"CDICAE - Collaboration to Design an Innovative Curriculum for Animation Education - 2017-1-TR01-KA203-046117 " project carried out by Republic of Turkey Ministry of EU Affairs, Education and Youth Programs Center Presidency and Erciyes University Faculty of Fine Arts, Visual Communication Design Department within the scope of the Collaboration for Innovation and Exchange of Good Practices within the framework of Strategic Partnerships for ERASMUS+ Program KA2 Higher Education Programs.

Animation Sector Trends

(O1. A Framework; Defining Needs and Expectations Between the Labor Market and the Academy)

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2.7. Animation Sector Trends

An up-to-date animation education program can only be made possible in the light of information from the animation industry and academia. Industrial studios are often engineering etc. Realizing the potential of developments in other areas to contribute to the workflow, they try ways to include them in the workflow before anyone else. When they achieve successful results, this turns into an advantage that they will use in order to stay ahead of their competitors in the market. In this case, the difference between the education given in the academy in the field of animation education and the up-to-date knowledge of the sector begins to open. Therefore, education programmers should follow the animation industry trends step by step . Only in this way can the curriculum update cycle be provided to close the level difference of the information between the academia and the industry or at least keep it at a certain distance.

From this point of view, before starting the subject about innovative courses, it is necessary to talk about the industry trends that make these courses necessary. Current trends in the animation industry can be summarized as virtual reality technologies, 3D printers, real-time rendering , depth sensors and cloud-based collaborative production workflow models (Gringon , 2018; Smith , 2018; McDonald , Gossett , & Moore , 2017). As you can see, all the titles in the list are topics related to engineering rather than the art part of the work. This trend is an indication that it is aimed to practice the processes and focus more on the art part, as opposed to a possible perception, such as when art and engineering are displaced or art is put into the second plan. Instead of the complicated tools used in animation production in the previous period, it is now oriented towards more simple and practical tools . These possibilities and new possibilities emerging with the combination of these digital tools, which are defined as “killer softwares” suitable for the target, have opened up and continue to open new horizons in terms of both doing what was not possible before and improving the existing processes. Digital transformation has been manifesting itself very clearly, especially in the field of animation. Starting with the production of digital alternatives for the most basic (Cell etc.) methods of animation, the digitization processes brought to the point referred to as the three-dimensional computer animation, where the animation is produced directly in the virtual space, including the production of model-skeleton-space-motion-frames-visual effects.

Results

In this section, the technologies related to the current trends in the animation industry are given under separate headings. The current and possible ways of integration of the related technologies into the animation industry are examined.

2.7.1. Cloud Technologies

Developments in communication technologies have caused something very different from all these innovations concerning production tools and processes. This is the realization of a collaboration opportunity that enables globalization of animation production in real terms, thanks to cloud technologies.

Although there have been some developments in the field of animation until now, with some exceptions, it would have to be in that studio in that city in order to be included in the team in general. Thanks to cloud technologies, your team-mate has now reached a point of collaboration at a table a few meters away or anywhere else in the world (Gringon, 2018) . Until recently, communication

technologies did not have the means to respond to this kind of cooperation. However, thanks to cloud technology and online project management tools, sharing of project files and project management among multiple project groups now makes it easier to collaborate, thus enabling excellent project coordination and access to resources in smaller spaces (Banerjee, 2017) . In addition to the economic benefits of this, it means that many people who were not part of the animation industry before are included in the industry with their own perspectives (Gringon, 2018) and thus the shared ideas will be enriched.

2.7.2. Rapid Prototyping / 3 -Dimensional Printing

Digital transformation for animation continues to progress by creating new extensions as needed in different directions, such as the branches of a tree. On the one hand, techniques for digital sculpture and model production methods are developed with tools such as graphic tablets and digital pens in two and three dimensional computer graphics, while on the other hand, many other tools are being developed that will create similar products with different interaction and monitoring possibilities in virtual digital environments surrounding the user. A very different branch of the tree is moving towards the digitalization of stop-motion animation, which includes the most traditional techniques such as puppets, cut - outs . With three-dimensional printing, also known as rapid prototyping technologies, Stop- Motion animation has been moved to a different dimension even though the basics remain the same. With the introduction of 3D Printers in the field of animation, hundreds of models required for different mimics that need to be handled in the stop-motion animation technique can be produced without error using the rapid prototyping method.

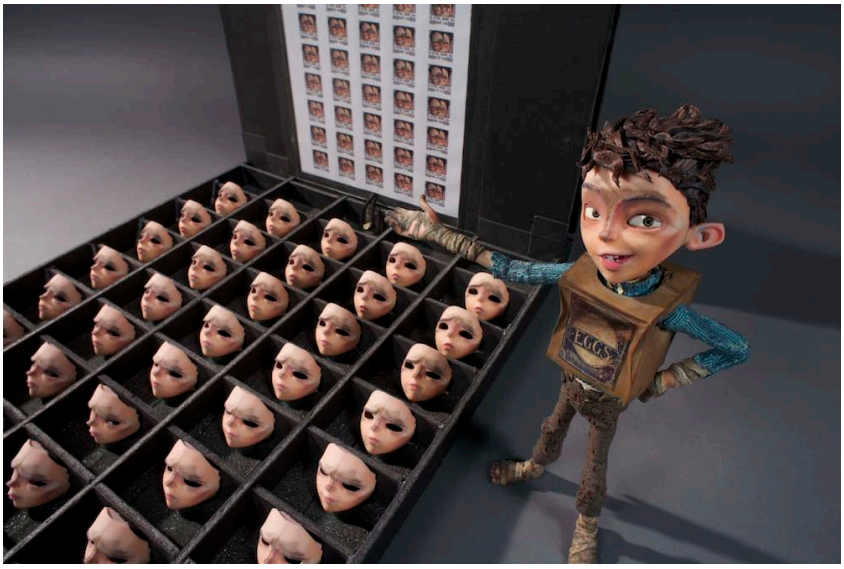


Figure 17. Face models printed by 3D print method for The Box Dwarfs (TheBoxtrolls) animated movie by LAIKA Studio (Davies, 2008).

Thanks to the developments such as lip movements of the characters according to the sounds, the different parts of the different emotions such as mouth, eyes, eyebrows or the whole face, which are copied with each other, it was possible to adapt the laborious workflows of the stop-motion technique to today's fast commercial life.

Figure 18. Face models printed by 3D print method for the box dwarf (TheBoxtrolls) animated movie by LAIKA Studio(Davies, 2008).

Another nice feature of this method is that it can be used in combination with traditional methods . " ThePirates ! " Released by Sony AnimationPicturesStudios in April 2012 . In addition to the 3D printed models in the movie “ Band of Misfits ” , the need for the use of clay to preserve the organic feeling; IanWithlock , who works as a keyanimator in the project , said: “The most important thing for performance is through the eyes. Having a more organic performance meant keeping the eyes as clay. So he continues to act as we want. ” expressed in words (Murphy, 2012) .

Animator Ian Whitlock demonstrates 3D printed mouths for a pirate captain model from "The Pirates! Band of Misfits" movie at Sony Animation Pictures Studios in Culver City, Calif.

Figure 19. ThePirates ! Three-dimensional printed mouth models for the pirate captain model in the Band of Misfits Animation movie (Murphy, 2012) .

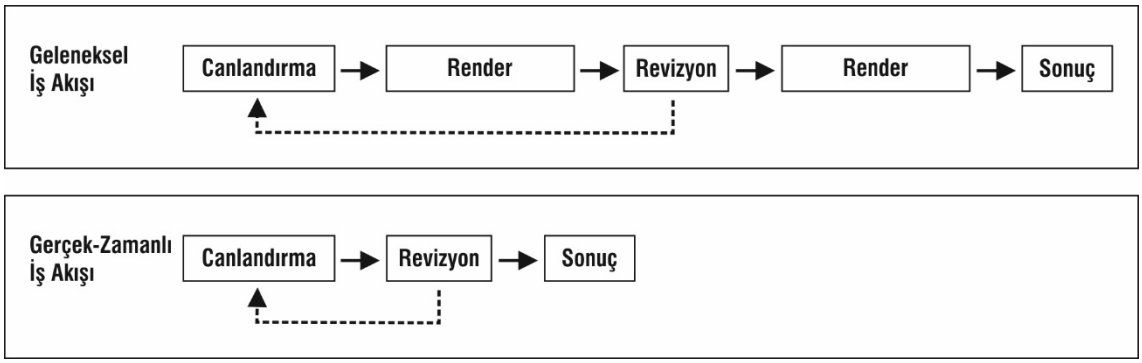
2.7.3. Real Time Render

Previously only fully developed rendering found in the vehicle Beam Scanning (ray tracing) and mimics the physical world like effects are added to the real-time engine. Thus, it is now on the agenda to produce complex scenes, which are due to computational difficulties and take quite a long time to create, with real-time engines such as Unity and Unreal Engine. Real-time image computing (rendering

), which we are familiar with in video games as well as augmented / virtual reality applications ; is the process of displaying the images quickly enough to allow the user to interact with the virtual environment. Despite the development of these engines are currently Available with V-Ray, Arnold , RenderMan and finalRender like rendering of the mainstream counted as motor vehicles are not able to access the level of film production process (Failes, 2017) .

Figure 20. *Real-time trailer created with Unreal Engine 4 for Fortnite game (Greene, 2017)*.

Despite this, it has been found to be used especially in the pre-production of films. In early pre-visualization processes, the rapid review of the shots gave the ability to make new decisions about the composition and even change the scene by moving the cameras and scene elements immediately, and apply the feedback to the team instantly while at this stage. Thus, the project team can use this time, which they have increased from the preliminary decisions, to focus on the movie elements with the best visual impact. Even traditional character animation is not required in real-time environments, gestures provide enough practicality that can be done with dynamic input devices or even touch screens on the real-time platform. Traditional and real-time image calculation work flow diagrams are given in Diagram 2.



Scheme 2. Traditional and Real Time Render Work Flow Diagrams. Converted from (Smith, 2018).

However, there are still limitations in product extraction, sophisticated complex models and in addition to dealing with the calculations required for real-time display of dynamic elements such as lighting, shadow, particle elements (smoke, water, snow, grass, etc.), hair, clothing and gravity. graphics processing power is needed. If there is not enough processing power, the milliseconds spent to display all these items on the stage can be added together, causing delays in display. Therefore, it is necessary to work with the best possible host and optimized scenes in terms of processing power.

2.7.4. Virtual Reality

Virtual reality technologies have found use in animation especially with high-end devices such as HTC Vive and OculusRift . The software developed for VR technologies coincide with the different types of work in the animation production process. These steps, pre-visualization -cameras to decide on the terms, animatic -Creating monitoring / reviewing and modeling that occurs (Failes, 2017) .

When the opportunities provided by VR are analyzed in two groups as "storytelling and animation making tools" and "modeling the element and character of the scene- texturing and background painting tools", the related software are given in Table 5 according to their intended use.

Table 5. VR Tools and Usage Areas

Software	Storytelling and Animation Production (+ Stage editing, Lighting etc.)	Pattern, Texturing / Painting
Tvori	✓	
AnimVR	✓	✓
PoseVR	✓	
Medium		✓
Quill	✓	✓
Mindshow		✓
MeetOllie	✓	
TiltBrush		✓
Norman	✓	

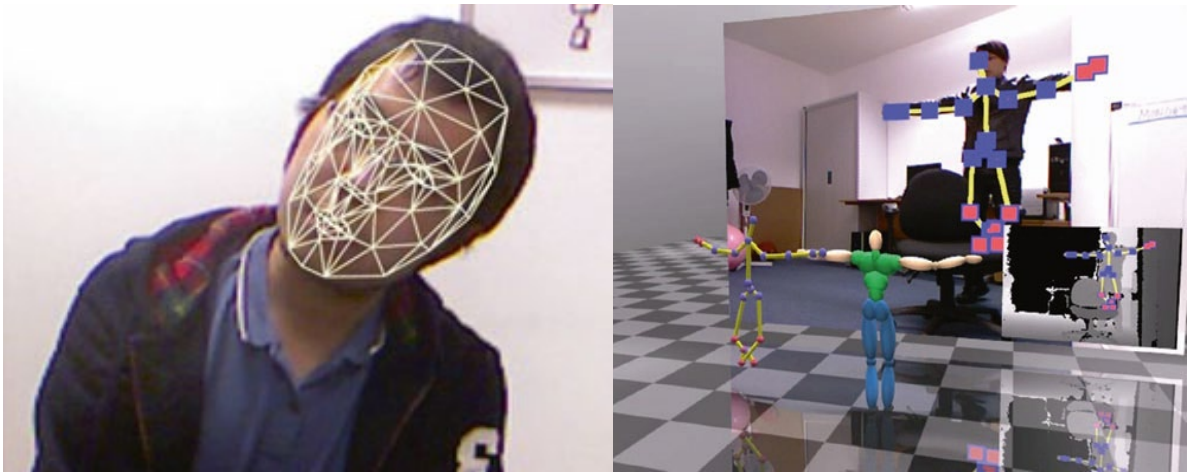
Figure 21. Key frame animation with Tivori software (Users and controls in virtual environment are given in blue avatar) (Tvori, 2018)

Figure 22. 3D modeling with Medium software (Iamag (a), 2017).

Figure 23. 3D modeling with Medium software (Iamag (b), 2018).

2.7.5. Depth Sensors

The effort to find more accessible solutions instead of high budget motion capture systems that find use in the animation industry has started to yield results in recent years. The process that started with mechanical systems continued with the inclusion of optical and inersial systems in the game. Today, much more economical Depth (RGB-D) Sensors are used for single studios or low-budget movie / TV series projects . With this method, movement data of both skeletal and facial can be obtained (Figure 24). Although the results obtained with depth sensors are less sensitive than motion data obtained by professional systems, they can be used in the workflow of projects that require less detail.



Görsel 24. a. 3D superficial bookmarks (p. 5) superimposed with a 2D color image defined by Kinect , b. Detected skeletal / posture reconstruction (Shen et al., 2016, p. 10) .

Microsoft's game console with integrated used Kinect sensors such as RGB-D sensors re-creation in the digital environment as it is about motion capture our 3D surface geometry, that can also be used for other words surface 3D scanning for obtaining information (Shen, Zhang Yang & Shum, 2016, p. 7)

Figure 25. 3D interior and human figure reconstructions (Moya, 2016)

Conclusion and Suggestions

As a result of the research on industry trends, it has been determined that there are trends in the use of new technologies given in Table 3 in the field of animation. Based on these results, the following are suggested; Business cooperation with other disciplines is another issue that needs to be considered how and how both the animation industry and institutions providing animation education should embrace other disciplines. For the next step; Those working in the fields of art, design and animation, engineering, medicine etc. It seems important for other disciplines to come together through workshops such as properly focused workshops , symposia and to research what can be done together.

Tablo 6. Industry Trends

Innovative Technology
Virtual Reality
Augmented Reality

Real time
Game Engines
Rapid Prototyping
Optical Sensors (Photometry , Laser scanning etc.)

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