression to a major physical movement. A man can gather enough energy to run out of his crouch before running, or on the contrary, he can retreat by lifting his arms and one leg in the air.

Figure 1.Anticipation

Thus, he will be prepared for the next series of movements. Mickey lifts up his arm in an exaggerated manner while looking at that object before taking it. So the audience knows that Mickey will interact with that object. This is one of the oldest vehicles in the cinema. Because if this does not happen, the audience will be anxious and uncomfortable. He cannot clearly

understand what is happening. Although "anticipation" does not explain why a character does that movement, it allows us to clearly perceive what he is doing. In this way, the audience can have a comfortable and pleasant experience.
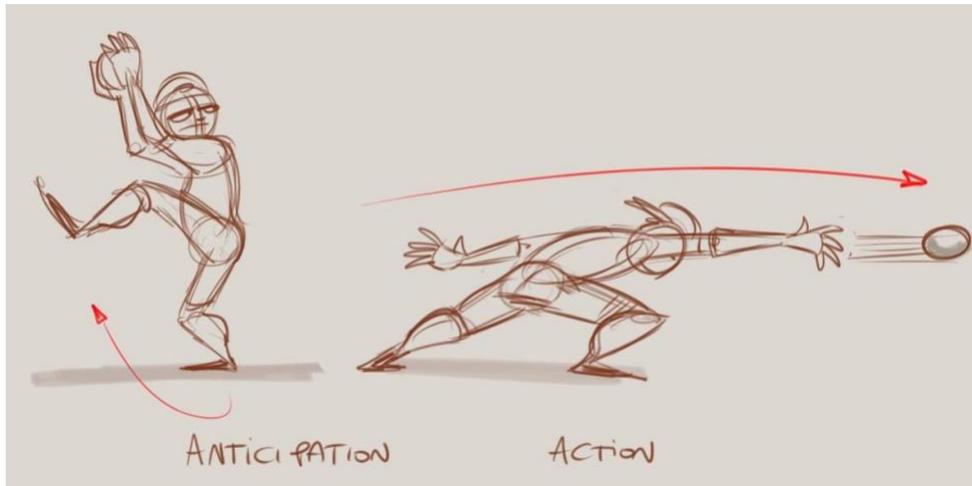

Figure 2. "Anticipation (Doing ahead, preparation pose) principle

Few movements in real life do not have an "anticipation". "Anticipation" is a natural requirement for the movement of creatures in nature, and without it it is not possible to demonstrate strength in movements. They stretch before a golfer or baseball player hits or throws the ball. Without these anticipation movements, it is not possible to capture the force and realism in movements.

After explaining the second principle of animation, "Anticipation (preparation pose)", students are asked to watch the video opened in the projector and take the necessary notes;
- The video titled "Explaining the principle of Anticipation (preparation pose) principle with Autodesk maya in EK_7_A_VR Field "in the supplementary files is watched and the notes in the video are taken to the students.

- While watching the video, it is asked whether there is a question they do not understand or want to ask; According to the feedback, the parts explained in the video can be explained and explained again.

2. After watching the video of "Explaining the Anticipation principle with Autodesk maya in EK_7_A_VR Field", students are asked to experience the principle of Anticipation (preparation pose) individually on the VR device.;
- The PC screen image used for viewing the experience of the students watching during this application is reflected on the projection and the students who experience the title can be verbally helped about the application.

3. After applying the Anticipation (preparation pose) principle to students in VR Field;
- • The student is asked to compare the "Anticipation principle" application according to their experience in the PC Field and to interpret the advantages and disadvantages of producing 3D content with VR.

MIDTERM (8.WEEK)

NAME OF THE EVENT: MIDTERM EXAM

OBJECTIVE: To ensure that students evaluate the Animation principles they have learned for 7 weeks as a whole and see the advantages and disadvantages compared to the PC Field.

LEARNING OUTPUT: students;
• "In the virtual reality Field, they understand the advantages and disadvantages of the use of 3d software tools in traditional methods by individually experimenting the principles of animation at the application level.
- • Students understand the principles of animation.

MATERIAL:
Projector
Internet connection
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A class space sufficient (2x2 meters) wide to use Oculusrift

DURATION: 150 mins(3 hours).

EXAM APPLICATION:

1. **To students;**
   The application method of the exam; According to the number of VR equipment, it is said that everyone applies the principles of animation they have learned individually with the rigged character previously prepared.
   - What you learned in MARUI INTERFACE USE in Autodesk maya program
   - What you learned at the PROJECT MANAGEMENT stage
   - They should apply the principles of "Anticipation (Pre-make, preparation pose) with Stretch and squash they learned during the animation principles.
   - By testing these steps, they are said to test that the result is correct.

2. **Then students are told the evaluation criterias;**

   - • During the exam, how accurate they are doing the previously taught animation principles will be evaluated.
   - • To evaluate how fluently they use the hardware when making applications.
   - • When they test their stages as the final evaluation criteria, it is said how accurate the result will be evaluated;

MIDTERM (9.WEEK)

NAME OF THE EVENT: MIDTERM EXAM

OBJECTIVE: To ensure that students evaluate the Animation principles they have learned for 7 weeks as a whole and see the advantages and disadvantages compared to the PC Field.

LEARNING OUTPUTS: students;
•"In the virtual reality Field, they understand the advantages and disadvantages of the use of 3d software tools in traditional methods by individually experimenting the principles of animation at the application level.
• Students understand the principles of animation.

MATERIAL:
Projector
Internet connection
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A class space sufficient (2x2 meters) wide to use Oculusrift

DURATION: 150 mins(3 hours).

EXAM APPLICATION:

2. **To students;**
   The application method of the exam; According to the number of VR equipment, it is said that everyone applies the principles of animation they have learned individually with the rigged character previously prepared.
   - What you learned in MARUI INTERFACE USE in Autodesk maya program
   - What you learned at the PROJECT MANAGEMENT stage
   - They should apply the principles of "Anticipation (Pre-make, preparation pose) with Stretch and squash they learned during the animation principles.
   - By testing these steps, they are said to test that the result is correct.

2. Then students are told the evaluation criterias;

- During the exam, how accurate they are doing the previously taught animation principles will be evaluated.
- To evaluate how fluently they use the hardware when making applications.
- When they test their stages as the final evaluation criteria, it is said how accurate the result will be evaluated.;

Learning 12 Staging principles of Animation with Virtual Reality

OBJECTIVE: To provide the students to comprehend the basic 12 "Staging from principle" principle of animation in VR Field.

LEARNING OUTPUTS: students;
• Students experience and learn the "Staging" principle, one of the basic animation principles, in a virtual reality Field.
• "They understand the advantages and disadvantages of the use of 3d software tools in traditional animation methods in the virtual reality Field.

MATERIAL:
Projector
Internet connection
Video Presentations describing the application of principles
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A class space sufficient (2x2 meters) wide to use Oculusrift
R.9 (CHAPTER 3)

DURATION: 150 mins(3 hours).

PROCEDURE:

In this course, students are told that we will experience the third animation principle, called "Staging", with Virtual reality equipment, and it is explained in the following order;

Staging

Staging is the most comprehensive of the principles, because it encompasses a lot of topics, and it has an origin that goes back to theater. But its meaning is very precise. An idea is to be presented as clearly and comfortably as possible. A movement or a personality must be presented in a way that the audience will recognize. Likewise, a mimic must be presented in a view that the viewer can see comfortably, or a mood must be presented to affect the viewer. Each of them can establish the strongest possible communication with the audience when staged correctly.
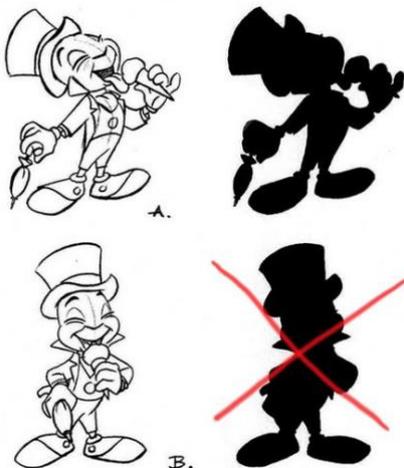

Figure 1. Staging

The most important point to consider in Staging is the purpose of the story. How can you best present an event that has been decided to take place in order to tell the story? With a general plan where everything seems clear, or with close-up plans where we can see the mood of the character? Is a single plan slowly approaching the character more effective? Or a series of short plans? Each scene will have its own needs, and staging should be used that best suits the story. Every plan should serve the narration of every square story.

If a scene is desired to be scary, symbols that evoke it are placed there. A moon that appears through the clouds. A minus wooden house. Like flying leaves and dried trees on the ground. A garden of colorful flowers may seem incompatible on your scene.

If you are staging an action, you need to make sure that only one action is visible to the audience. With an incorrect camera angle, the action should not become incomprehensible or shaded by any other action that happens simultaneously on the stage. Each frame is designed to serve to stage that movement in the simplest and most open way. In fact, it is like saying to the audience, "Look at this, now look at this, okay now look at this." You need to make sure that the camera is at a distance suitable for the movement of the character. You cannot stage a kicked character with a close-up that points above the waist. If you want to emphasize the feelings of a character, you cannot stage it with a general plan that we cannot see clearly.

Figure 2. Staging

Wizards say that it is easier to work when people are close to you because you can draw their attention in any direction. But it is much easier for the audience to look at your feet or watch what's going on behind you while working alone in a big scene. The audience begins to pay attention to everything that the wizard does not want to show in order to understand the number. For this reason, close plans are very important to show the audience what is desired from other elements, but the animators had a unique problem. The characters were in black and white. Even shades of gray were not available. Mickey's hands, legs and body were completely black. Different shades of colors could not be used to make the form clear and therefore every movement had to be explained through the silhouette. Other movements were incomprehensible. If he held his hand over his chest, he would disappear completely in the picture. Every move was designed to be understood from the silhouette of the character.
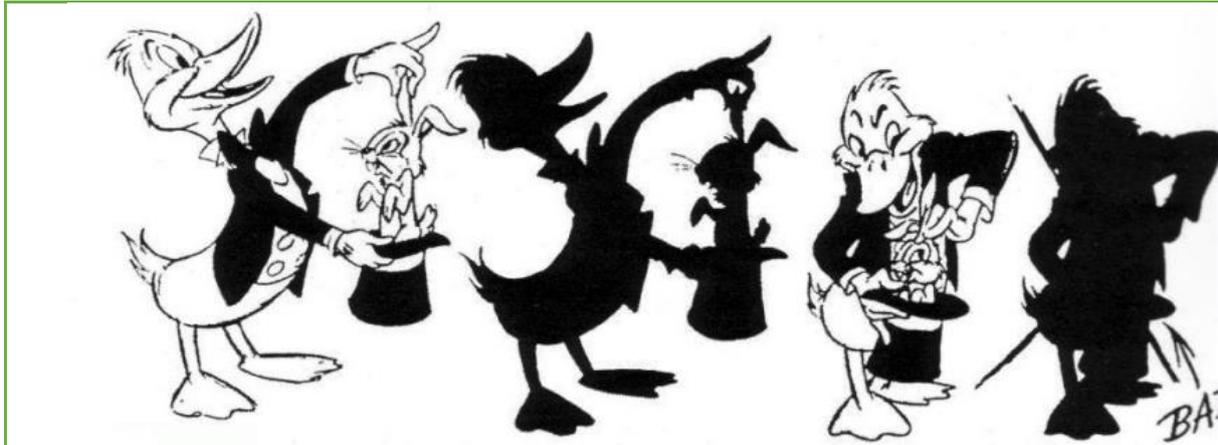
Figure 3. Staging

But this restriction actually turned into a huge advantage. It became clear later that making the movement understandable with the silhouette gave much better results. Walt asked Disney animators to keep an eye on it all the time. They also tried to develop this method by working differently, producing different poses and finding interesting understandable poses, saying the principle statement is completed and then;

1. **After explaining "Staging", which is the third animation principle, students are asked to watch the video opened in the projector and take the necessary notes;**
   - The video titled "Staging principle with Autodesk maya in EK -10_A_VR Field" in the supplementary files is watched and the notes in the video are taken to the students.
   - While watching the video, it is asked whether there is a question they do not understand or want to ask; According to the feedback, the parts explained in the video can be explained and explained again.

2. **After watching the video of "Staging principle with Autodesk maya in EK_10_A_VR Field", the students are asked to experience the learned principle individually on the VR device;;**
   - The PC screen image used for viewing the experience of the students watching during this application is reflected on the projection and the students who experience the title can be verbally helped about the application.

3. **After applying the Staging principle to the students in VR Field;**
   The student is asked to compare the "Staging principle" application according to their experience in the pc Field and to interpret the advantages and disadvantages of producing 3D content with VR.

ACTIVITY 11 (11. WEEK)

Learning the principle of "Straight Ahead And Posetoposeanimation (straight exposure-pose to pose)" with virtual reality

OBJECTIVE: To provide students to comprehend the principle of "Straightaheadandposetoposeanimation (flat exposure-pose to pose)" from 12 basic principles of animation in VR Field.

LEARNING OUTPUTS: students;
• In the Virtual Field, Students experience and learn the principle of "Straightaheadandposetoposeanimation (flat exposure-pose to pose)", which is one of the basic animation principles.
• "They understand the advantages and disadvantages of the use of 3d software tools in traditional animation methods in the virtual reality Field.

MATERIAL:
Projector
Internet connection
Video Presentations describing the application of principles
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A class space sufficient (2x2 meters) wide to use Oculusrift
R.9 (CHAPTER 4)

DURATION: 150 mins(3 hours).

PROCEDURE:
1. In this course, students are told that we will experience the fourth animation principle called "Straightaheadandposetoposeanimation (straight exposure-pose to pose)" with Virtual reality equipment and it is explained in the following order;

STRAIGHT AHEAD AND POSE TO POSE ANIMATION

There are 2 approaches in the animation production process. The first is the StraightAhead Action method. The animator draws all the frames in order, starting with the first frame. He can add ideas that come to his mind to his drawings at that time. Although the main idea of the scene and what it will tell is roughly clear, this method does not know exactly how to explain it until the animator starts drawing. That scene will be completed with the last picture. This is a method that can produce creative and unexpected results.
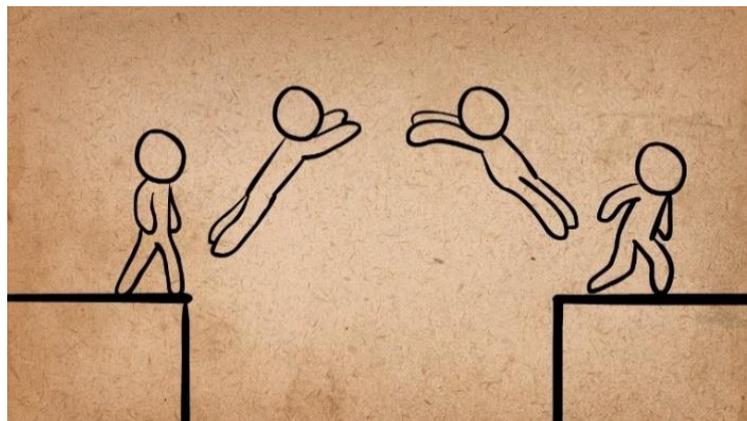

Figure 1. StraightAheadAndPoseToPoseAnimation

The second method is posetopose. Here, the animator plans the actions and poses on the stage in advance. He draws the most necessary frames for the expression of the movement and gives the scene to his assistant. The assistant fills in the gaps between them. The scenes made with this method are easier to follow. Because the animator can tell the story with a minimum frame

before diving into the drawing of each frame. Thus, by working more on these important frames called keyframes, they have the opportunity to move poses and movements to higher quality. While Posetopose has openness and strength, StraightAheadAction has spontaneous.

Both methods are used, and both have their advantages and disadvantages in certain types of motion. It is generally used by mixing two methods. Thus, the movements are prevented from getting out of control. The scene is designed as a movement line and rough poses and approximate poses and movements of the character are determined. But none of these drawings are drawn for use in the finished animation, it is only intended to be a guide for topics such as ratio, position, attitude, and relationship with the background. Thus, a certain level of control is provided. Some animators think that not having control brings spontaneous things. They say, "The animator who does it as much as those who watch a scene should be surprised to see the work." Studies involving very frantic movements can yield better results with this kind of workflow rather than intensive planning.
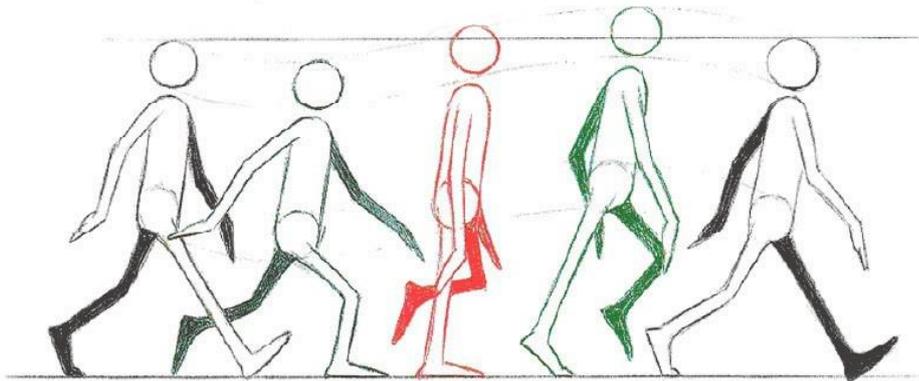

**Figure 2. Straight Ahead And Pose To Pose Animation**
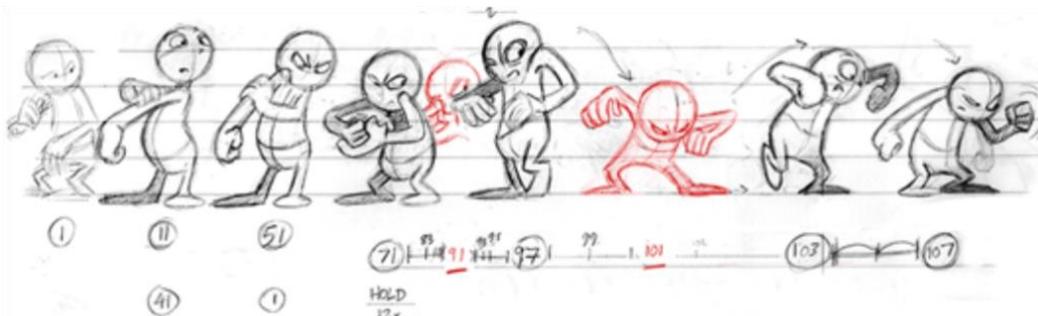
Figure 3. StraightAheadAndPoseToPoseAnimation

However, if there is a deep perspective on the stage, the straightahead method is mostly useless. An animator makes a dog animation that jumps around. He was able to capture a very cute and attractive movement, but the animation cannot be used in the movie because the movements are not suitable for the layout of the scene. It is unclear how much the dog bounces, when his feet touch the ground, and the pictures do not match the perspective on the stage. A flat background wouldn't be a problem in a scene that allowed freedom of movement in all directions.

However, most acting scenes require a different approach. If Mickey's morale is broken, he turns around, puts his hands in his pocket, looks back over his shoulder, kicks a stone in front of him and walks away on foot. This scene should be done with the posetopose method because every pose should be studied in detail in terms of clarity, attraction and communication. These poses are developed until they are able to describe the desired in the most efficient way. The only issue after capturing the main poses is to dump the movements and complete the intermediate pictures.
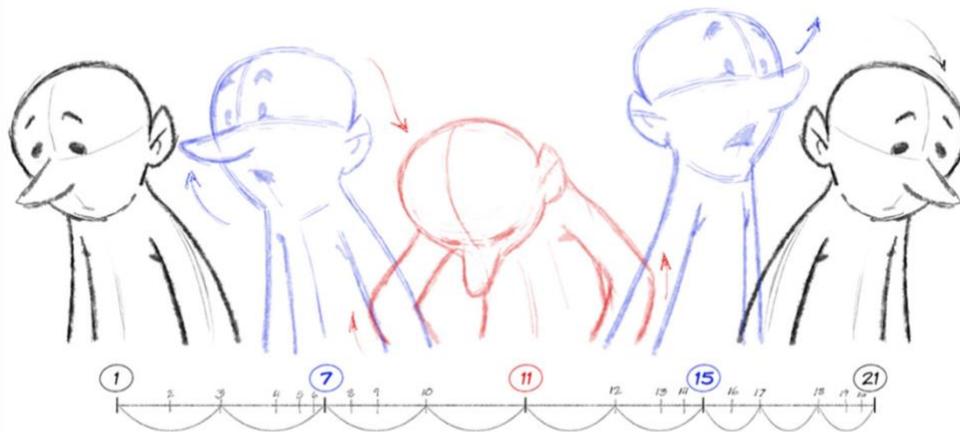
Figure 4. Straight Ahead And Pose To Pose Animation

Another issue to consider is texture. A series of movements at the same tempo and intensity will become boring and predictable very quickly. Fast and unexpected movements create a much more interesting scene after a series of slow and fluid movements. Of course, it will not be possible to achieve such a result with the straightahead method. By using Posetopose, a planning that will give the desired effect can be made and expression can be strengthened. The first animators who used the Posetopose method saw this as a method that would give quick results and could not grasp the full potential of the method. They were more concerned with the positions of the characters on the stage than creating fun moves. "The man is standing here, then he picks up his hat, and then he turns to look at his cane, if his wife is watching him, he jumps lightly and goes out the door. I have already finished 6 7 pictures and the scene!" Taken this way, when the poses were not properly associated, emotional and boring scenes became inevitable. As you learn to use stronger poses, as the dominance over the principles of timing, secondaryaction increases, and finally the movinghold technique develops, the posetopose method is literally found itself, and then;

After explaining StraightAheadAndPoseToPoseAnimation, students are asked to watch the video opened on the projector and take the necessary notes;

- The instructions in the video are watched by watching the video titled "StraightAheadAndPoseToPoseAnimation (Flat Exposure-Exposure to Poza) principle expression with the Autodesk maya in the EK_11_A_VR Field" in the supplementary files.
- While watching the video, it is asked whether there is a question that they do not understand or want to ask, according to the feedbacks, the parts explained in the video can be shown again by showing.

2. **After watching the video of "StraightAheadAndPoseToPoseAnimation (Straight Exposure-Posing-Posing) principle narration with EK_11_A_VR Field", students are asked to experience the Staging principle with the ready character individually on the VR device;**
    During this application, the pc screen image used for viewing the experience of the students watching is reflected on the projection and the students who experience the title can be verbally helped about the application.

3. After having experience in principle in virtual reality Field; They are asked to compare this principle according to their experience in the pc Field, and they are asked to interpret the advantages and disadvantages of producing 3D content with VR.

ACTIVITY 12(12.WEEK)

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Learning the Principle of Animation in the Virtual Reality Field, Follow Through AndOverlappingAction (Tracking Exposure-Overlap Motion)

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OBJECTIVE: To provide them to comprehend the principle of "Follow Through AndOverlapping Action", which is 5 and 6 principles of the basic 12 principles of animation, and SlowOut and Slow In.

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LEARNING OUTPUTS: students;
• They experience and learn the rules of Follow Through AndOverlapping Action, which are two important principles of animation, and -SlowOutAndSlow In.
• "In the virtual reality Field, they understand the advantages and disadvantages of the use of 3d software tools in traditional animation methods.

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MATERIAL:
- **Projector**
- **Internet connection**
- **Video Presentations describing the application of the principles**
- **1 Oculusrift hardware (4 batteries AA size)**
- **1 pc with sufficient hardware,**
- **A sufficient (2x2 meters) wide classroom area to use Oculusrift**
- R.9 (CHAPTER 5-6)

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DURATION: **150 mins(3 hours).**

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PROCEDURE:
1. In this course, students are told that we will experience the fifth and sixth animation principle, called "Follow Through AndOverlappingAction" and -SlowOutAndSlow In (Acceleration-Deceleration) with Virtual reality equipment, and will be explained in the following order;
FOLLOW THROUGH AND OVERLAPPING ACTION
        This principle is the animation term applied to items added to a character that does not act independently. When a character entering the stage reaches that point for his next action, the character often comes to a sudden stop. Clothing, hair, necklaces, tails (except that the tail also has secondary movement) and so on will not look harsh and natural unless it stops moving after it stops.

        In the animations made, when a character entering the stage stopped completing his motion, it was completely freezing and becoming inanimate. This was a very strict move and did not look realistic, but no one knew what this problem could be solved by doing it. It was a problem worn on Walt's head. He said that every part of the character's body would not stop at the same time, and that different parts would complement each other in succession. Various methods were developed to solve this problem and they were generally grouped under 2 headings. Nobody knew where one of these principles, called Follow Through and Overlapping Action, ended and where the other started. But basically they divided the subject into 5 different categories;

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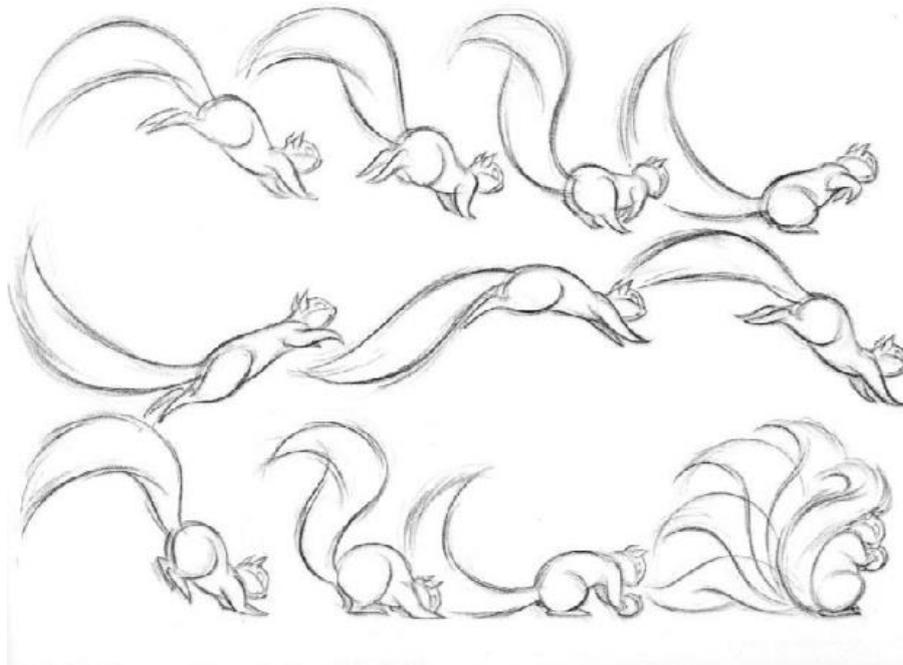
Figure 1.FOLLOW THROUGH AND OVERLAPPING ACTION

1. If a character had extensions such as ear and tail, these extensions would continue to move after completing the character movement. Hair and clothes were some examples that can be observed easily. The timing of the movements of these extensions was carefully adjusted to give the movements a realistic feel of gravity and oscillation, and the movements should be designed to follow the actions of the character one after the other.

2. Not all parts of the body move at the same time. Stretches, stretches, some parts follow from behind, twists, turns constantly changes form. Others may still be moving while a piece comes at a halt. The arms may still be in motion after the trunk has entered the pose. To reflect the attitude, the head, shoulders and trunk can enter the pose at the same time, because they are the most effective parts to reflect the character's feelings and personality. After a few frames, the arms complete their movement and sit down. When the whole character stands in a pose that reflects the desired emotion, this is called the hold pose.

Some animators thought of it as being too meticulous. According to them, they could not understand why such a detail was required for a beautiful scene. But then they could grasp what they meant.

3. The parts of the characters other than the skeletal structure make slower and different movements. Like cheeks or Donald's trunk or Goofy's entire. This trailing movement is sometimes called drift. It is a very important element for flexibility, which will create the feeling that the character is alive. When done well, this flexibility is felt very little when viewing the movie and is not clearly seen. Although it looks very flexible and extravagant when you look at it individually, it is a technique that is used only to be felt when you watch it in motion.

This technique has been the key to creating many funny scenes. The fat man always follows the fat while running, and eventually the character's skeleton leaves his body completely and continues on his way. Such exaggerated uses have been a source of humor in short films, but this technique has found its real power in much simpler and implicit uses.
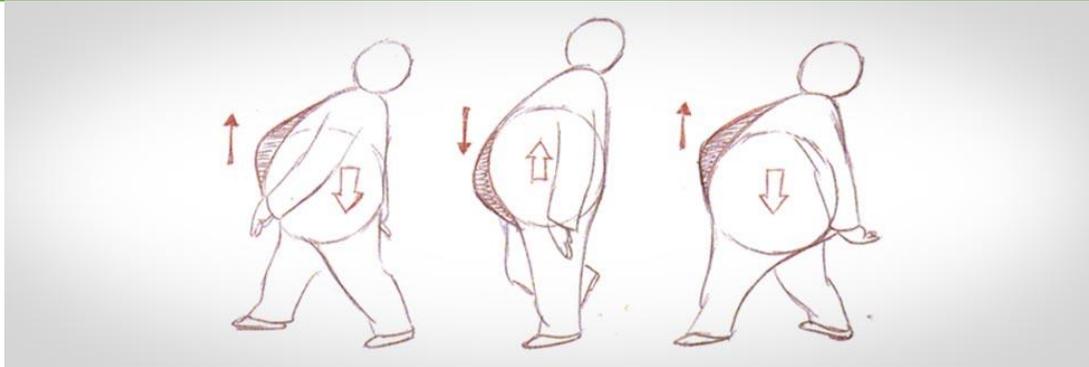
Figure 2.FOLLOW THROUGH AND OVERLAPPING ACTION

4. The way a move is completed gives us more information about the character than the pictures that show the move itself. It takes only a few frames for a golfer to hit the ball, but it will take at least 20 to 30 frames to complete the move, which will give us much more information about the character. Anticipation prepares the action we expect, the action itself flows, and we come to the striking moment of the joke, where we will see how the event ended. Of course, the end of the movement should be planned as it starts the animation just like the movement itself, but it is interesting that in the early stages, these last parts were almost never planned. It was enough just to do the movement itself, and with more detailed planning, how much more fun the movement could be and how much it could tell us about the character was not considered.

5. And finally there was the movinghold technique. This technique used a combination of overlappingaction and followthrough techniques to achieve new vitality and clarity. When the character entered a carefully designed pose, a few frames stood in this pose without moving. Sometimes this could be half a second, sometimes a second.
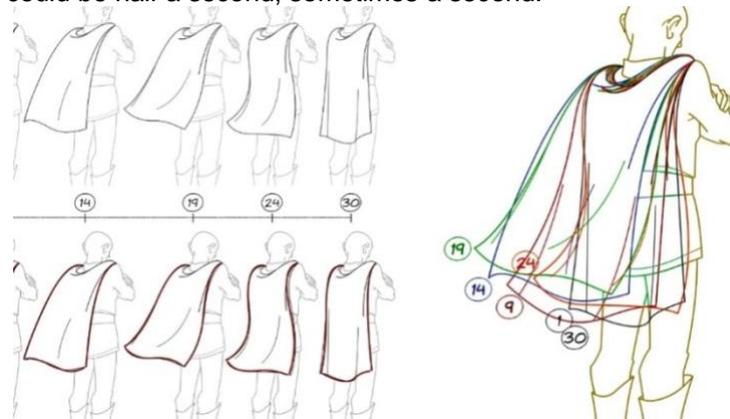

Figure 3.FOLLOW THROUGH AND OVERLAPPING ACTION

This was done so that the audience could understand the character's attitude. Usually it was enough even if it took less than a second. But when a picture remained immobile for so long, the flow of movement deteriorated, and the character became dull, flat. For this reason, it was necessary to somehow keep these poses in motion. The answer was actually to use two poses, one of which was slightly exaggerated than the other, even if they were the same pose. After the character entered the pose, it would slowly shift towards a more exaggerated pose, where each element was moved a little further, with the same pose more exaggerated. Hands would be lifted, eyes would open more, he would rise to his fingertips, but basically he would still be in the same pose. Combined with the principles of Overlapping Action and Follow Through, the liveliness of the poses could be increased by making the character more alive and organic. All these techniques gave the character more life than ever before.

Now students are told the next Slow-Out and Slow-in Principle.

SLOW-OUT VE SLOW-IN

After the animator had decided on the poses he would use in his scene, and when he made the best he could by drawing these poses over and over again, he would adjust the timing of their transitions from one to the other. Keeping the intermediate frames called Inbetween closer to the key poses and ensuring that only one frame is somewhere in the middle of the movement was very organic and impressive. This was called SlowIn and SlowOut due to the timing of the intermediate frames. Although it feels very lifeless and mechanical when used excessively, it was a very important invention for the progressive stages of animation.

Animators were asked to better analyze and analyze movements. It was necessary to reach this style, which was a caricature of realism. "Reality must lie at the heart of our work, the most successful comedies are always based on realistic events." he said.
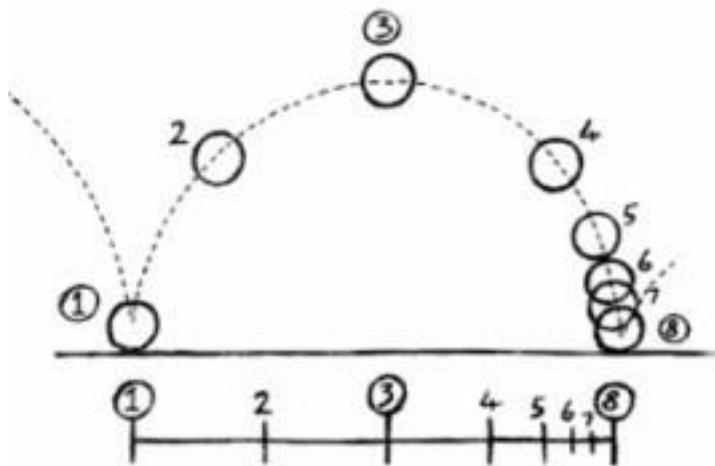

Figure 4. SLOW-OUT VE SLOW-IN

Slows entry and exit processes with gaps between drawings between extreme poses. When the action starts, we have more drawings next to the starting pose, one or two in the middle, next to the next pose. Less sketching is faster and more sketching slows the motion. Slow entries and slowdowns soften the action, making the movement smoother.

After explaining FOLLOW THROUGH AND OVERLAPPING ACTION (FOLLOW EXPOSURE and OVERLOADING MOVEMENT) and SLOW-OUT and SLOW-IN (ACCELERATION-SLOW), students are asked to watch the video opened on the projector and get the necessary notes;

- The instructions in the video are watched by the video titled "EK_12_A_VR Field, FOXOW THROUGH AND OVERLAPPING ACTION (FOLLOW-UP POSITION and UPPER-BUILDING MOVEMENT) and SLOW-OUT AND SLOW-IN (ACCELERATION-SLOWING) principle in the supplementary files.
- While watching the video, it is asked whether there is a question that they do not understand or want to ask, according to the feedbacks, the parts explained in the video can be shown again by showing.

2. After watching the video "The principle of" FOLLOW THROUGH AND OVERLAPPING ACTION (FOLLOW-POSITION and UPPER-BUILDING MOVEMENT) and SLOW-OUT AND SLOW-IN (ACCELERATION-SLOWING) principle "in the EK_12_A_VR Field, the students are shown their individual principles in this device. they are asked to experience;
- The PC screen image used for viewing the experience of the students watching during this application is reflected on the projection and the students who experience the title can be verbally helped about the application.

3. After the students experience the principle in the virtual reality Field; they are asked to compare this principle according to their experience in the pc Field, and they are asked to interpret the advantages and disadvantages of producing 3D content with VR.

ACTIVITY 13(13. WEEK)

Learning from the Animation Principles "Arcs (motion springs) -SecondaryAction (secondary motion) Principle in Virtual Reality Field

OBJECTIVE: To provide them to comprehend the principle of "Arcs (motion springs) - Secondaryaction (secondary motion)" which is the 7th and 8th principles of the basic 12 principles of animation in the virtual Field.

LEARNING OUTPUT: students;
• Experience and learn "Arcs (motion springs) -Secondaryaction (secondary motion) rules, which are important principles of basic animation, in a virtual Field.
• "They understand the advantages and disadvantages of the use of 3d software tools in traditional animation methods in the virtual reality Field.

MATERIAL:
- **Projector**
- **Internet connection**
- **Video Presentations describing the application of the principles**
- **1 Oculusrift hardware (4 batteries AA size)**
- **1 pc with sufficient hardware,**
- **A sufficient (2x2 meters) wide classroom area to use Oculusrift**
- R.9 (chapter 7-8)

DURATION: **150 mins(3hours).**

PROCEDURE:
1. In this course, students are told that we will experience the seventh and eighth principles, called "Arcs (motion springs) -Secondaryaction (secondary motion), with virtual reality equipment, and will be explained in the following order;

Principle 7 - ARCS (MOTION SPRINGS)

Few organisms in nature act like a machine by making forward and backward, upward and downward linear movements. The movements of a woodpecker or some insects may be the exception, but most live curved floods and circular movements. The head often does not just move forward and backward. As it moves forward, it rises slightly, while it comes back, it lowers slightly and creates a circular motion. This may have to do with weight or anatomical structure, but whatever the reason is, the movement is usually this way.

Figure 1. ARCS (MOVEMENT SPRINGS) in walking animation

The discovery of this method allowed to seriously break the mechanical influence in previously made animations. Instead of going straight up and straight down, the head of a walking character draws an arc when it reaches the hill, and when it reaches the lowest position, it draws another arc. In a ball launch animation that can be created with a straight line of motion, the hand comes by drawing an arc at the beginning of the movement and can continue by drawing a spiral with followthrough.
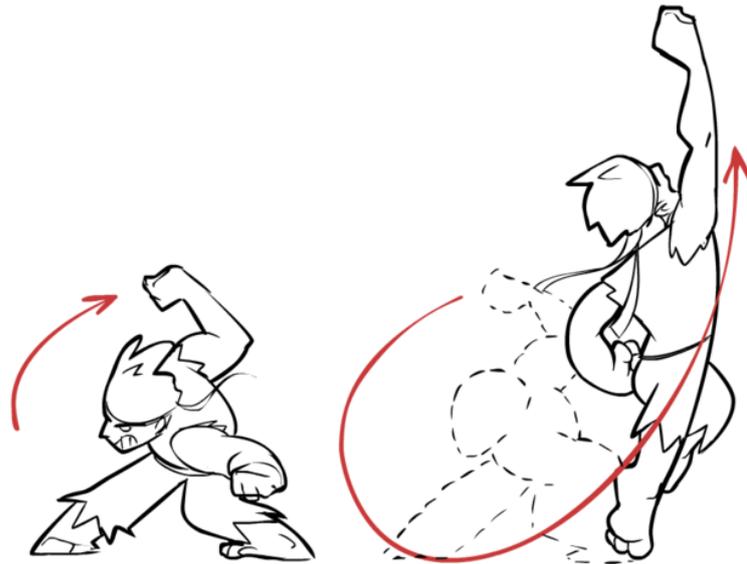
Figure 2. ARCS and followthrough combination (MOVEMENT SPRINGS)

As this technique developed, the animators began to define the arc in their rough poses. They defined where poses should fit on a curved route. This allowed animators to use the SquashStretch and Overlapping Action principles more effectively.


Figure 3. ARCS (MOVEMENT SPRINGS)

One of the main problems was that inbetween illustrators had difficulty following arc. Animators said they had to pay attention to the arc when handing their scenes to inbetween artists, but drawing an ordinary inbetween and drawing an inbetween following an arc was not the same. Inbetween drawers had a tendency to draw a linear inbetween rather than following the arc. Even when working with the most experienced inbetween illustrators, it was difficult to make sure that the movements sat on the arcs until the sequence was followed fluently. But this was a very basic requirement, because the linear inbetweenes could easily destroy the vitality of the scenes.

Principle 8 - SECONDARY ACTION

This principle concerns actions that occur in addition to the primary action of the characters. For example, if you have a character walking on the street, the effect of walking will be primary. If the same character lifts an arm to shake someone while walking, arm movement and wave are secondary movement. Secondary action usually works to always support primary action.

Figure 4. SECONDARY ACTION

The idea in a scene can often be made stronger by a supporting movement in the body. A sad person may wipe away the tear that glides over his cheek as he turns around. A dizzy person may nod his head while trying to stand up. When this additional movement is supportive of the general movement, it is called secondaryaction and should always be secondary to the main movement. If it coincides with the main movement or becomes more dominant, more interesting, there is a problem either in stating or in the choices made by the animator.

The main challenge is to present a single proposition with different but related movements. If we need to see the facial expression of the sad character, then the gesture of wiping tears with his hand should be carefully designed. An exaggerated and half-covered hand gesture is unacceptable. However, if the movement is too vague and weak, it will not be read clearly enough. On the contrary, it will not work because it will be exaggerated, but we will never see

the face. The secondary movement should be designed to strengthen the main movement.
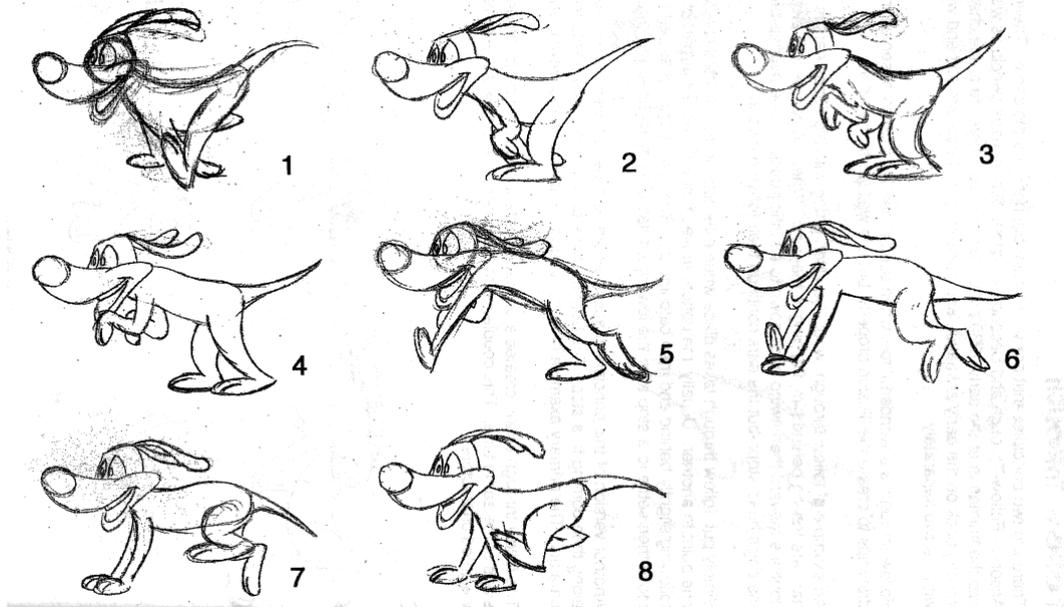

Figure 5. SECONDARY ACTION

The picture below is a good example of secondary operations. The real action is "No! I am not angry with you! "The character on the left speaks only the line. The character on the right is to cut an onion with anger. This highlights that the character is really angry. Giving personality and showing emotion with a secondary action that the audience will take.

Figure 6. SECONDARY ACTION

Sometimes the secondary movement can also be the facial expression itself. Imagine the transition from a very broken facial expression to a helpless facial expression and the character turns around in the same order. This change of expression needs to happen before the character turns right back so that the viewer can see it. The narration should be staged so that it is very clear. The secondary movement that takes place in the middle of a very large movement will often not be noticed and will not give the desired effect.

An animator solved this problem with a technique called "buildingblock". First, he would draw the body parts that concern the main movement, and then pass over once more to revive the secondary animation-related parts. If necessary, it would pass through it once more, allowing all parts to move in relation to each other, so that a very natural movement could be achieved.

To make sure that the narration will be clear, it is recommended that everything be described first with simple sketch pictures called thumbnail. When used properly, secondaryaction adds

richness to the scene, increases the naturalness of the movements and adds a new dimension to the characters.

After the principles of Arcs (motion springs) -Secondaryaction (secondary motion) are explained to the students, the students are asked to watch the video opened on the projector and take the necessary notes;

- The instructions in the video are watched by watching the video titled "Explanation of the principle of Autodesk maya and Arcs (motion springs) -Secondaryaction (secondary motion)" in the supplementary files.
- While watching the video, it is asked whether there is a question they do not understand or want to ask; According to the feedback, the parts explained in the video can be explained and explained again.

2.After watching the video of "Arcs (motion springs) -Secondaryaction (secondary motion) principle narration with EK_13_A_VR Field", students are asked to experience these principles individually on the VR device**;**
- The PC screen image used for viewing the experience of the students watching during this application is reflected on the projection and the students who experience the title can be verbally helped about the application.

3. After having experience in principle in virtual reality Field; They are asked to compare this principle according to their experience in the pc Field, and they are asked to interpret the advantages and disadvantages of producing 3D content with VR.

ACTIVITY 14(14. WEEK)

Learning the Timing and Exaggeration Principle, One of the Most Important Animation Principles in Virtual Reality Field

OBJECTIVE: To provide them to comprehend the "Timing and Exaggeration" principle, which is the 9th and 10th principles of the 12 basic principles of animation in the virtual environment.

LEARNING OUTPUT: students;
• They experience and learn the rules of "Timing and Exaggeration", which are important principles of basic animation, in a virtual environment.
• "In the virtual reality environment, they understand the advantages and disadvantages of the use of 3d software tools in traditional animation methods.

MATERIAL:
- **Projector**

- **Internet connection**

- **Video Presentations describing the application of the principles**

- **1 Oculusrift hardware (4 batteries AA size)**

- **1 pc with sufficient hardware,**

- **A sufficient (2x2 meters) wide classroom area to use Oculusrift**

- **R.9 (Chapter 9-10)**

DURATION: 150 mins(3hours).

PROCEDURE:
1. It is said that we will experience the ninth and tenth principles called "Timing (Exaggeration)", which is one of the most important animation principles, with Virtual reality hardware and it is explained in the following order;
PRINCIPLE 9- TIMING

Timing or the speed of an action is an important principle because it makes sense to the movement. The speed of an action defines how well the idea is read to the audience. Timing can also define the weight of an object. Two similar objects can appear as very different weights, simply by changing the timing. Timing can also contribute to the size and scale of an object or character. Timing plays an important role in showing the emotional state of an object or character. It is the changing speed of character movements that indicate whether a character is lethargic, excited, nervous, or comfortable. Expertise in timing comes best with experience and personal experience, using the trial and error method in refining technique.

The main points are: more drawing between poses slows and smoothes movement. Fewer drawing makes the movement faster and clearer. Various slow and fast timing in a scene add texture and attention to the action.
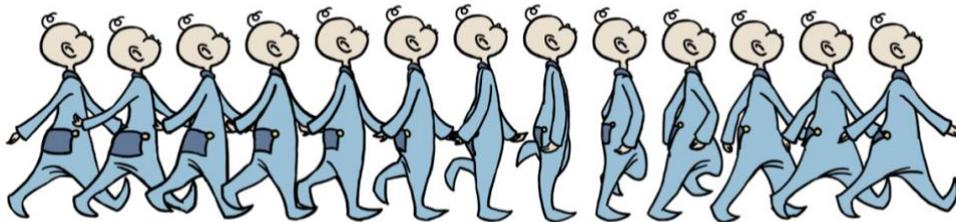

Figure 1. Timing

Timing is everything, an animated movie has 24 frames per second, some animators take two shots, that is, a drawing is made for every 2 film frames, so for one second, the animator draws 12 drawings. Animators always play with timing, sometimes 3, 4, 1 frame etc. Holds the drawing or image for, the view you want is held until it appears in playback. Timing is also related to the ranges of your drawings.

The number of images used to animate a movement determines how long that movement takes place on the screen. If the pictures are simple, plain and explanatory, the main point of the story can be easily transferred, and that was the only thing animators thought in the early stages of animation. The timing in these cartoons basically consisted of fast movements and slow movements, with the exception of some details that demand extra attention. The character of the characters' personality was determined by the timing in their movements rather than their appearance. This is what makes the characters excited, nervous, and calm. Attitude and acting could not be created without much attention to timing. The complex relationship with Secondaryaction and overlappingaction required extra time and care, but even the simplest movements revealed the importance of timing and the need to constantly work harder. Even an animation, consisting of only 2 pictures, looking down on the right shoulder below the left shoulder and on the second shoulder above, could give different emotions thanks to timing. Every inbetween between these two extremes could add different meanings to the animation.
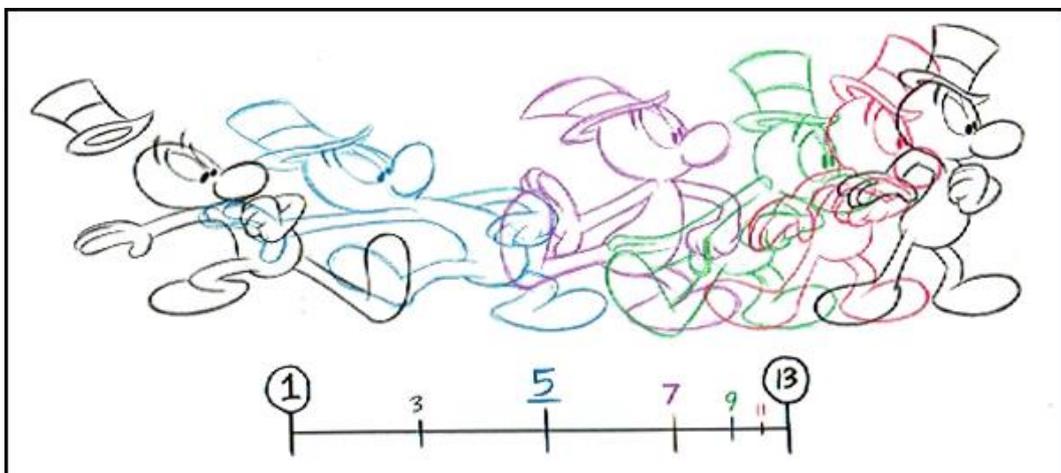
Figure 2. Timing

Without Inbetween: The character has received a very, very strong blow on his head. His neck was almost broken.
Single inbetween: Head hit with a brick or pan.
2 Inbetween: He has a stressed tiki or a spasm in his muscles that he cannot control.
3 Inbetween: Turns his head to escape from brick or pan.
4 Inbetween: He's giving a precise command, "Come on forward" "Go!"
5 Inbetween: More friendly. "Come here, come on"
6 Inbetween: A pretty girl or sees the sports car she always wants to buy.
7 Inbetween: Trying to see something better.
8 Inbetween: Looking for the peanut butter jar from the kitchen shelf
9 Inbetween: Thoughtful
10 Inbetween: Flexes stiff neck muscles.

The question that was constantly asked was this. When do you use 1s, when 2s? This number meant how many frames each picture would appear in the movie. If each frame appears once, it was called 1s, if it appeared twice, it was called 2s. It was generally known that for most movements it was not necessary to draw a picture on each frame. Each picture would take 2 frames in the movie, and the viewer wouldn't notice it as it flowed 24 frames per second. While this technique provided a serious reduction in the amount of work done, it added fluency to slow movements. Even in fast movements, an animation made with 2s seemed more vivid and impressive than animation with inbetween. Animations with Inbetween could become more lifeless in terms of timing.

Whenever the camera made a pan movement in a plan where the character's feet were visible, these movements had to be animated with 1s to accommodate the camera movement, otherwise a shaky and strange-looking result would appear.

Sometimes animations that had to be perceived more consciously and clearly had to be made completely or partially with 1's. A quick reaction or joke should have been revived by 1s. But to make this decision, the animator might have to go through trial and error several times. Only then could he have access to the correct information he needed to portray the scene.

Figure 3. Timing

Figure 4. Timing

PRINCIPLE 10 EXAGGERATION

Exaggeration, also known as pushing pose, is about taking action and pushing it to the next level for clarity of the story. This is what makes a drawing sometimes appear "cartoony", but it conveys the action or expression of a character with a great effect to the viewer, who is not surprised at what is happening on the stage.

The image below shows a character who sees something that shocks or surprises him. This is an exaggeration, because the eyeballs never get out of your head, but the animation can escape with it. It shows comedy and is very open to those who watch how shocking the character is.
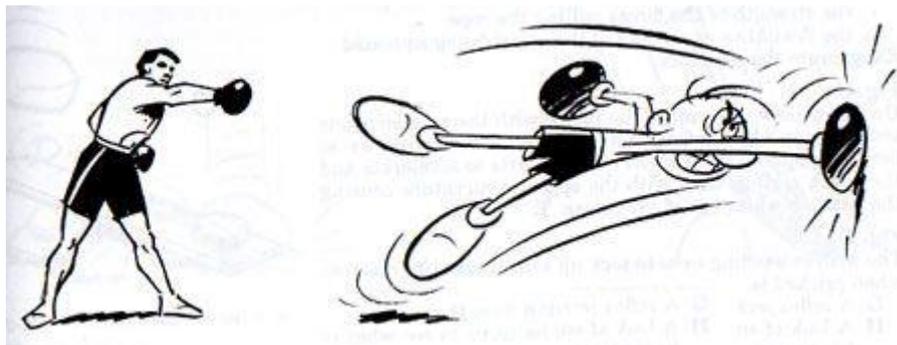

Figure 5. Exaggeration

Figure 6. Exaggeration

This principle is widely used in animation. Adding character and reality imitation is great in static cartoons. Depending on whether the animator wants realism or a particular style, there may be different levels of exaggeration. Exaggeration can remain true to the truth, but it offers a stronger or extreme form. Other forms include supernatural or surreal character or element changes.
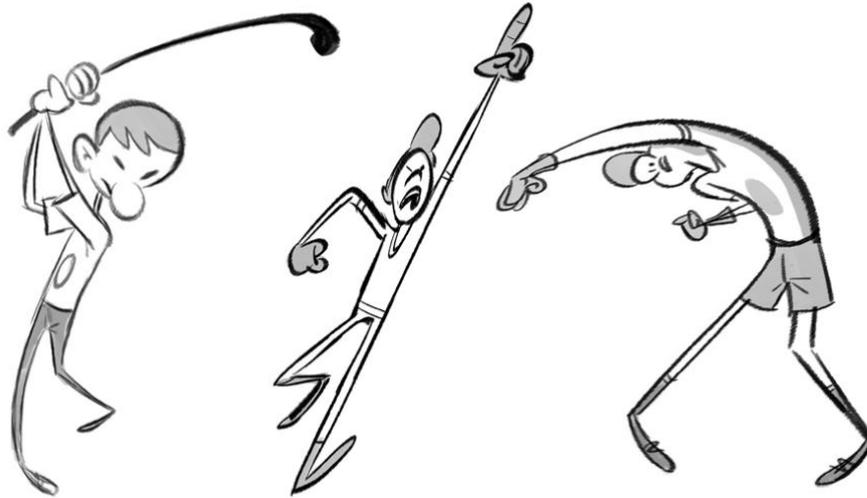

Figure 7. Exaggeration

In addition, Exaggeration in animation is not an excessively distorted drawing or always an overly wide, violent action. Facial features are like caricatures of expressions, poses, attitudes, and actions. The action watched from the live action movie may be accurate, but robust and mechanical. In feature animation, a character must move wider to look natural.

The same applies to facial expressions, but the action should not be as wide as in a short cartoon style. Taking exaggeration in a walking or eye movement or even a head turn makes your movie more attractive.

After explaining the principles of timing and exaggeration, students are asked to watch the video opened in the projector and take the necessary notes;;

- • The instructions in the video are watched by watching the video entitled "Explanation of the principle of Autodesk maya, Timing and Exaggeration (exaggeration) in EK_14_A_VR" in the supplementary files.
- • While watching the video, it is asked whether there is a question they do not understand or want to ask; According to the feedback, the parts explained in the video can be explained and explained again.

2. After watching the video of "Timing (Exaggeration and Exaggeration Principle Explanation with Autodesk maya in EK_14_A_VR environment"), students are asked to experience these principles individually on the VR device;

- The PC screen image used for viewing the experience of the students watching during this application is reflected on the projection and the students who experience the title can be verbally helped about the application.

3. After having experience in principle in virtual reality environment; They are asked to compare this principle according to their experience in the pc environment, and they are asked to interpret the advantages and disadvantages of producing 3D content with VR.

ACTIVITY 15 (15. WEEK)

Learning the Principle of "Soliddrawing (key pose) and Appeal (appeal)" from Animation Principles in Virtual Reality Field

OBJECTIVE: To provide them to comprehend the principles of "Solid drawing (key pose)) and Appeal (attractiveness), which are 11 and 12 principles of the basic 12 principles of Animation in virtual environment.

LEARNING OUTPUT: students;
• In the virtual environment, they experience and learn the rules of "Solid drawing (key pose) and Appeal" with a ready character.
• **"**They understand the advantages and disadvantages of the use of 3d software tools in traditional animation methods in the virtual reality environment.

MATERIAL:
- **Projector**

- **Internet connection**

- **Video Presentations describing the application of the principles**

- **1 Oculusrift hardware (4 batteries AA size)**

- **1 pc with sufficient hardware,**

- **A sufficient (2x2 meters) wide classroom area to use Oculusrift**

- **R.9 (chapter 11-12)**

DURATION: 150 mins(3hours).

PROCEDURE:
1. Students are told that we will experience the principles of Animation called "Soliddrawing (key pose) and Appeal (appeal)" with Virtual reality hardware and it will be explained in the following order;

Principle 11 - SOLID DRAWING (KEY POS CREATION)

In this principle, soliddrawing, a clear, understandable, clear drawing on the subject should be made and the meaning of the message in the keypoints created should be fully expressed. requires drawing knowledge.

Figure 1. SOLID DRAWING

When creating a key pose, the character must be drawn or exposed in a credible effect.

ANA POZ   ARA POZ   ANA POZ

Figure 2. SOLID DRAWING

Principle 12 -APPEAL

Appeal is one of the animation principles that makes the character or design stand out. The audience should feel realism and the character design made should also be attractive. A weak drawing lacks charm. A complex or difficult to read drawing is not attractive. When the character is presented it must have a Charisma that can create a charm. Appeal is not only used in leading characters. But it can also be used to villain, helper and any other character. Spectators enjoy watching something expressing themselves, an expression, a character, a movement, or an entire story situation.

Figure 3. APPEAL

After explaining the principles of "Solid drawing (key pose) and Appeal", students are asked to watch the video opened on the projector and take the necessary notes;

- • The instructions in the video are watched by watching the video titled "Explanation of the principle of" Solid drawing (creating key pose) and Appeal (appeal) ") with" Autodesk maya "in EK-15_A_VR environment in the supplementary files.
- • While watching the video, it is asked whether there is a question that they do not understand or want to ask, according to the feedbacks, the parts explained in the video can be shown by explaining again.

2. "After watching "Solid drawing (key pose) and Appeal" video with Autodesk maya in EK_15_A_VR environment, students are asked to experience these principles individually on the VR device with a ready character;

- The PC screen image used for viewing the experience of the students watching during this application is reflected on the projection and the students who experience the title can be verbally helped about the application.

3. After the students experience the principle in the virtual reality environment; they are asked to compare this principle according to their experience in the pc environment, and they are asked to interpret the advantages and disadvantages of producing 3D content with VR.

REFERENCES

1 Activity Sources

Additional Material Source

OCULUS GUIDE Virtual-Reality-Setup-Instructions-and-Troubleshooting-Guide

https://www.lib.ua.edu/wp-content/uploads/Virtual-Reality-Setup-Instructions-and-Troubleshooting-Guide.pdf

Figure 1.https://www.thetechmonkey.org/product/oculus-rift-cv1-1-sensor-xbox-controller-vr-headset/)
Figure 2. (https://www.turbosquid.com/3d-models/oculus-rift-headset-3d-max/1089621)
Figure. https://www.dreamstime.com/editorial-stock-photo-side-view-man-wearing-vr-virtual-reality-oculus-rift-d-headset-looking-upwards-formal-shirt-tie-to-observing-image55069068)
Figure 4. https://cooltechtrends.com/oculus-quest-review-the-best-standalone-vr-headset)

Figure 5. https://www.howtogeek.com/246333/oculus-rift-vs.-htc-vive-which-vr-headset-is-right-for-you/)

4 Activity Sources

Figure 1. https://www.researchgate.net/figure/Oculus-Touch-Raw-Mapping-Oculus-2017-8_fig2_334629439)

6 Activity Sources

Figure 1.https://support.animationmentor.com/hc/en-us/community/posts/203351118--12-Principles-of-Animation-videos-by-Alan-Becker)

Figure 3 https://support.animationmentor.com/hc/en-us/community/posts/203351118--12-Principles-of-Animation-videos-by-Alan-Becker

7 Activity Sources

Figure 1 https://jordandesignsweb.wordpress.com/2018/03/13/12-principles-of-animation/

Figure 2 https://jordandesignsweb.wordpress.com/2018/03/13/12-principles-of-animation/

10 Week Sources

Figure 1. Staging (Sahneleme) https://www.slideshare.net/hexakali/07-571-performance)

Figure 2. Staging (Sahneleme) http://www.dsource.in/course/principles-animation/staging)

Figure 3. Staging (Sahneleme) https://medium.com/chocoladesign/os-12-princ%C3%ADpios-fundamentais-da-anima%C3%A7%C3%A3o-ca94b4f04e34)

11 Activity Sources

Figure 1. https://medium.com/chocoladesign/os-12-princ%C3%ADpios-fundamentais-da-anima%C3%A7%C3%A3o-ca94b4f04e34)

Figure 2-3-4

StraightAheadAndPoseToPoseAnimation (Düz Pozlama-Pozdan Poza)

TheAnimator'sSurvival Kit 2nd Edition Paperback: 342 pages
Publisher: Faber&Faber; 2 edition (January 7, 2002)
Language: English
ISBN-10: 0571202284
ISBN-13: 978-0571202287
https://www.amazon.com/Animators-Survival-Kit-Richard-Williams/dp/0571202284

12-13-14-15 Activity Sources

Figure 1-2-3-4-5-6

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FINAL EXAM (16.WEEK)

NAME OF THE EVENT: FINAL EXAM
OBJECTIVE: To enable students to test the animation principles they have learned during the semester as a whole and see their advantages and disadvantages compared to the PC environment.
LEARNING OUTPUT: students; • Students learn to test the Animation principles that they have learned and applied during the semester at the production level. • "In the virtual reality environment, they understand the advantages and disadvantages of the use of 3d software tools in traditional methods individually in terms of animation principles.
MATERIAL: **Projector** **Internet connection** **1 Oculusrift hardware (4 batteries AA size)** **1 pc with sufficient hardware,** **A class space sufficient (2x2 meters) wide to use Oculusrift**
DURATION: 150 mins(3hours).
EXAM APPLICATION: **1. After the projector is turned on and connected to the PC, to the students;;**   According to the number of VR equipment, it is said that everyone should test the animation they produce with the already prepared rigid character individually and the created animation should comply with the learned animation principles. **2. Then students are told the evaluation criterias;** • During the exam, the correctness of the animation principles previously taught will be evaluated. • It is said to evaluate how fluidly they use the hardware when making applications;

FINAL EXAM (17.WEEK)

NAME OF THE EVENT: FINAL EXAM

OBJECTIVE: To enable students to test the animation principles they have learned during the semester as a whole and see their advantages and disadvantages compared to the PC environment.

LEARNING OUTPUT: students;
• Students learn to test the Animation principles that they have learned and applied during the semester at the production level.
• "In the virtual reality environment, they understand the advantages and disadvantages of the use of 3d software tools in traditional methods individually in terms of animation principles.

MATERIAL:
Projector
Internet connection
1 Oculusrift hardware (4 batteries AA size)
1 pc with sufficient hardware,
A class space sufficient (2x2 meters) wide to use Oculusrift

DURATION: 150 mins(3hours).

EXAM APPLICATION:

1. The projection device is turned on and after connecting to the PC, students;
According to the number of VR equipment, it is said that everyone should test the animation they produce with the already prepared rigid character individually and the created animation should comply with the learned animation principles.
2. Then, students are told the evaluation criteria;

• During the exam, the correctness of the animation principles previously taught will be evaluated.
• It is said to evaluate how fluidly they use the hardware when making applications;