CREATING A 2D ANIMATED SHORT FILM WITH SOUND AND IMAGE SYNCHRONISATION

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Abstract: *Animation is a method, in which still images create the illusion of movement on the screen. We manipulate the viewer with fast-moving pictures to make them look as if they can move. This article intends to make a 2D animated film based on a screenplay template with synchronized sound. In the article, we had to provide different Software: Adobe Illustrator, Adobe Animate, Adobe After Effects, Adobe Premier Pro, Reaper (Digital Audio Workstation), and Sketchbook. In addition to the software and, of course, the computer, we also used a graphics tablet, a microphone, and a sound card During writing the article, we get to know the workflow of the creation of animation, from the design to the final product. We tested ourselves in the role of all important members of production houses to get the most realistic insight into the creation of such a project. The final product of the article is a short cartoon with a synchronization of speech and sound.*

Keywords: animation, 2D, cartoon, lip sync, synchronized sound

1. INTRODUCTION

Animation is the result of a sequence of still images that together create the illusion of motion in the real world. The word animation itself comes from Latin, where the ancient Romans knew the word anima for soul. Artists use animation to give characters a soul or bring them to life. Animated films are about bringing cartoon characters and objects to life by moving them around, by "giving" animated characters a soul. And so, these characters can be good or evil, honest, villainous, naive, funny, deadly serious, oblivious, and so on. For this reason, some of them have always remained in our memory, because cartoons were part of our childhood. We had fun watching them, we identified with the cartoon characters, and finally we could learn something from their good and bad qualities. When we grow up, most people stop watching cartoons. But few go beyond the level where not only the body language of the characters and the visual action of the story are important, but where they also notice and learn the hidden qualities of cartoons that we mostly overlooked as children. Some want even more: they want to be involved in the process of creating animated films. They want to create new heroes to entertain new generations and provide them with new learning opportunities.
The goal of the project was to create a short-animated film that would be educational and interesting for all generations, and to overcome the preconception that animated films are childish and only for children. We also spent a lot of time expressing ourselves artistically to make a project where we could bring our love of drawing to the screen. Our work was about learning about the process of creating a cartoon with dubbed sound, and experiencing all sorts of problems we encountered along the way. We wanted to learn how to reduce these problems and, most importantly, how to supplement the knowledge we gained at the university with additional research and put it into practice to realize the project we wanted.

2. METHODS

Through the production of an animated film, we learned about the role of the scriptwriter to the producer of such a project, giving us an insight into the work of an individual on a professional project for a large production company using amateur equipment.

2.1 Creating a story and its screenplay

We began our creative process by coming up with a story, and we had to make sure it had enough speech, which was the only way we could learn animation and sound synchronization. First, we read existing literature, then we had the idea of our own story, which allowed us to create the story, the

characters and the images in our own style, and to try a different artistic style, which was an additional challenge. Once we had our story well fleshed out, we began writing the script. Since we had decided to animate with speech, the elaboration of the script was especially important, because without a well-defined dialogue it is not possible to start animating the characters. When writing the script, we had to pay attention to the audience we were writing for. In our case, when we were putting together the animation for the kids, we had to be extremely careful with words they might not understand, and there were a lot of those in our case. We spent a lot of time on the problem of how to explain to children in the simplest way what cubism means.

2.2 Creating a visual image of the protagonist and other characters

Since our story is divided into two realities or two different worlds, we have adjusted our drawing style accordingly. In the story, we have one main character who makes two different appearances throughout the story. Our protagonist switches from one reality to the other, changing his appearance, and at the end of the animation he returns to his original form.
Our creative journey began with sketching in Sketchbook software, which we used to get as close as possible to the characters in the story. We focused on our main character first and later developed the other characters in the same way. For the first part of the story, we mainly used the line drawing technique that we had the most practice within previous projects. The work continued with a slightly more difficult challenge - drawing a character in a cubist world. To do realistic dialogues in the script, we wanted our character to have more mouths and retain the main features of his character from the "real" world in "cubism".

2.3 Creating a storyboard

A storyboard is a sequence of images that represent the visual content of a story based on a script. A storyboard can consist of simple sketches on paper or fully developed colored and shaded drawings or even photographs. Storyboards save a lot of time in project development and can alleviate many financial problems (White, 2005).
In our case, we visually defined the story with sketches in Sketchbook and added the appropriate dialog into the scene. In this way, we thought like a cinematographer and defined the camera position in each scene, which gave us a more detailed view of the spaces we would use in the animation and where we would place our cartoon characters. We took the drawing style from our sketches into the storyboard. We started with a black and white drawing and continued with a color representation as the two worlds transitioned.

2.4 Recording the dialogues

In this step, the actors lent their voice to a particular character in the cartoon. We needed some test recordings to find the right sound without any background noise. We covered the entire studio with pillows and various blankets to dampen unnecessary vibrations in the room. In any case, we recorded many of the same recordings with different voices to have more choices later. All the material was saved directly in Reaper software, where we also removed the noise that was still present despite our careful layout and exported to files that Adobe Animate software can read.

2.5 Animation of the walk and run cycle

Animating a walking cycle (Figure 1) is one of the most basic and important animation processes, but also one of the most difficult. Both drawn characters and real people differ in the way they walk. This depends on the shape of the body, the mood, the personality of the character, etc. (Roberts, 2011). The sad character will walk slowly and hunched over, while the happy character will bounce around the stage. When creating the cartoon, we paid a lot of attention to what mood the character is in at a particular moment. The most important element of the walking cycle animation is the illusion of gravity. When walking, one foot is always on the ground, regardless of whether they are alternating. However, when we have a cycle where both legs can be in the air for a moment, it is no longer walking, but running. As with walking, we animate running with the same key elements, but we need at least one frame where we take both feet off the ground. The number of frames used is critical to the animation of running. If we want the character to run or sprint very fast, we only need three frames, but if we want the character to run and jump slowly, we add more frames in between for that effect. Running cycle in shown in Figure 2.
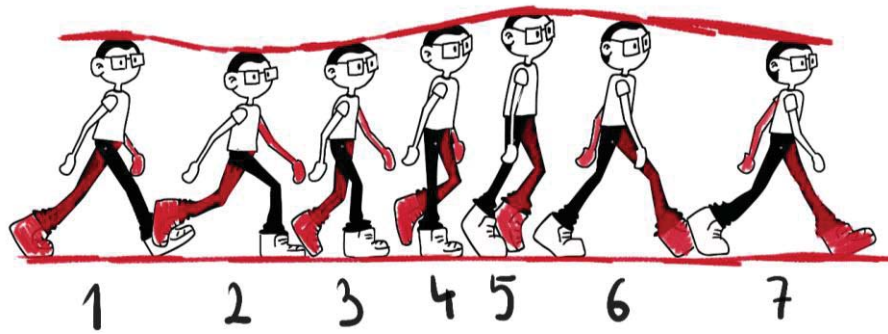
Figure 1: Representation of protagonist's walk cycle

Figure 2: Representation of character's run cycle

2.6 Speech animation
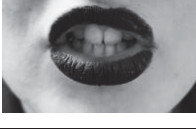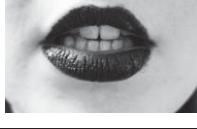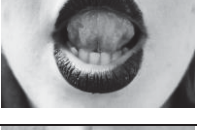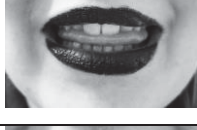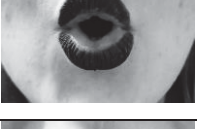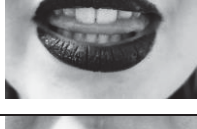
After creating the animation of the character's body movements, we started animating the mouth and facial expressions. We spent some time studying the method of lip synchronization, which led us to the realization that we needed to do some of the intermediate steps ourselves. Like various literary sources, the Internet is full of tips on lip-syncing the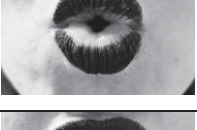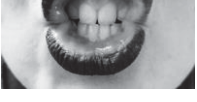 English language, which of course differs in alphabet from ours. Even some of the letters we have in common in the alphabet are not pronounced the same way as in their language. Since we decided to make our animation in Slovenian, we started by creating the mouth positions for the phonemes ourselves. We began the study by photographing the lips next to each letter of the alphabet, and the images were compiled into a table (Table 1) containing the alphabet and the viseme corresponding to each syllable. We searched the table for the letters where the differences in the shape of the lips were insignificant, so that we could group them together.

The more time we are willing to invest in animating a character's mouth and matching the image with the sound, the better he will look when he speaks, and the speech will be more understandable, making the animation more successful (Breen, 2016).

The vowels are the most important part of the synchronization, and since they are not similar enough to any other letter of the alphabet, we have drawn a shape for each syllable. They are also the only ones in the table that are not colored since they do not have to have a common shape. All other letters or consonants were grouped by color, as were the common shapes we then assigned to them. This way, we were able to consolidate our collection of lip shapes that we used in the animation, and the final product was a smoother and more efficient synchronization.

One of the basic principles of animation is exaggeration, and that's what we followed in our lip design. We exaggerated the position of the lips when we took the photo to make them more visible, and even more when we designed them for animation. To create the profile of the lips, in addition to our reference photos, we also looked at popular cartoons that use the side view, such as Family Guy, American Dad, Disenchantment, etc. Table 2 shows all the necessary lip positions to make our animation realistic enough. The common visages are divided by the same colors as in the previous Table 1.

Table 1: Photos of the shape of the lips when pronouncing the whole alphabet

LETTER	PRONUNCIATION	LETTER	PRONUNCIATION	LETTER	PRONUNCIATION
A		B		C	
Č		D		E	
F		G		H	
I		J		K	
L		M		N	
O		P		R	
S		Š		T	
U		V		Z	
Ž					

Once all the characters' movements were animated, we could begin the actual speech synchronization. To animate the lips, we used Adobe Animate's automatic speech synchronization feature. To properly animate the lips, we first had to draw them in Adobe Illustrator and import them back in, assigning each illustration its own keyframe in the software. We also gave each keyframe a name to make it easier to figure out which frames belonged to a particular audio clip at a particular time. In the next step, we imported the frames into the timeline and tried out the lip sync, which surprised us in a positive way. Since the program is written in English, we did not expect it to be compatible with Slovenian. But surprisingly, it split the audio track into the correct timing of the different syllables. Of course, there were some errors, but nothing significant that could not be replaced or even added by other lip shapes.

Table 2: Depiction of all the necessary letters for correct synchronization and their corresponding illustrations

LETTER	LIP SHAPE ILLUSTRATION	LETTER	LIP SHAPE ILLUSTRATION
A		C, J, S, Z	
E		D, N, R	
I		F,V	
O		H, K	
U		L, T	
B, M, P		Č, G, Š,Ž	

3. RESULTS

The result of our work is a short-animated film with synchronized sound and speech. The animated film follows the protagonist who, during an art excursion in a gallery, accidentally falls into a painting and finds himself in a fantasy world where he searches for ways to return to the real world. During his visit to the world of painting, he learns about the artistic style of cubism, in which he changes his image when he comes over from the previous, real world. The animation is educational and can be used for educational purposes in art classes for children. Our idea or desire for future projects is to create a series of short animated films where our protagonist can dive into the imaginary worlds of different paintings and learn about artistic styles. The idea for the animated film came from our childhood imagination. We wanted to show in a metaphorical and informative way the moments when someone stands in front of a painting and looks at it forever, and then his parents tell him that he just lost track of time and "totally fell into the painting." The animated film "Hop into Reality" was created with great love for art and different forms of artistic expression.

4. DISCUSSION

We were aware from the beginning that a project like this would not be easy, but we must admit that we never thought it would be so time-consuming. However, we learned a lot during our research and gained a real insight into how a project like this works. If we could start the project again with the knowledge we have so far, we would do a lot of things differently because the work did not always go as we had imagined. During our creative journey, we encountered all kinds of difficulties. These started at the very beginning of the animation because we wanted to use the same drawing style in the animation as in the sketches, where we used simulated pencil strokes as tools. Since we had not thought carefully enough about the fact that our sketching software - Sketchbook - is a raster software, while Adobe Animate is a vector-based software, we were a bit disappointed when we realized that the drawing tools offered did not match those of the sketches.
We realized quite quickly that time would be a major problem in our case. We realized that we would have to leave out some details that would not make much difference, hoping that we could add them at the end of the project, but unfortunately, we did not succeed. A big problem arose in the design of the

visemes for speech synchronization. Our first thought was that we would use similar lip shapes to those in the various instructional videos on the Internet that we had watched extensively before starting the project, but we had not considered that we had chosen a completely different language for synchronization. Although creating and studying our own viseme was a lengthy process, we are glad we undertook it because we spent more time studying our facial expressions and perhaps helping someone doing a similar project with our research. We would also like to point out a problem we encountered during the animation process when we realized we did not have a good idea of the timing of the animation. Frames were limited to speech, meaning scenes with dialog or monologs took as long as the soundtrack. However, since we created the storyboard before recording the speech, we did not have a good enough idea of the timing of the shots. Therefore, for the first page of the storyboard, we unfortunately had to remove or change some scenes that were already drawn. However, since the storyboard is created at the beginning of the creative process, we did not change it later because we did not need it.

If we could start again, we would leave more time for sound effects and music in the animation. We would have spent most of post-production choosing the sound effects or recording them ourselves. That way, it would be easier to synchronize them with the reference we had already made, and later, thanks to the same recording equipment, it would be nicer and easier to mix the sound together. Despite our sometimes poorly organized workflow, we are extremely satisfied with the final product. We believe that we managed to fix all the problems to a large extent, or at least mitigate them to the point where they are not so visible anymore.

5. CONCLUSIONS

We set out to create a short 2D film with synchronized sound and image, and we succeeded with the final product. Our creative journey was not easy, as we kept encountering various difficulties during our work. But every clever solution gave us the motivation we needed to finish the work. Every time we look at the finished product, we are truly grateful that we did not give up.

At the end of the day, we are not only proud of our finished product, but also very satisfied with the knowledge and experience we gained during the production process. We learned all kinds of new software, the history of animation and finally different drawing techniques. During the creating of the animation, we learned the main elements of the creative process used in the professional world of animation. And what is really encouraging is the fact that with the knowledge we have gained, we are now more confident and therefore ready for new projects.

Creation an animated film is a time-consuming process that most people do not realize when they see it. We hope that our article has given a realistic picture of the working process and the dedication we put into each step.

6. REFERENCES

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