The use of animations in teaching technical drawing

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Abstract—The technical animation has only been used for design. We have discovered that we can use it in the education. We have made a new multi-media visual tool that helps teachers and students in work.

Keywords: animation; multimedia; technical drawing

I. INTRODUCTION

It is inevitable using the new methods and modern communication tools and their wide range of applications in the process of engineering education. All of these are generated by using new technical tools and students’ needs together. It’s no denied of the fact that today’s digital generation is not so satisfied with traditional classroom teaching, they get more channels from information and they need to experience things. So, it is the same in connection with the technical presentation. The technical drawing is a practice oriented training are fit to industrial demands driven by knowledge base for the students. That is why it is important to focus on the subject within the possibilities offered by new tools.

The technical information, also including geometric information of the products mostly electronically generated and we use them. We usually plan the product geometry in CAD software. This is the basis for production planning and quality control (measurement). The CAD software are significant spread in the industry. Therefore In the technical area learners need to learn CAD basics. This knowledge is not a substitute for real geometry and geometric characteristics of the product understanding.

Modern CAD software not only making the model can be used. We can create animations also with them. An obvious solution would be to improve the teaching technical drawing of animation. This device is spectacular, modern and efficient in the solution, and it is also known to the students.

II. AIMS AND TASKS

The technical animations use in education is not yet universal. This technical solution to replace the traditional methods of illustration, but it is not exclusive.

Dealing with educational researchers try to increase the quantity of information flows and communication tools to keep pace with the rapid development of new teaching and learning methods are formulated. They were all in the hightech tools and opportunities to maximize the most efficient forms of development of curriculum mastery motivation.

All the teachers and participants in the educational process with their digital skills has to be able to meet to expectation of virtual environment. This requires the existence of digital knowledge on the students side, and on the teachers side the most important to induce the students’ motivation and develop the new educational tools and tutorials.

When we make a new educational tool first we should accurately define our aims. If we defined the aims then already we could easily be designed our tasks.

Aims:

- The clarification of the definitions of manufactured geometric
- The pair production and representation of concepts (the initial product – starting geometry)
- Knowledge of the geometry of the parts description of representation options
- Presentation of representation methods of preparing
- Improvement of stereoscopic vision
- The technical drawing (2D) and the geometry of a real body connection between the development
- Improvement of ability reconstruction

The aims are known, we can define the tasks.

- We must define that when we use the animations and which in subject.
- We have to choose what parts and product are presented. The parts can be existing, manufactured components, or even imagined ones by us. Condition, however, that they are equipped with the geometric features, which we want the animation to illustrate.
- We must define the initial product and in the starting geometry to parts. This is necessary in order to we can animate the surfaces.
The choice of subject is defined the type of representation, and the method. It is important to ensure the issues logically consistent structure.

Before we make the animation we must prepared part models and technical drawings.

The preparation of animation takes a long time on the computer. Depending on the computing devices that can last for several days.

The last job is the testing the device. What will be the results of the testing process?

III. A CONCRETE PROBLEM SOLVING

We present the development of animation based on a concrete example. We have used some software to the tasks which is widespread and well known.

- Autodesk Inventor 2012 (model and animation)
- AutoCAD 2012 (model and technical drawing)
- Windows Movie Maker (film editing)

Our task was to create a body of complex geometry's step-section. The selected part of the animation is shown in Figure 1. The upper figure is a contour drawing (axonometric), below is a photorealistic image. We prepared the part model with Inventor 2012 software. We processed a part-model on drawing software after file conversion. So we can utilize the resources well, we can work division of labour. We prepared the images this way on Figure 1.

Many part of the surfaces are often used in production: holes, countersunk holes (counter bore), slot, etc... The next task was to determine the initial product. We could interpret the task of the education or the production side. We had to consider what and how is it made the parts in production. The pedagogical point of view was less important. It was essential to introduce the geometric features, and to characterize them.

We followed the pedagogical principles, as shown in the Figure 2.

We are well able to use the properties of parametric modeling software when you create an animation. The different geometrical features appear in sequence in the part. If a feature appears in the animation we may add to explanation. If necessary, we can stop the animation and we can give more detailed description of the subject. The animation is a detail of the Figure 3. The counter bores have already appeared in the part. The graded slot seems but has not yet been completed. We index lines were fitted to the image. These are the names of the shape characteristics (technical terms).

Fig. 1. The part's pictures

Fig. 2. The starting geometry

Fig. 3. The development of geometry
The different shape characteristics after the appearance the parts should be turned around. So that the geometry we can be studied many sides. This is necessary because we are so we can explain why we chose a method representation. We should make a step-section of technical drawing. We cut the part along the symmetry axis of our imagination. The cutting plane is complex, because it passes through the holes and slots on the axis of symmetry. Half of the cut parts we removed, of course, only in imagination. Although the internal surfaces were not visible, then they become visible. The technical people must to solve in mind this problem. This is a very difficult task for the unskilled person. The animation helps in solving the problem. The Figure 4 shows how we were cut from the part. If we rotate to face the remaining surface is then essence of the representation appears.

We will hatch these areas on technical drawing. We should be ensured the visible image animation and technical drawings comparison. We cannot do it with the animation. We have solved the problem using the Windows Movie Maker software. We have edited the finished animation, and we pasted the current technical drawings (2D) into it. The sectional image (Figure 5) appeared the after Figure 4B in the animation. We can discover the solution if we compare two pictures. Then we see the representation of rules, and do not need to do the task in mind.

The sectional image was a result of our work so far. This is the front view place. But we need more of one projection. So it will complete the representation. The top view is complete because we just removed the imaginary part of the half. In animation the object completed and then turns towards the top view. If we showed a new projection in the animation a new technical drawing would appear. So each part of depiction becomes complete. The final details are in the Figure 6.

The Figure 4A is the intersection of the plane. The red areas marked the intersection of the material parts. The grey details have shown that where are the holes and the slots. Final result of the previous operation is on the Figure 4B. This is the most important part of the animation. The section of a part is made from this figure. The red areas are also important.
IV. THE DEVELOPMENT OF TRENDS

The animation test and improvement are very important but in this development has several possibilities. One direction of developments is that they also use other disciplines of science. The project is made by an accessible, popular and widely used software. Therefore, students also can create similar animations. The biggest problem is that the animation preparing up to several days to complete. The development of hidden reserves is that the modeling software is parametric acting. The presented animation is static nature. Therefore, it only can process a concrete task. We thought that we change the geometry of parts. So we could show several variations of a basic task as well. Other disciplines require more such opportunities; for example, material testing. The development work will continue in this direction. The students are not so much interested in technics, but rather for the service. Our task is to serve their needs, to show the details virtually, and use the new educational devices in the most of fields of technical sciences. We have to know how caracterise the curriculum on the screen of new communication devices, because it is right that mobile devices are so slow to fill the same function as a couple of years ago the PC’s. It is a today’s challenges of the teachers.

REFERENCES