PROFESSIONAL 3D VISUALIZATION SYSTEMS IN EDUCATION

Integrated multimedia complex
with 3D visualization SVEGA® MMK-3D

Mobile integrated multimedia complex
with 3D visualization SVEGA® MMK-3DM

Mobile integrated multimedia complex
with 3D visualization SVEGA® MMK-3DM МИНИ

CO. LTD. “SVEGA-COMPUTER” AT THE MOSCOW INTERNATIONAL EDUCATION FAIR (MIEF) 2019

ABOUT

CO. LTD. “SVEGA-COMPUTER”

The “SVEGA” company was founded in 1989 (Co. Ltd. “SVEGA-Computer” since 1995) and became one of the first Leningrad computer companies. Since its foundation, the company has been operating in the field of information technologies and has gone it’s way from a computer manufacturer to a provider of integrated IT solutions. The products and services provided by the company include: SVEGA® computer equipment, server equipment, computer and office equipment of leading world manufacturers, design and creation of various engineering support systems, complex multimedia systems, information security and much more.

Our company has always paid special attention to working with educational institutions. Co. Ltd. “SVEGA-Computer” is an official partner of the UNESCO Institute for Information Technologies in Education in the framework of the program activity “Innovative pedagogy expanded by information and communication technologies, developing the competence of teachers and schools”.

One of the directions of this project is the use of modern 3D stereo visualization technologies in the educational process.

Over the years, our company's specialists have developed and implemented in many educational institutions of the Russian Federation an Integrated multimedia complex with 3D visualization.

The entire cycle of research and development work was carried out exclusively on an initiative basis at the expense of our company on the basis of the principle of expediency of using complex information and multimedia technologies in the educational field, namely, the use of complex technical solutions in education is justified only in those cases when they open up new (compared to traditional approaches) learning opportunities.

We have conducted research both in the field of information technology and in the field of psychophysiological foundations of education and hygiene of the educational process. The experience of implementing information technology in educational processes in Russia and abroad was studied.

Particular attention was paid to the recommendations of the Russian Academy of Medical Sciences. The development of our innovative educational product was based on the recommendations of teachers, and psychologists, highly specialized publications and teaching materials were studied.

VIRTUAL TECHNOLOGIES IN EDUCATION

Currently, the world community has entered a new phase of its development, which is a direct consequence of the unprecedented leap in the development of modern technologies that occurred at the turn of the XX-XXI centuries. One of the key components of the technologies of the XXI century is virtual technologies and the introduction of new forms of learning using them is the most important task today, because the development of new forms of human-machine communication is the next step in the development of artificial intelligence.

In the modern computer industry, the use of virtual technology is one of the most successful areas. Many universities, research centers, laboratories and firms of the world work on the development and creation of various virtual devices. Hundreds of these devices are successfully used in various fields, including the education system. Equipping schools with glasses and helmets of virtual and augmented reality is no longer surprising. Of course, they provide students with the opportunity to individually view stereoscopic educational content. However, these technologies have a number of medical restrictions on their use and, nevertheless, are mainly designed for individual training.

Although one of the most modern and demanded educational activities is the collective form of learning, stereoscopic 3D technologies (one of the segments of virtual technologies) of group and collective learning are undeservedly relegated to the background. The solution offered by Co. Ltd. “SVEGA-Computer” just allowed filling the existing gap.

Multimedia complexes with 3D visualization of educational content SVEGA® MMK-3DM are currently used in the real educational process in its various segments, namely, in general, inclusive and professional education.

The introduction of modern information technologies requires careful preparation: teachers, curricula, software, guidelines for its use, instructions, and many other related aspects. They were precisely the specialists of Co. Ltd. “SVEGA-Computer” that over a number of years completed the whole range of preparatory work, carried out large-scale testing of the SVEGA® MMK-3DM complexes, and, as a result, the pedagogical community was provided with another effective and efficient tool, which fully and completely corresponds to Task No. 1 of the National Russian project “Education”.

In particular, this fact was confirmed by Decree of the Ministry of Education of the Russian Federation No. R-117 of November 20, 2019, which approved, within the framework of the Federal project “Modern School” of the National project “Education”, an approximate list of recommended equipment and training tools for equipping individual organizations operating according to adapted basic educational programs, including “Multimedia complexes with 3D visualization”.

RUSSIAN PRODUCTION

The main task of engineering work is the creation and improvement of various technical products, ensuring their efficient and uninterrupted functioning.

Our specialists have been making efforts to solve these problems for more than 30 years. A worthy fusion of representatives of the Soviet and Russian engineering schools, which have always been strong in our country, allows us to solve the most complex problems at the highest professional level. This is confirmed not only by the company's impeccable reputation, which has been earned over many years of work, but also by the international recognition of our multimedia complexes with 3D-stereo visualization of educational content, which are recognized as unique on a global scale[1].

In 2017, we completed the long-term cycle of research and development work carried out with the aim of developing Stationary and Universal mobile multimedia complexes with 3D-stereo visualization SVEGA® MMK.

1 This project is unique on a global scale, which was noted by EPSON European and Russian representatives during a visit to St. Petersburg in 2015 represented by Corporate Director Mr. Takanori Inaho, Commercial Director Mr. Neil Cahoon, Head of marketing Department Mr. Hans Dammer, as well as representatives of EPSON operating in Russia and CIS countries: Senior business development Manager Dmitry Bobkov, Senior Manager for projectors and business technology Eugene Dzhaksimov, partner Manager Leonid Matissov.

The systems were certified in accordance with the Technical Regulations, sanitary , epidemiological and hygienic requirements of the Customs Union. Since May 2017, Co. Ltd. “SVEGA-Computer” has been carrying out serial production of the systems.

In 2020, all stages of complex testing of the Mobile integrated multimedia complex with 3D visualization SVEGA ® MMK - 3DM MINI, announced as part of MIEF-2019, were successfully completed.

Serial production of these complexes has been organized.

For a number of years, we have done a great job in promoting, testing and piloting our innovative educational products by participating in numerous events both at the Russian and international levels, creating experimental sites on the territory of the Russian Federation.

The results of this work fully confirm the high efficiency of our systems in educational institutions of the Russian Federation and their compliance with global trends in the use of virtual technologies in the educational process.

We have created a unique tool and are proud to have held the high title of Russian engineer for many years.

BRIEF BACKGROUND

Russia has always been famous for brilliant engineers and inventors. But many achievements, unfortunately, are now forgotten. So the contribution of Soviet engineers to the creation of the global stereo film industry was undeservedly forgotten.

In 1965, at the All-Union Scientific and Research Film and Photo Institute, under the leadership of A.G. Boltyansky and N.A. Ovsyannikova completed work on the creation of a shooting system and demonstration of stereoscopic films, called “Stereo-70”.

The premiere of the first stereoscopic film “No and Yes” took place on April 30, 1968 in the small hall of the Moscow cinema “October”. At that time, “Stereo-70” system was one of the best in the world of stereo cinema, which is confirmed by the American Academy of motion picture arts “Oscar” in the category “For the best technical achievements” (Technical Achievement Award), which was awarded in 1991 for its contribution to the development of three-dimensional cinema.

In the USSR, the development of stereo cinema was not given serious attention, so there were an insignificant number of cinemas suitable for demonstrating stereo films, and they were located mainly in Moscow and Leningrad.

After perestroika, when the Soviet system of film production and film distribution fell into decay, the development of new 3D technologies in our country stopped. But it was precisely the achievements of Soviet engineers in this field that accelerated the creation of the IMAX 3D system - the best in world 3D cinema. The system was developed in Canada and patented in 1985.

3D stereo technology is now widely used in the entertainment industry. However, since the beginning of the 2000s, the first studies of the use of virtual technologies in the educational process began in the world. In 2011-2012, by order of the Ministry of Education and Science of the Russian Federation, large-scale system studies were also conducted in our country to develop models and regulations for organizing the educational process using 3D stereo technology in secondary schools. All the above studies have shown the unique impact of these technologies on learning outcomes, namely, that they significantly contribute to the development of all types of educational and cognitive activities, increasing the informative capacity of classes and student motivation.

Based on the relevance of the task of creating an easy-to-use, reliable and safe solution designed to demonstrate stereoscopic educational content, the specialists of our company successfully implemented a project to create a multifunctional complex with 3D stereo imaging SVEGA® MMK. This fact allows us to consider ourselves worthy successors of the developers of the “Stereo-70” system.

ADVANTAGES OF MULTIMEDIA COMPLEXES WITH 3D VISUALIZATION SVEGA-MMK

The success of any development depends on numerous factors, the description of which is devoted to a huge number of scientific works affecting various aspects of this subject.

In the process of creating our systems, we always remembered the old principle: “Garbage in - garbage out” according to George Fuechsel. Initially, this is a principle in computer science, which now carries a deeper semantic load and means the following: if the initial information that formed the basis of the development contains errors, then the result will be a non-viable system that gives a negative result that is different from what is expected.

The concept of the phrase “Garbage In-Garbage Out” was known at the time of Charles Babbage (1864), an English mathematician, inventor of the first computer, but George Fuchel, the programmer who used it as a teaching method in the late 1950s, was the first to introduce this term. “The best way to avoid“ garbage ”at the exit is to keep it from entering,” says William Lidwell, an American designer and researcher in engineering psychology.

In order to avoid the use of inaccurate or unreliable data, we had at the initial stage to perform a set of works to coordinate the functionality of the designed object (multimedia complexes with 3D stereo visualization SVEGA ® MMK) and their application environments (educational institutions).

Based on the target audience, the main task was to pay special attention to **HEALTH-SAVING** issues. When developing stereoscopic methods for viewing educational material, medical contraindications were minimized. The technologies used in our complexes allow all, without exception, students to participate in the educational process.

When organizing the educational process itself, we used the **SYSTEM APPROACH**, namely, we studied all available 3D - stereoscopic educational content and involved representatives of the pedagogical community for the educational and methodological support of our project. As a result, our complexes were equipped with sufficient training software with accompanying classifiers and guidelines for the lessons.

The **EFFICIENCY** of using 3D stereo technologies in the educational process has been confirmed by numerous studies, both in the Russian Federation and abroad, but numerous attempts to introduce them into educational institutions of the Russian Federation have not given the desired result. To verify the reliability of the data from the above studies, we created a number of experimental sites in various segments of the educational process.

The work of the experimental sites was carried out for several years with the maximum involvement of both students and teachers, with strict reporting and summing up.

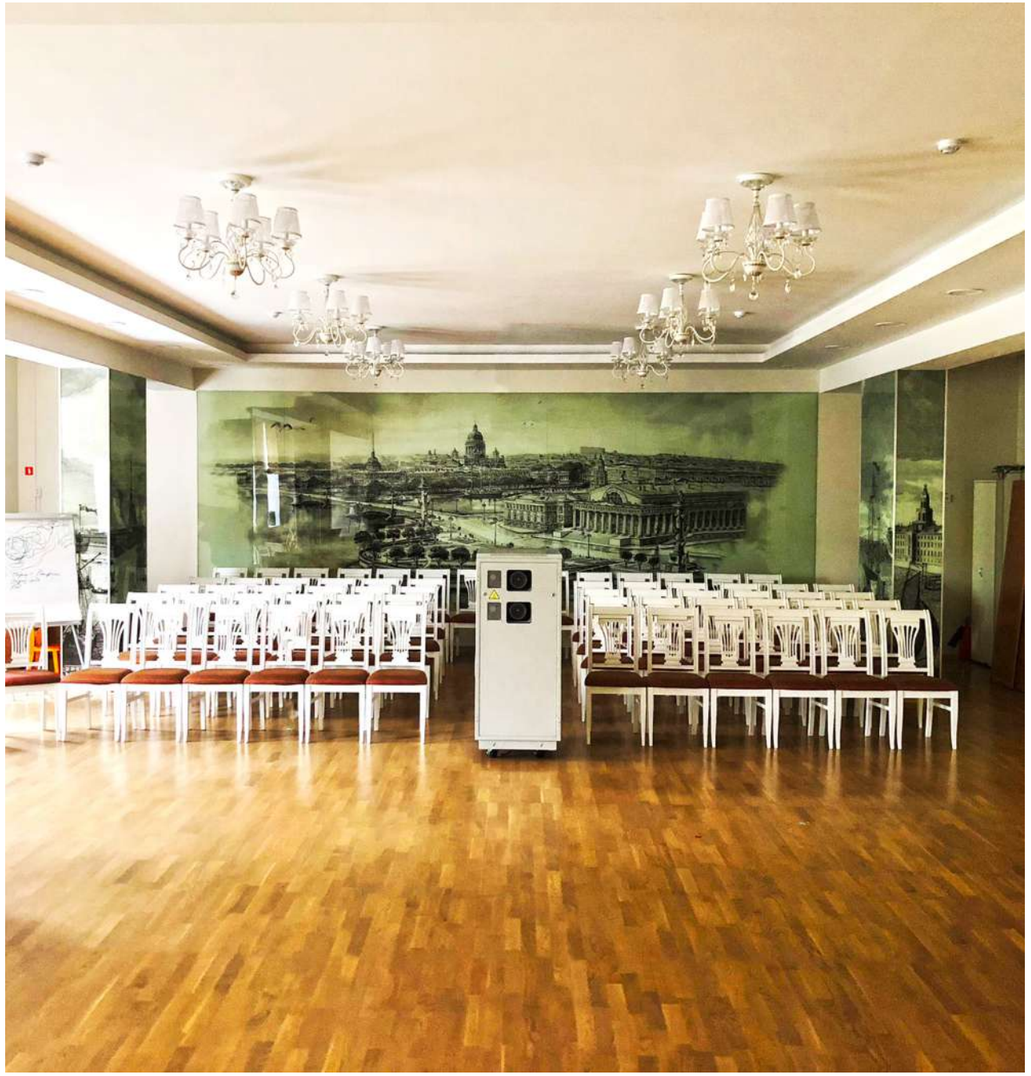
This approach confirmed not only the **EFFECTIVENESS** of using 3D – stereo technologies in the educational process, but also confirmed the **FEASIBILITY** of using it as a fundamentally new (compared to traditional) approach to learning. According to the teachers, we have created a fundamentally new tool that is interesting and easy to work with for any teacher, regardless of their professional level.

In the process of testing the SVEGA® MMK complexes in a real educational process, the main reasons for the negative attitude to these technologies from a number of representatives of the pedagogical community were clarified.

As a result of the positive results of the aforementioned studies of the Ministry of Education and Science of the Russian Federation in 2013-2016, some hardware and software systems that allow demonstrating stereoscopic educational content appeared in some schools of the country. As a rule, they were equipped with various stereoscopic software products. As time has shown, a part of the equipment after commissioning was not used due to the lack of classifiers and methodological recommendations for conducting lessons using the supplied software.

That is, the presence of the equipment itself was not sufficient for the introduction of 3D stereo technology into the real educational process, since the teachers did not have clear instructions on how to use it.

All of the above problems were a direct result of the lack of a **SYSTEM APPROACH**.



Many educational institutions, where equipment began to be actively used, faced a different, more serious situation. When demonstrating stereo content, some students experienced severe discomfort: headache, nausea, dizziness. The main reason for this fact is the use of equipment for demonstrating stereo films, which has medical warnings and risks. The developers of these educational complexes did not place the proper emphasis on the **HEALTH-SAVING** issues of the target audience, i.e. secondary school students. When designing such systems, not only the psychophysiological features of binocular vision were not taken into account, but also numerous errors were made in the initial data used, which led to the creation of technical products that did not ensure efficient or uninterrupted functioning.

The SVEGA® MMK systems in terms of their technical characteristics are superior to the equipment available in the Russian Federation today, which is similar in functionality.

TECHNICAL PERFECTION, embodied in our products, was the result of the highest professional level of specialists of our company. We are grateful to our foreign colleagues for their achievements, which gave impetus to the creation of multimedia complexes for 3D-stereovisualization of educational content SVEGA® MMK.

Summarizing the above, we list the advantages of our system:

• there is no visual discomfort when perceiving stereoscopic images;
• the ability to view from anywhere in the room without distortion and loss of stereo effect is provided;
• there is no flickering of the image, which provides comfort during prolonged viewing and minimizes eye fatigue;
• you can use any surface for the projection of the image;
• there is no double vision at the maximum “fly-out” of a virtual object from the screen;
• 100% separation of the channels of the right and left eye from any observation point and on any screen is implemented;
• we use light glasses that minimize pressure on the bridge of the nose and are compatible with medical glasses;
• reusable glasses that are subject to normal sanitary treatment are used;
• for persons who are not able, for medical reasons, to watch stereo films, glasses are provided that convert the stereo image to normal;
• the systems are reliable in operation and do not require special technical knowledge during maintenance;
• the systems are easy to operate and do not require special training of the teaching staff.

STEREOSCOPIC EDUCATIONAL PRODUCTS FOR EDUCATIONAL INSTITUTIONS

The use of any of the most advanced innovative and popular computer equipment in educational institutions will be successful only if high-quality educational software is available.

The quality of educational software is understood as full compliance with the educational standards of the country of application, and in relation to stereoscopic software, we are talking about the quality of its manufacture, i.e. visual quality. Improperly selected parameters of the camera or stereoscopic errors in the development of software products significantly affect the discomfort perception.

During the developing of our systems, we paid special attention to the selection of basic stereoscopic educational software products. Since no stereoscopic software is currently being performed in the Russian Federation, we have established partnerships with leading world developers and manufacturers of high-quality stereoscopic educational content.

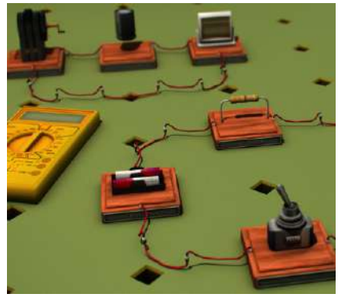
Our experts tested the fine quality of all available software products, and representatives of informational and methodological educational centers conducted their examination for compliance with the Federal educational standard of the Russian Federation.

The software we studied was divided into two types: stereo video films or virtual tutorials.

As a result of the work performed, the following products turned out to be the most suitable for adaptation and use in secondary schools of the Russian Federation:

- Reachout Interactives (Great Britain) “Captain Jack Maths” (Mathematics 1-4 class).
- Designmate (I) Pvt. Ltd. (India) “Eureka 3D” (Physics 7-11 classes, Chemistry 8-11 classes, Biology 5-11 classes, 300 lessons, 145 laboratory works).
- Sensavis (Sweden) “3D classroom”.

In the process of experimental work and piloting of the selected software products, the most popular were the software products, presented in the form of stereo video films.



Educational institutions use “Captain Jack Maths” as part of the continuing education program, and “Eureka 3D” as part of basic education programs.

“Eureka 3D” aroused additional interest among some heads of educational institutions of closed type for people with deviant behavior. In these institutions it is forbidden to use chemical and physical laboratories in the educational process. Virtual laboratories of the “Eureka 3D” product demonstrating experiments in simulation mode are quite capable of solving this problem.

According to the data provided by educational institutions using SVEGA® MMK multimedia systems with the above software, the effectiveness of the educational process has significantly increased in terms of the following indicators: academic performance, motivation for learning, personal creativity, digital literacy, motivation for success, reflection, communication, subject matter training, olympiad successes.

Based on the results obtained and the wishes of the representatives of educational institutions, our company, exclusively on an initiative basis and at the expense of the enterprise, decided to proceed with further translation into Russian of the educational stereoscopic content “Eureka 3D”.

This decision was caused not only by the relevance and feasibility of performing these works, but, first of all, by the significant contribution of Designmate specialists to the development of the stereoscopic product “Eureka 3D”. In the last two years alone, the number of lessons in the English version of the product has increased by almost one and a half thousand, and a significant amount of laboratory work has been added. The visual quality of the product has also improved markedly.

Since “Eureka 3D” was developed in accordance with the educational standard K-12, adopted in most English-speaking countries, it is necessary to solve not only technical problems, but, first of all, bring it into line with the Federal State Educational Standard of the Russian Federation.

Currently, we have carefully studied the English version. Viewed about two thousand lessons and laboratory works. Representatives of the pedagogical community of St. Petersburg and Kazan, carrying out educational and methodological support of the project, selected and approved more than 200 lessons and laboratory works. Added new lessons in chemistry, biology, physics. Lessons in mathematics, geography, astronomy and other subjects are included in the new Russian version of the product. Particularly attractive is the elementary school block, which, upon completion of work, may well be used as part of the basic education program.

To achieve the final result, we have to perform the following work:

- primary translation of the scripts of the selected lessons into Russian;
- adjustment of terms and texts in accordance with the educational standards of the Russian Federation;
- pairing the corrected scenarios with the help video;
- sound recording of the corrected texts in accordance with modern technologies of sound dubbing and directing;
- pairing a sound recording with a video of a lesson, laboratory work;
- output control, in order to verify and ensure the quality, of the compiled version of the Russian-language product;

Of course, all works are supported by colleagues from Designmate (I) Pvt. Ltd. Together with them, a full cycle of works on test examples was completed, the results were agreed and approved.

We also pay attention to the second type of stereoscopic software, namely virtual training manuals. We carefully study and test a number of very attractive products, especially since the process of adapting them to the requirements of the the Federal State Educational Standard of the Russian Federation is more simple.

In addition to specialized stereo software, our systems are intended, inter alia, to demonstrate ordinary stereo films. In the public domain there is a huge number of non-fiction documentary stereo films. Fragments of these films can be used without infringement of copyrights in educational process. This approach is used, with our support, for a number of institutions where children with disabilities and special educational needs study. In particular, for the Regional Center of Autism in St. Petersburg, our specialists, together with the teachers of the Center, selected a number of stereo materials in accordance with specialized lesson development for institutions of this profile.

Educational stereo films can be made by any modern 3D film studio, based on the needs of the educational institution. Like any filming, this process is very expensive and time-consuming. We offer a simpler, low-budget way to independently create educational stereoscopic content. Many educational institutions use the camcorder offered by our company for this. The video camera is designed for stereo shooting of educational material, based on the semantic needs of the user and converting it into a 3D stereo format for visualization on SVEGA® MMK-3D systems.

If the user is an educational institution of secondary vocational education, then most likely they will need a stereo film about the technology of a particular production. It is more advisable to use our technologies in the learning process of manufacturing complex confectionery products or cutting meat.

The use of SVEGA® MMK systems in secondary vocational educational institutions is relevant, since their functionality allows masters of industrial training to absorb new methods and technologies, and students to explore modern technologies and the best world practices. In conjunction, this will be a real step in modernizing the content of professional educational programs in accordance with WorldSkils standards.

We are confident that in the near future, excellent all-encompassing Russian stereoscopic educational products will be developed. In the meantime, this is a necessary minimum, but it is sufficient for large-scale and productive implementation.

SVEGA MMK-3D

Stationary integrated multifunctional complex for demonstration of 3D-stereo content for an audience of up to 400 people.

THE COMPOSITION OF THE EDUCATIONAL COMPLEX:

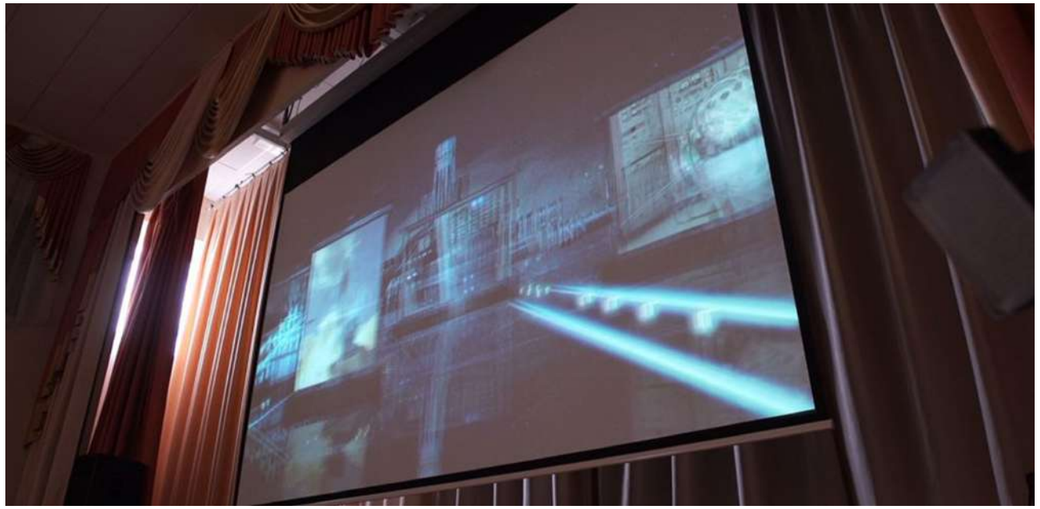
“Integrated multimedia complex with 3D visualization SVEGA MMK-3D. TU KBPD 202269.727 TU, Russia”.

The composition of the stationary complex, functionality, delivery time and cost are available on request based on the actual needs of the customer

THE COMPLEX IS DESIGNED FOR CONDUCTING:

- training sessions with the use of 3D-stereo content;
- conferences using an interactive podium;
- concert and mass events;
- for viewing any 3D stereoscopic movies with quality that meets world standards.

The delivery condition includes pre-design inspection, development of technical specifications, direct design of the stationary complex, delivery, installation, commissioning, training of personnel, warranty service and technical support. Operation of the complex is simple and does not require special technical training.



SVEGA MK-3DM

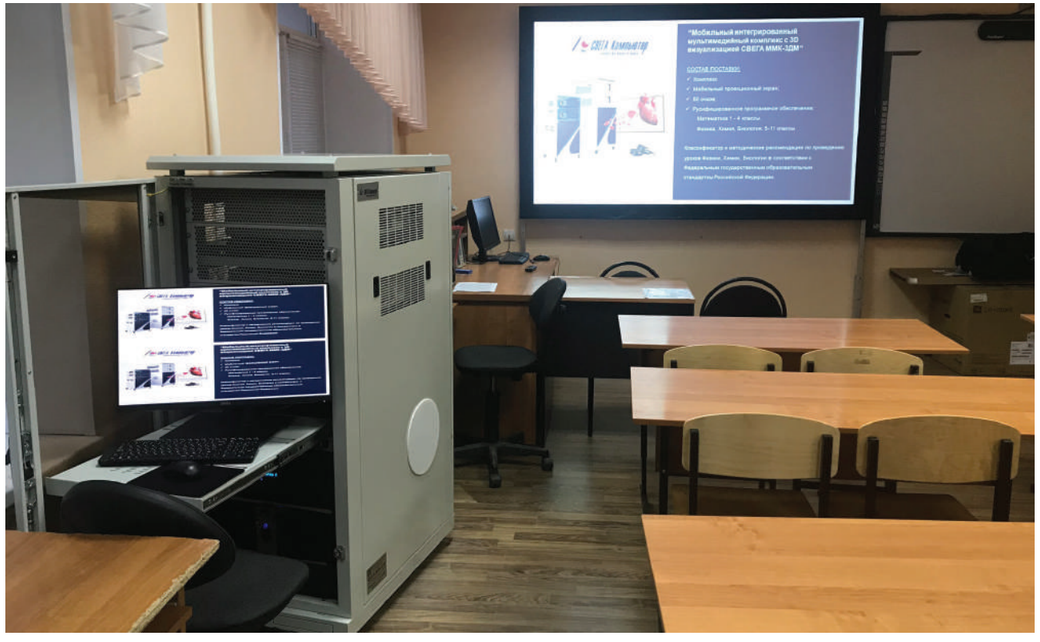
Mobile integrated multimedia complex with 3D visualization for an audience of up to 50 people (with the possibility of application in an audience of up to 150 people).

THE COMPOSITION OF THE EDUCATIONAL COMPLEX:

"Mobile integrated multimedia complex with 3D visualization SVEGA MK-3DM. TU KBPD 202269.728 TU, Russia "

The complex includes:

- Projection system;
- Amplification and sound reproduction system;
- Uninterruptable power source;
- Mobile projection screen;
- A set of 50 passive glasses;
- Russified Reachout Interactives software "Captain Jack's Journey" (Mathematics 1 - 4 classes);
- Russified Eureka 3D software (Physics 7-11 classes, Chemistry 8-11 classes, Biology 5-11 classes, 300 lessons, 145 laboratory works) complete with a classifier and methodological recommendations for conducting lessons in accordance with the Federal State Educational Standard of the Russian Federation .



The SVEGA® MMK-3DM system is intended for use in educational institutions at all levels from primary to higher. Currently, the systems are involved in institutions of general and inclusive education in the Russian Federation. They are used in the system of secondary vocational education and participate in the additional educational program for advanced training and professional retraining of educators of the Republic of Tatarstan. The presence of a wide range of visual laboratory work in the simulation mode of the Eureka 3D software product solves a number of problems for closed educational institutions for students with deviant behavior.

A huge number of documentaries and popular science films in 3D - stereo format enables teachers (within the framework of general education programs or continuing education programs) to create fundamentally new innovative products based on their own methodological development of lessons that correspond to global trends.

The delivery condition includes delivery, installation, commissioning, staff training, technical support, warranty service for 36 months. The operation of the system is simple and does not require special technical training. The SVEGA® MMK-3DM system is mobile and multi-functional, while it can be used in an audience of up to 150 people with the required number of glasses and a larger screen. In this case, its functionality will fully correspond to the capabilities of the SVEGA® MMK-3D stationary complex.

SVEGA MMK-3DM MINI

A mobile training system with 3D stereo visualization for an audience of up to 30 people.

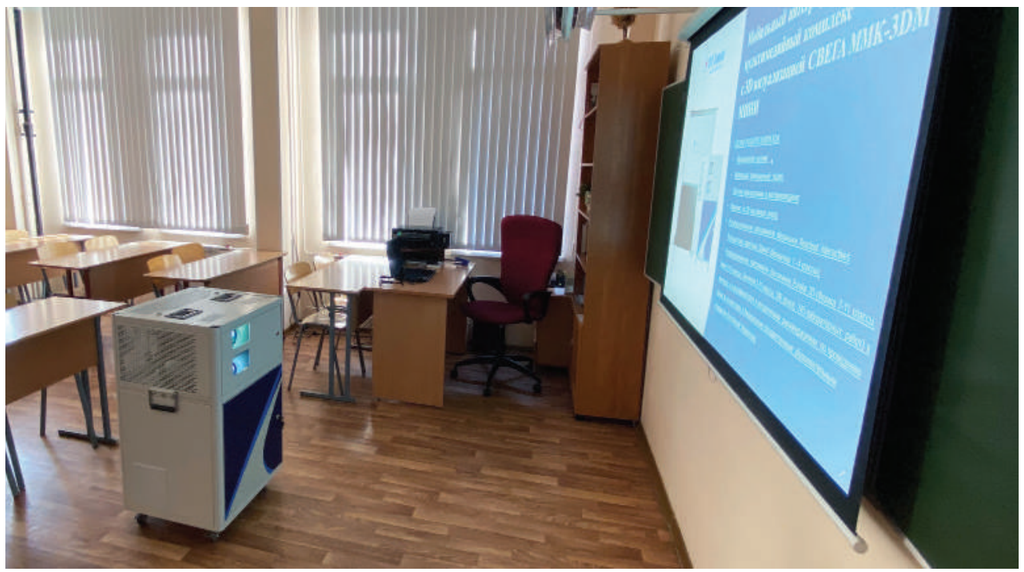
THE COMPOSITION OF THE EDUCATIONAL COMPLEX:

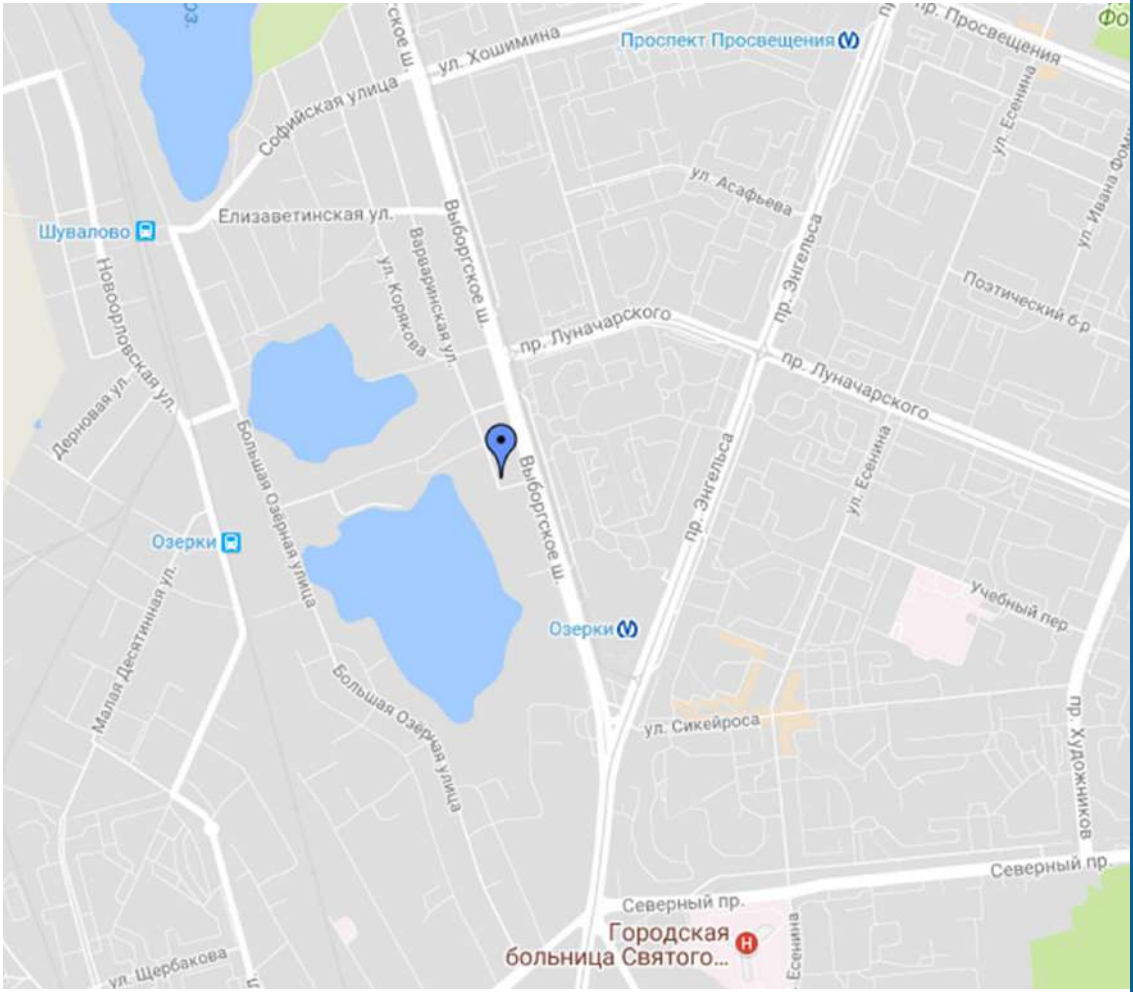
“Mobile integrated multimedia complex with 3D visualization SVEGA® MMK-3DM MINI“

The complex includes:

- Projection system;
- Mobile projection screen;
- Amplification and sound reproduction system;
- A set of 30 passive glasses;
- Russified Reachout Interactives software “Captain Jack’s Journey” (Mathematics 1 - 4 classes);
- Russified Eureka 3D software (Physics 7-11 classes, Chemistry 8-11 classes, Biology 5-11 classes, 300 lessons, 145 laboratory works) complete with a classifier and methodological recommendations for conducting lessons in accordance with the Federal State Educational Standard of the Russian Federation.

The complex is mobile, has 2 image projection modes: standard and standard plus; lightweight and compact body; teacher’s mobile computer; wireless video transmission system.





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