# 3D Scanning with colors.

In the twenty-first century technology development is progressing literally every day. Technologies that for our grandparents were pure fiction, today are our everyday life. Coffee, which literally makes itself from the capsule or a car that parks by its own. The phone, which not only calls, but serves as a games console, camera, book, calendar, and a window to the world. Pen, which checks the correct spelling while writing. Often the inspiration for new ideas was the world of science fiction. So it was with mobile phones or 3D printing. Same as 3D scanning. Device, that many people still don't believe in is slowly entering into our daily lives by giving endless possibilities. As being children we watched movies about the conquest of space where, if the hero was wounded, the medical team putted him in a special capsule, scanned his body and was able to evaluate the damage to quickly heal them. Today this technology is here. It's not only about well-known to us roentgen or extremely advanced CT scanner. 3D scanners also become much more advanced every day. Available on the market today are not only used in industry to quality control or for reverse engineering, but also in museums, game design, medicine, and for pure entertainment.

Most models use structured light of different colors, each of them have distinct characteristics. Usually they use blue or green light, but some companies, like SMARTTECH have developed models with white light. Depending on the color of the light scanner has different properties. Basic is blue, available in the largest number of models. The result of the scan is a cloud of points or object made up of triangles which is stored in the CAD model, and it is ready for processing in a computer program. The second type of light is green, which is 30% more accurate than blue. However, in both these cases the scan we got has no color. Objects in color should be scanned with white structural light. This gives you an infinite number of possibilities.

Already, 3D scanners can be found in the dentist office or dental technician. They are used to create a three-dimensional model of the jaw and missing teeth, and later the specialist is able to develop perfectly fitting dentures or implant. In past days making of even a single implant required a several visits to the dentist. Impression in wax, modeling, choosing the right color, size and shape to match the remaining teeth. Today, it can take less than a few minutes, and the rest is a matter of working in a computer program.
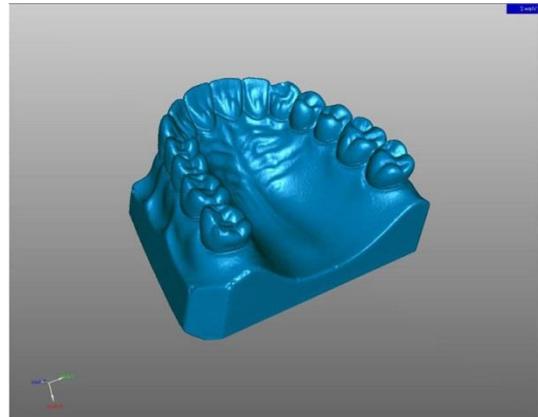
Scanning in color allows the more accurate representation of the resulting implant, so that it is indistinguishable from natural teeth of the owner. This gives the user greater comfort and reduces production costs by minimizing the time and the materials used.

Scanners are used not only in the dentist's office, but also at the other fields of medicine. Now you can find them at burn wards,

orthopedic wards or in plastic surgery clinics. Scanning burn wound allows the calculation of the exact area of damaged skin and match appropriate methods of treatment, to apply the most fitted dressing or skin graft, and monitor progress of healing. Skin autograft is always going to be some additional intervention in the patient's body, and with exact calculations surgeon knows how to extract just the right amount of skin fragment and put it on the wounded area.
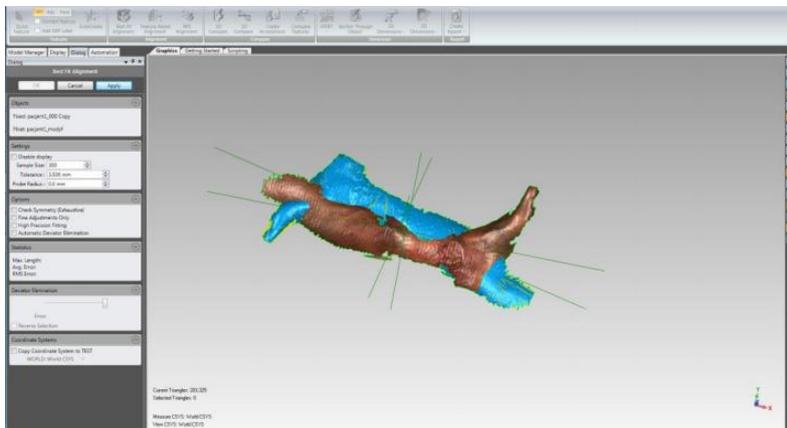
Skin and biological dressings also created in the laboratory should be carefully tailored so that nothing is wasted. Here is also the place for color scanning.

The dermatologist doctor can scan the lesion and take a close look at it. And in the future he can compare it with the past scan and see how it was changed. 3D scanning in color takes place in the plastic surgery. Doctor after scanning the patient's face creates a colorful visualization, for example, the correction of the nose or ear shape. Shows the effects of the operation in real-time. When it comes to scanning elements of the human body, scan in color is very helpful in creating prostheses, because it not only very accurately maps the healthy limb, but also obtains the corresponding color of the skin tone of the patient. Thanks to this the prosthesis can be as close as possible with the appearance and

color to the second limb giving greater comfort to the user. Currently, it is also possible to scan and print in color small implants as earlobes. Scan of a healthy ear is reversed in a graphics program, and by using a 3Dprinter with specialized material implant is printed directly with the patient's skin tone to match the remaining ear.

Color scanning is used in movies and video games. Not all elements can be generated in the program and sometimes effects may not be satisfying. Graphics work hard to make the accurate representation of the facial features of celebrities who lend their image to the games. However, using a scanner, such work becomes faster and easier, and face seems more similar to the original. For example, when designing a game where players actually exist as a real football team and they all should look like in a real life and be recognizable. Doing a scan of a person's face we can create a very realistic mask, which may be superior to that performed manually. How much easier and faster is to use a color CAD model to design a mask for a movie. The mask that is based on a realistic mapping of the actor's face. Such masks are more convenient and more relevant, and in addition can be quickly modified. If you have a 3D printer whole process is very fast and even can reduce the cost of production.

Commercial use of 3D scanning is the creation of miniature figurines which would be a representation of ourselves. This could be the most realistic figures, including clothing. But they can also be historical figures such as knights and princesses who will have the face of the person, and even character from the

world of fantasy. Everyone would like to have a little representation of himself on the desk.

Could be used, for example, as a birthday gift, or even as the wedding cake figurine. This element stays for years and is a nice reminder of the most important day in your life. In the end it does not have to be just a figure of a standing couple, but even acted out scene. And the fact that the dolls have faces of the newly wed further enriches the entire event.

However, one of the most important applications of color 3d scanning is to preserve the cultural heritage in the form of virtual visualization. Conventional scanning without color collection, which works in industry and modeling will not apply here. Because just as important as the shape of the object that you want to save is its color. No matter if it is a Rembrandt painting or maybe Min dynasty vase. Here, color plays a tremendous role. If you do a scan using a device with blue or green light you will get only the shape of the frame or canvas. You can certainly make up the image on the modeling stage in the program, but it will not give realism to the object. If we scan the

painting we want it to map every little detail. Not only brush marks on the canvas, but also every sliver gilt on the frame. Every detail is equally important. If you do not recreate the ideal colors you will not be able to accurately analyze the work of an artist. Color scan, for example, allows you to modify the color in graphic program and discover every paint layer. Scientists studying the works of Rembrandt discovered his technique by using 3D scanning in color with an accuracy of 10 microns. And have come to the conclusion that he used to paint not only with brush, but with his own fingers. He imposed the dry paint on the still moist canvas, thereby forming a specific structure.

Scanning with such precision also allows us to explore every crack of paint which has arisen over the years. Please note that the images that we admire in major museums have even 600 years and are extremely delicate, and to keep them in good condition is a very difficult duty. Accurate scan can help to preserve this delicate structure.

In the future, a visit to the hairdresser does not have to end up with an unpleasant surprise. Hairdresser will scan the customers head and using a graphical modeling in the real-time options will present another haircut. The client immediately will see the effect. And today, you can also make a whole body scan and monitor the progress of a person's weight loss. Seeing yourself in the mirror is always perceived subjectively. Computer visualization

can be objective, and the measurements are much more accurate. Scanners are used to examine children faulty posture.

Create a fully three-dimensional online store also soon will not be a problem. Ordinary 2D images do not reflect every detail of the item. Buying online does not have to be a problem, if you will first see the object in three dimensions.

3D scanning in color is the future and is very close to us.