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SPECIAL EFFECTS USED IN CREATING 3D ANIMATED SCENES PART II

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Abstract: Today, the computers have made special effects so real, very hard to distinguish from the real elements on the screen, that we can barely notice them. The 3D animation technology development mirrors the progress of technology in the 20th century from mechanization and industrial to computerization and virtual. While the special 3D animation from today could not exist without computers, people are still the ones who conceive these effects. There are many opinions according to which 3D animation will have a much greater impact than it has had up to now. Filming animated 3D scenes offers various opportunities for achieving direct camera shooting. 3D Graphics is a lot more complex, it works with textures, volumes, light schemes and everything is being realized with the help of the computer and of the intelligent mind of the 3D graphics editor. Also, the computer-aided design, the integrated machine-tool systems with automatic control, industrial robots, etc., are some of the current mutations of industrial production that strongly influence product design. The 3D programs are spectacular; thanks to the developments from the hard and software technology, lighting and dynamic renderings specific to 3D scenes can be integrated more and more easily even in complex scenes. The viewer will not even notice that some of the nature landscapes will be generated by the 3D graphic editor. The aim of this article is to briefly present the geometric modelling of some component elements of the proposed 3D scene. Like any other developed product, it has to replace one that already exists, and for it to be accomplished an essential criterion is to introduce a new user facility or to improve the technical performance of the predecessor. Competition also led to diversity, the producers had to capture unexplored market sectors and bring improvements specific to a certain job. The aesthetic valences are ensured by the use of high-quality plastic, metal and ceramic materials and finishing, but also by an arrangement of different primary or combined geometric shapes that confer the status of a "decor" object, when we look at the design of new products as an art.

Key words: Design, scene, 3D, special effects, natural.

1. INTRODUCTION

Today, computers have made the special effects so real, so hard to notice the real elements on the screen, that we almost don't notice them [1]. The evolution of special effects technology in 3D animations mirrors the developments of technology in the 20th century from mechanized and industrial to computerized and virtual [2, 3]. And while the special effects in today's 3D animations could not exist without computers, people are still the ones who design these effects and play a major role in making them happen [1, 2, 3].
Today there are several leaders on the software market, the competition between them being fierce. All aspects are taken into consideration: type, interface, existence of documentation, ease of use, addressability, compatibility with other programs, the operating system it runs on and, last but not least, the price [4, 5, 6, 7]. It often makes the difference between professional programs (which end up costing thousands or tens of thousands of dollars) and simple ones, with fewer features, which are usually used only to perform a limited sequence of actions [5, 8, 9].
The evolution of special effects technology in 3D animation mirrors the developments of technology in the 20th century from mechanized and industrial to computerized and virtual. When special effects were first made, people had to work the machines [7, 8, 9, 10]. This article aims to exhibit a game design from these days, using special effects and dynamic rendering in the process of scene creation. Our contribution is to briefly present the geometric modelling of some component elements of the proposed 3D scene. The aim of the research is the

overall purpose of conducting the research by using our resources and ideas. In order to meet the objectives of the paper, a study in the existing literature in the area was performed.

2. COMPUTER GENERATED SPECIAL EFFECTS (CGI)

Optical special effects have been replaced over the last ten years by digital processing. Even the pyrotechnicians, who must take part in the scenes with explosions and fire, are starting to feel more and more the competition of digital effects. 3D graphics are a kind of infographic that has taken up a lot of vector and matrix graphics. But, over the years, there have not been only tricks with the camera. In movies the magicians of special effects have learned to deceive the audience using physical tricks. In "The Great Train Robbery" (1903), the audience was frightened when a member of the train crew was thrown from the train by bandits [9, 11, 12]. They did not realize that it was only a doll. While Buster Keaton chose to destroy an entire locomotive in "The General" (1926), others used miniatures to simulate planes, buildings, ships and even gigantic creatures. "The Lost World" (1925), starring Willis O'Brien's little dinosaurs, was the first to make extensive use of animatronics, where manually or electronically operated puppets are used to create a kind of 3D animation [13]. O'Brien's work can also be seen in "King Kong" (1933), in which the 18-inch-tall gorilla climbs a model of the Empire State Building. O'Brien's protégé, Ray Harryhausen, raised animatronics (animatronics - hydraulic puppets controlled by a computer) to the level of art in films like "Jason and the Argonauts" (1963).
Horror movies are generally scary because of another skill of an illusionist: makeup. Artist Jack Pierce designed the screw in Boris Karloff's neck for his appearance in "Frankenstein" (1931), although director James Whale softened the look to make the monster more sympathetic. Much later special effects artist Tom Savini, influenced by the blood he saw while he was in Vietnam, outfitted actors in films like "Dawn of the Dead" (1978) with latex body parts filled with fake blood to simulate extraordinary mutilations [12, 14, 15]. In the early 1990s, it became obvious that special effects films would have to be divided into two eras: I.C. for before computers and D.D. for after digital. Computer generated images, or CGI, began to significantly alter the art of film. The changes have been remarked in the 1998 remake of Willis O'Brien's "Mighty Joe Young" [16].
Disney created a 5-meter gorilla, which only occupied 20-25% of the character's time in the movie, the rest being occupied by computer-generated images. Only the most fanatical keyboard users will agree that computers will totally replace the traditional smoke and mirrors effect of humans [15, 17]. But in films like "The Lost World" (1997) (based on Michael Crichton's novel, not the 1925 film), new guru Stan Winston achieved a new style in which CGI is combined with large fake animals.
Even if in the 90's the use of CGI grew at an exponential rate with the development of the computer industry, CGI became a big part of the film industry with the release of the movie "The Abyss". This is the movie that defined what CGI can do and was later outdated by "Terminator II - Judgment Day" which had one of the best effects ever made. One such industry led to the making of the first episode of George Lucas' trilogy "Star Wars: The Phantom Menace" where an entire battle sequence was done in CGI and the character of Jar Binks is also created entirely with CGI. Along with the developments in the computer industry, CGI will continue to grow and influence the special effects industry in the future [15, 17].

3. SPECIAL EFFECTS IN 3D ANIMATIONS

Particle dynamics can be used in creating effects produced by millions of entities, including here fire, fog, dust, explosions, mud and even a swarm of bees [5]. A particle is a point in 3D space that can be affected by simulated physical forces, which are arranged like entities, including spheres, clouds, images and undefined surfaces - even certain objects like leaves or spaceships. Particles can be drawn within a scene independently, or they can be created with the help of an emitting device, which automatically emits particles in a certain way, depending on the desired effect [17, 18].
There are all sorts of pre-made particle effects to simulate fire, to emit smoke, to produce lightning, even to realise a river flow in a valley. In general, they are a starting point for something much more complex, so you need to adjust them in order to reach the desired effect. By using pre-made effects, you can benefit from a particle-based system that also contains other attributes that directly affect how the particles react [17]. These attributes are made of pre-made expressions and connections. For example, when creating fire using the Fire effect, the Turbulence, Gravity and Drag fields are automatically connected to the particles, as well as a pre-made shader and special expressions to offer a higher control.

4. GEOMETRIC MODELLING

Sometimes the best way to apply a new special effect is to look at how to make systems that have already been created. A good place to start in this way is represented by the virtual examples already created, but in the first place the effects created naturally. Fluid special effects are part of a realistic simulation technology and fluid motion rendering [17, 18]. These effects are made to create a very wide variety of atmospheric, pyrotechnic, space, and liquid effects in both 2D and 3D.

5. CREATING THE 3D SCENE

There are many opinions that 2D animation will disappear at some point. It is believed that the share of special effects obtained in 3D will be much higher than it has been done so far. Firstly, because it gives you a much wider palette than what you can get with direct camera shooting and, secondly, the costs are much lower. On the 2D side it's a routine work to do it frame by frame.

There are situations where there must be a collaboration with an "art director" and a "graphics editor". In this case, the art director draws, colors, sets the animation style and, together with the editor, cuts frame by frame. Basically, you adapt according to the type of project, there is no rule to apply. In the case of 3D graphics, 2D graphics are often used to visualize movements, cursive, frame duration.

2D is drawn and, if everything looks as desired, 3D construction and animation on the 2D model begins. It's simpler and more efficient from all points of view. 3D graphics is much more complex, you work with textures, volumes, lighting schemes and everything is done with the help of the computer and an intelligent mind that belongs to the 3D graphics editor. 3D programs are spectacular, but you need time and tests to learn them very well [14].

3D representations are obtained due to a three-dimensional graphic creation process using computers and special software. They were made in the form of still images or video clips. The stages of creating a 3D project involve: modeling the objects in the scene, texturing them, lighting the scene and rendering. However, when representing a scene, we must take into account several factors. The first factor taken into account in creating the scene, the geometric arrangement of the light sources, the object and the observer [12, 13].

Experience shows us that at certain angles we see light spots reflected by the object, and these do not have the same color as the object. So, the reflection spectrum is dependent on the geometry. Also, surfaces facing directly towards a light source will appear brighter than inclined surfaces [19, 20, 21]. Lighting geometry – is a point or distributed source, how far it is from each object. Another factor taken into account in modeling the scene, the physical nature of the surface - is it glossy, matte, colored, transparent, smooth or bumpy. The effect of the other surfaces in the scene and the medium through which the light passes - smoke, fog, underwater, rain [22, 23].

Giving a geometric description, we were able to generate her image in several ways. Next, we focused on lighting modeling and visualization. Geometric modeling has been handled so that it does not affect visualization. On the time of the visualization process, the following distinctions were taken into account: the illumination of objects by light sources (whatever their origin); light reflection on an object; object shading (for display on a graphics screen). Regarding the first point, we had to model the geometry of the light source, its physical dimensions as well as its intensity distribution, and also its spectral distribution, its color. Next, we had to consider how the incident light is modified by a given surface, especially regarding the color of the light.

For this, we will define a model of light reflection, and we have several ways available. The third point is necessary because in most cases we just calculate the light leaving a few specific points on a surface and use different interpolation techniques to determine the light leaving the surface at other points. There are two ways to calculate lighting effects: local lighting models and global lighting models. We decided from the beginning that we wanted to create what could be considered a game level, using along the way modeling, texturing and animation techniques specific to video games. Although optimization can be difficult many times, the techniques used can be considered standard.

For this reason, we decided to include an object that will be modeled using more advanced techniques, named Sub-D modeling. Regarding the animation, we wanted to keep it relatively simple from a technical point of view. We animated the tank turret and the camera moving in three-dimensional space.

In post-production, we added and synchronized the explosion of the projectile that destroys the tank track. The decision to make a simpler animation was conditioned by the desire to learn the basic elements of 3D animation, without being confused by more advanced concepts. From an artistic point of view, we made the decision to create something that could be present in a commercial game from today. Considering that the best-selling game of 2010 was Call of Duty: Modern Warfare 2, the decision was relatively simple. This is how we decided that

our scene will be quite similar to many of the locations present in this type of games. More precisely, a town in the Middle East destroyed by this conflict.
The modeling has started with the parts near the entrance to the building. we chose to start from a simple plan, because it was more representative for the building. By selecting the top and bottom edges, we used Connect to create 7 new edges. We arranged these new edges (created at equal distances by the program) to create the support pillar in the edge and the horizontal dimensions of the 3 windows. then selected all the horizontal edges and used Connect again to create a new edge that goes through all the other 7.

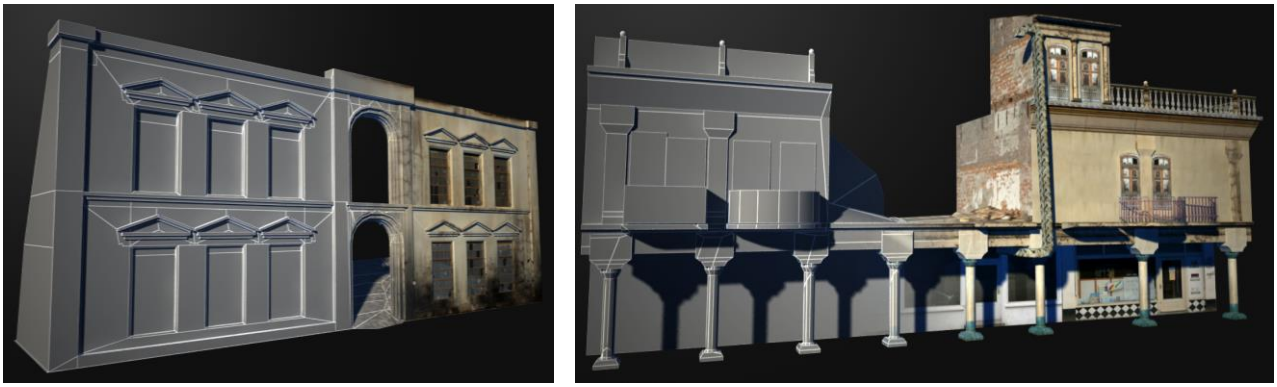

Fig. 1. Moodboards, [16]

By having the base of the windows and the pillar, all that was left was to use Extrude on those polygons. The windows received a negative value (to be deepened inward), and the pillar, a positive value (to be deepened outward). The image from below illustrates the technique described in these rows. The second modeled building had some special challenges. Considering that the level was made for a game, the most important thing is the player.
This has some less obvious implications. The player will be closest to the lower levels of the building. Which, from the point of view of details and geometry, means that the most important detail must be placed at the level closest to the player.

Fig. 2. Barrier modeling, [16]

This building has a rather detailed balcony on the first floor and an elegant railing on the roof, probably for a terrace. But, although they are relatively detailed, they are far from the player, who does not have access to the upper floors. Which means that we had to find a method by which to preserve the details of those objects, but also to be efficient in terms of performance. Thus, we decided that the model should be a simple plan. The most important part is the texture, which has an Alpha channel for transparency. So, the details are preserved, but the geometry is greatly simplified.
Sub-D (Subdivision Surface) is a method of finishing a mesh, subdividing each polygon for a better approximation of a curved surface. It can be used to create fine surfaces, but without working with a very large amount of information, because the fine surface is approximated from a surface that is easier to handle, with fewer edges. This modeling method was used only for the tank, which will not be present in the whole scene, but only in the animation clip. We used this method because we also wanted to practice Hi-Poly modeling.

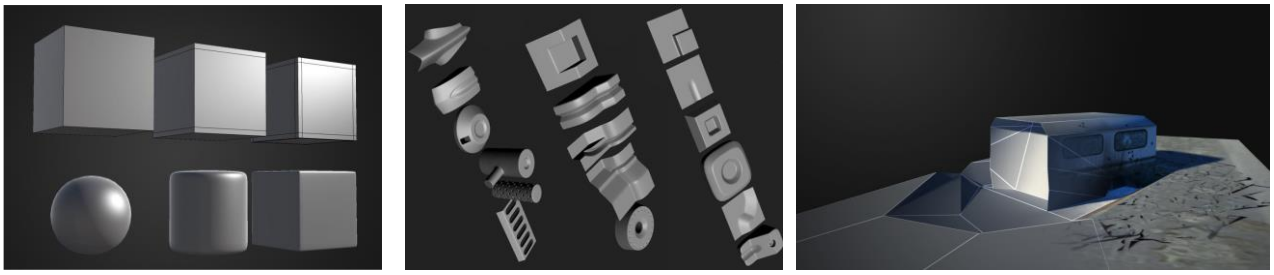

Fig. 3. Sand bag modeling [16]

The biggest advantage of this method is that it allows adding much more details directly in the geometry, not in the texture. It also allows finishing the transition between two surfaces that are at 90 degrees. In 3D graphics, any created object has a perfect transition between these surfaces, but in reality, there is no surface that has perfectly right angles. We will describe below the method used to create these transitions. In the image 3, it can see that, without editing the cube in any way, it turns into a sphere when we apply Sub-D. To avoid this, we must introduce some "control lines" to reach the desired shape. In this way we can obtain a cube with slightly curved edges, closer to reality. Using this basic concept, fine edges can be introduced in any kind of shape, for a much more pleasant and realistic appearance.

As we exemplified above, these shapes (or similar shapes) are often found in mechanical objects. Using these basic techniques, we modeled the Hi-Poly tank. Texturing is no longer used in the 3D modeling program, because it does not have 2D drawing capabilities [24, 25]. To create the textures, we used the standard program in the industry, Adobe Photoshop. The style of the textures had to be realistic, which is why we decided to use a lot of photographic sources to create the textures. These sources provide details that are almost impossible to reproduce manually, at least, at the same level of fidelity. This purpose of this paper is to describe the primary result of a special effect within a scene.

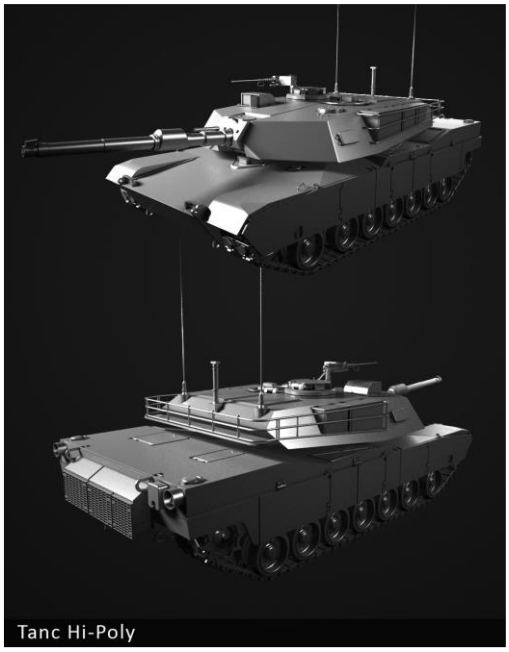

Fig. 4. Barrier modeling

In order for the textures to be used in a game, they must be slightly edited compared to the original picture. First of all, many pictures contain shadows (because they were taken during the day). These must be removed from the final texture, because the final result, in the game, including the lighting, will not look good. Sometimes, it can even look ridiculous, when the sun in the game beats in one direction, and the shadows in the texture go in another direction.

If the desired picture is not found, it can be created. Photoshop offers a collection of very powerful tools in this regard. Most often, we used the "Select Color Range" command. This selects the color chosen by the user. It is very useful when adding, for example, drain marks on a concrete wall. Only dirt tracks from one picture can be selected and superimposed on another. By combining all these methods, a huge number of variations can be created [26]. As we stated at the beginning of the work, we chose to make the animation relatively simple. The main idea was to present the tank during the action. To add some interest, we decided that the tank would be

taken by surprise by the enemy and an explosion would take place that would incapacitate it. We decided to put the explosion in the post-processing phase, wanting to learn this aspect of production as well.

Fig. 5. Animation process

After encoding, the desired special effects were obtained: explosions, dust particles scattered in the atmosphere, collisions, the scene being realistic, all these can be seen in the figure 5.

Fig. 6. Dust particles

To start the animation process, we placed a camera in the 3D space, figure 7. This is an object with editable properties, which offers more control than the simple Perspective view (which cannot be animated anyway). Field of View (FOV), lens type, focal length, etc. can be adjusted. All these options offer a wide range of possibilities when it comes to camera animation. We chose a 24mm lens, because it offered a wide field of view in a rather small space.

The first step was to establish the initial position of the camera, which is called the "establishing shot", or the frame that establishes the action. We start with the tank in the foreground of the level, or the square, in the background, to define a relationship between the tank and the environment.

We established the first keyframe. Animation in 3ds Max works on the basis of keyframes. These are some key points in the animation, in which each object will have a certain position. After two keyframes are established, the 3D program automatically creates the other frames to bring, for example, an object from position A to position B, modifying its properties along the way, depending on the two keyframes.

We established the key positions in which we wanted the camera to be during the animation, trying to get some interesting frames and then the fluidity of the movement was given by the timing, meaning the distance between two key frames, which also determines the duration of that movement.

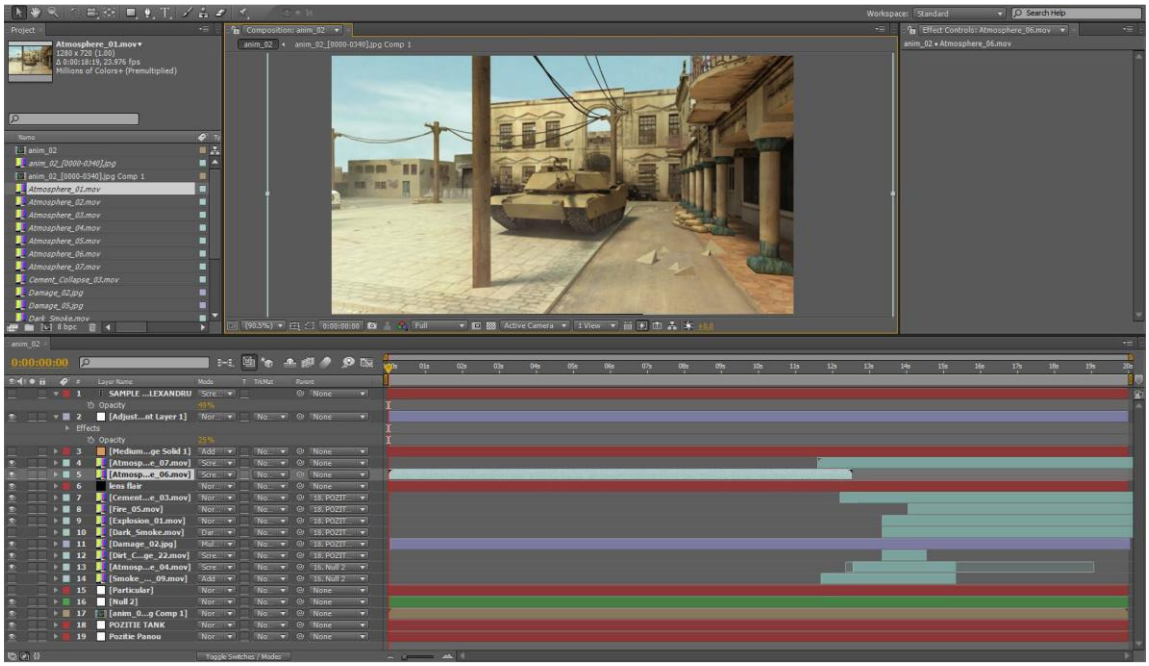

Fig. 7. Animation process

6. CONCLUSIONS

This paper provides a brief overview of how special effectef impact a scene. In 3D animation, special effects imply particle dynamics. Thanks to advances in hardware and software, visual effects can be integrated more and more easily in complex scenes. The viewer will not notice anything from the improvement of the working conditions of the technicians, probably will not even notice the fact that some landscapes from nature will be generated on the computer. So, one of the aims of this paper is to apply the special effects to scene.
The artificial characters have more and more natural features, because new generations of software support this. In any case, cinema professionals can already enjoy themselves, because in the very near future even specialists will not be able to recognize more than 30% of the visual effects. The special effects in 3D animations still have a lot of surprises in store for us. The aim of this article was to gain an understanding of the importance of special effects used in a scene.
Computer graphics is an important tool in this process because visualization and visual inspection of the object are fundamental parts of the iterative design process. Over the past 30 years, geometric modeling and computer graphics have evolved as closely related fields, especially after the introduction of high-resolution graphics stations that are now ubiquitous in the engineering design environment. This article will cover the different ways a special effect can influence a scene.
The general objective of this research was to determine how special effect affects the performance of the animation. Although a photorealistic project is desired, certain details have been exaggerated to add spectacularly to the current scene: proportions, colors, position of objects, volume, etc. Special effects have become a more powerful alternative to traditional drawing and representation methods used in scientific research.

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