

UDC 004.4'275; 004.928

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Animation: current status and future prospects

The investigation and analysis of current status and future prospects of using animation in cinematography and other field of human activity. It was developed the systematization and classification of animation components and technologies

In today's world, animation is one of the main and the best way for attracting attention of customers. It is an independent form of art that is interesting for all. Animation is the process of creation an illusion of motion due to the rapid change of sequential images [1, 2].

The following animation technologies, that are used for creation cartoons, were defined with using sources [3]:

- two-dimensional animation;
- three-dimensional animation;
- combined animation.

Two-dimensional animation is the oldest kind of animation. It can be traditional animation when each frame is created manually or computer animation. Two-dimensional animation uses flat shapes with or without monotonous shadows. The processes of creation two-dimensional animation not laborious if it is compared with three-dimensional animation [3].

Systematization of cartoon components was created [2, 4, 5], that is shown in fig. 1.

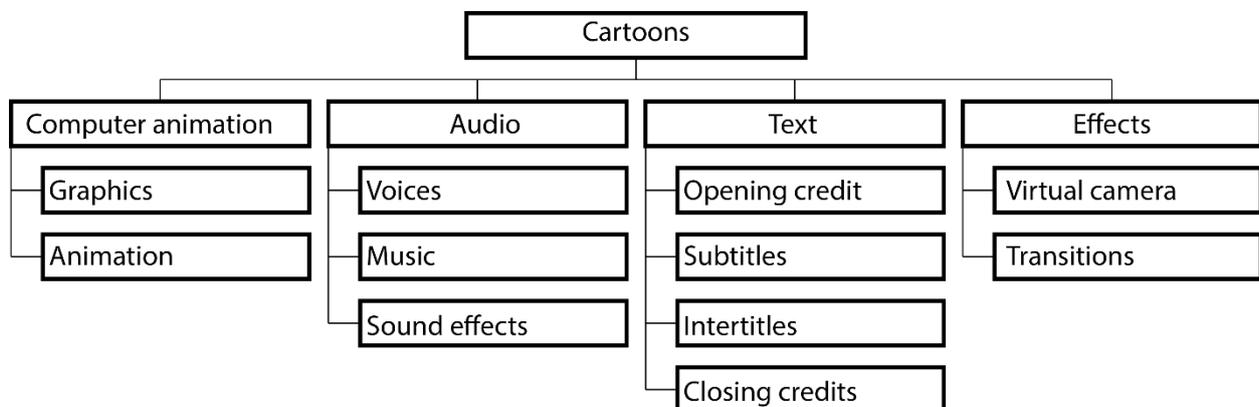


Fig. 1. Systematization of cartoon components

Computer animation is a derivative of computer graphics, since it uses the same principles of image creation [6, 7].

Images can be created in two alternatives:

- on paper with a subsequent scan;
- directly on the computer with the appropriate software.

Computer graphics includes tools for creating and processing images with hardware and software tools [8].

The animation can be divided into the following groups:

- by creating frames;
- by changing the parameters of the objects in the frame;
- using the programming language.

In traditional animation, images that are part of cartoons, are created manually. It means that all key frames and intermediate frames are drawn by artists. The software for creating animation allows you to digitize scanned images, and also combine them into one project [4, 9].

If the animation is created with computer graphics, intermediate frames are interpolated automatically. To do this, artists need to create key frames, and then set the rules for generating intermediate frames [4]. The basic principle is that if an object moves smoothly in a straight line from point A to point B, then it is possible to construct two positions of the beginning and end of motion and describe all the positions that the object pass. More complex trajectories are divided into short segments [10].

The audio information in the cartoons may be in the form of a voice announcer and a musical accompaniment, individually or in combination. The voice of the heroes, that takes place in the frame, is recorded before the creation of animated video clips, for the correct synchronization of visual and audio information. Synchronization of sound effects is also performed, but with less precision than the voice of the heroes. Musical accompaniment is added at the final stages when the cartoon is already created. In order to properly select the musical accompaniment, it is important to follow the rhythm of the cartoons. Music must complements the picture, but did not attract much attention. In addition to the musical accompaniment, sound effects can also be added to cartoons. This provides greater realism to events that is occurring on the screen. The sound behind the scenes is created artificially with the help of different objects and sources [11]. Systematization of song effects are shown on fig. 2.

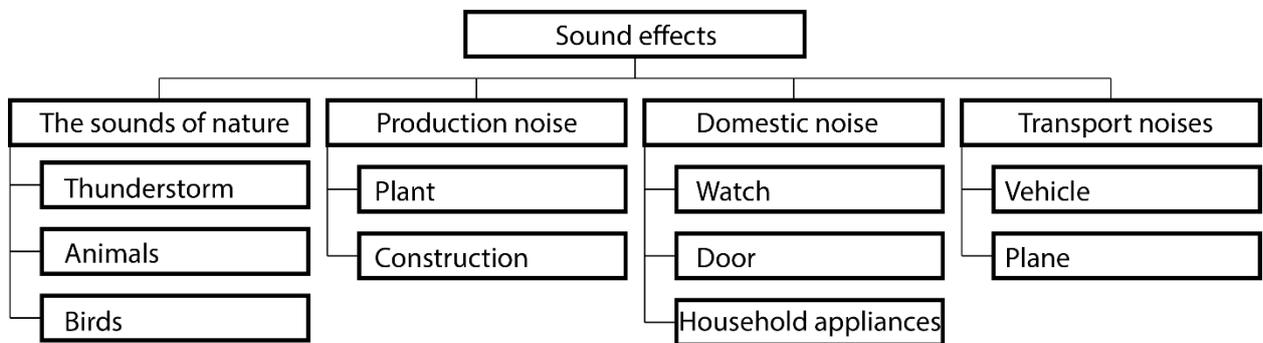


Fig. 2. Systematization of song effects

The following software are used for creation cartoons: Toon Boom Harmony 14, Adobe Animate CC 2018, TVPaint Animation 11 Pro, Toonz Premium 7.4, Moho Pro 12. Animo and Toonz have leading positions in the United States and the UK. Moho and Toonz Premium allow to use traditional animation technology and animation of key frames [1, 2, 5, 13].

On the basis of this study, generalized classification scheme of the software for animation was created (fig. 3).

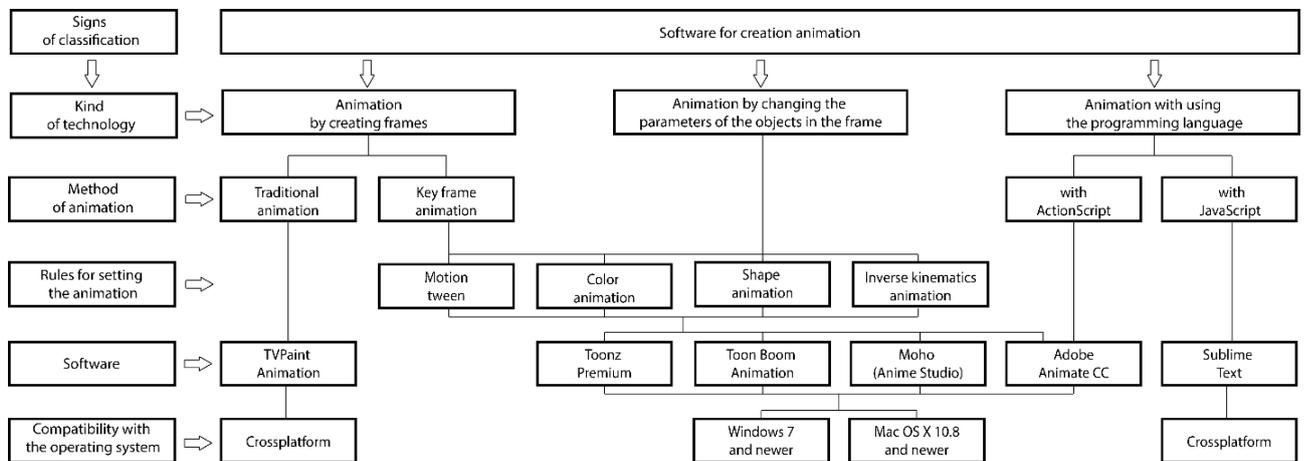


Fig. 3. A generalized classification scheme of the software for animation

There are the main operation for creation animation, that are stated with scientific and technical literature [5, 9]:

- creation of drawings (by scanning, using graphic editors, using programming);
- creation of movement (generation of intermediate frames by computer);
- use of virtual or real camera control;
- completed processes - editing, adding effects and exporting.

Today there is a transition to a new format of vision, that must be taken into account when frames are composed. In accordance to the recommendations of ITU-R BT.1379-1 [14] zone for the location of important information is indicated for frames with different aspect ratio (fig 4). The size of the fields that may be lost when viewing the cartoons on screens with different aspect ratios is taken into account.

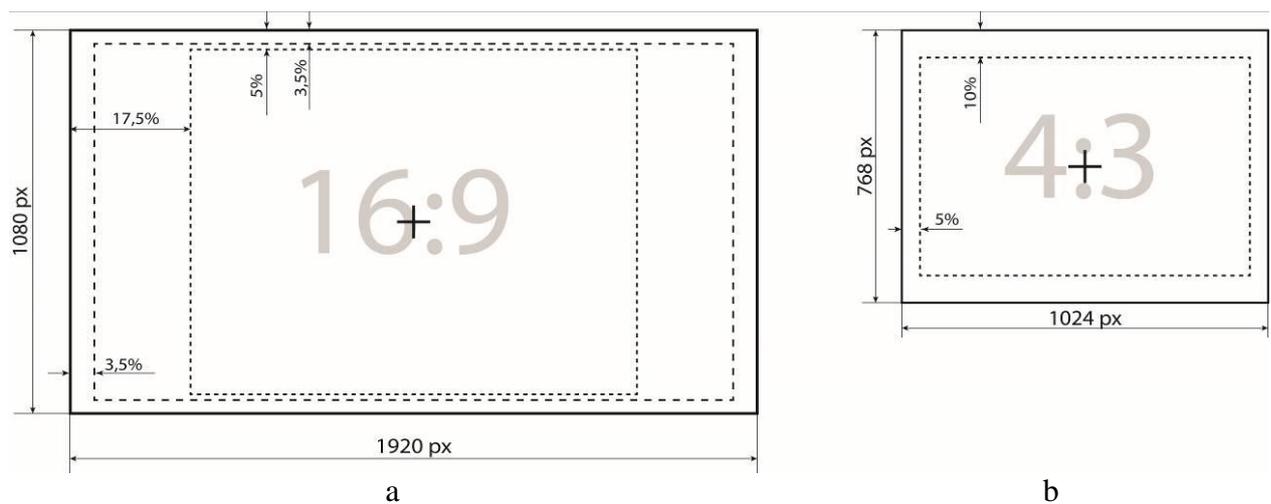


Fig. 4. Layout of the frame: a - aspect ratio 16:9; b - aspect ratio 4:3

The frame of the cartoons can be played at a frequency of 25 frames / second (PAL TV system) or 30 frames / second (NTSC television system).

In the post-production stage a variety of effects are added to cartoons, such as the effect of a virtual camera, color correction. A virtual camera can be placed at any point in the scene, and then moved from one point to another. Blur effect can help to add depth to a frame. With every new improvement, computer effects become more and more realistic.

Three-dimensional animation is an appropriate and effective solution for nonexistent objects or when it is not possible to record the real object or landscape. The process of creating three-dimensional animation has such labor-intensive processes as the creation of 3D models and their animation. 3D-models have a realistic view from all angles and they provide information about the shape, size, color, surface properties and position of the light source, camera. The software automatically predicts the perspective and converts objects for viewing on 2D monitors [3].

3D animation consists of digital and stop-motion animation. There are software tools that are used to create animation: XSI, Maya, Max, Blender, Wings and others. The skeleton, that makes the interconnections between all components in 3D models, is superimposed on the created 3D model. This process is called inverse kinematics. Stop-motion animation is a process of animating objects with the help of a virtual camera [12].

One of the promising ways to use animation tools is a combination of video, computer animation and 3D animations, that are called combined animation. Combined animation is based on chroma keying technology.

Animation of three-dimensional objects can be created:

- manually;
- by digitizing the movements of the real actors.

For this purpose directors apply digitized motion of actors to 3D models of digital characters [4].

The most popular are research and development of animation that use sensors for environmental recognition. These technologies are widely used for 3D cartoon, combined animation and for mobile applications.

Animation does not lose popularity with the advent of new technologies. Now it is used in almost all field of human activity: film industry, education, entertainment, advertising, and others. This is achieved due to animation is unique implementation of the country's ideas and fantasies that can not be recreate in real life.

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