The SMARTTECH3D med scanner helps in creating personalized anti-smog masks

The SMARTTECH 3D medical scanner was used in the unique project of creating personalized anti-smog masks initiated by the MASSQ Group created by students from the Faculty of Design at the Academy of Fine Arts (ASP). The SMARTTECH company joined the group's project by performing 3D scans of the face of the people for whom the masks were designed.


The growing problem of air pollution

Smog is a serious problem faced by more and more cities around the world. In Beijing, it is so dense that you can not see buildings in the near area. Also, Chinese cities are among the most polluted in the world, but this problem applies to Poland as well. With deadly smog, we need to deal not only in agglomerations such as Warsaw or Krakow but also in smaller cities across the country. Anti-smog alarms during the heating period have become a disturbing everyday life and inhalation of smog is comparable to passive smoking.

To care for health, city dwellers decide on various forms of protection, such as filters and recuperators installed in homes, and anti-smog masks used outside buildings. There is also a growing awareness of the harmfulness of breathing with polluted air, which is why it is more often to meet people wearing masks on their faces on the street nowadays.

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According to studies, anti-smog masks are able to stop more than 99% of harmful substances with particles larger than 0.1 micrometers. For comparison, PM2,5 smudges have particles up to 2.5 microns in diameter and PM10 up to 10 micrometers. However, in order for the mask to fulfill its task, it must be maximum tight and ideally suited to the user's face. If it will not stick tightly, the risk that unpurified air will enter the lungs
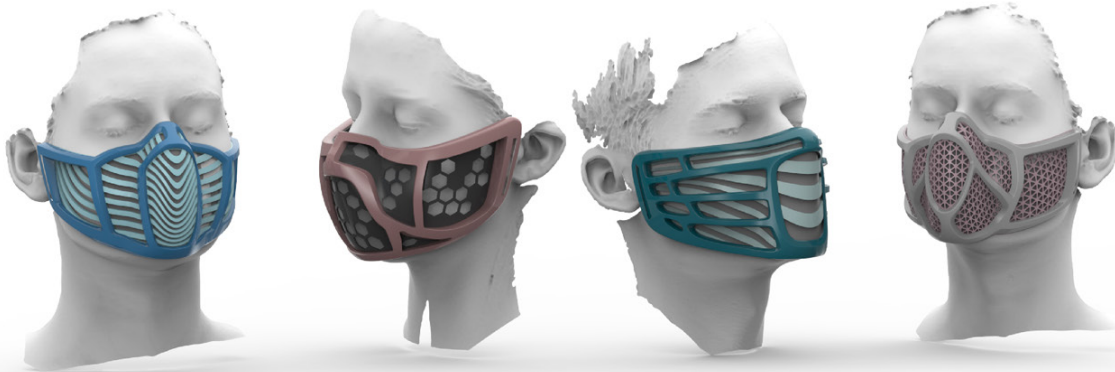

increases dramatically. So the SMARTTECH company was invited to the project and asked to create 3D scans of the faces, that will be treated as a base to 3D prints of a mask. The group opted for spatial scanning because it allows to accurately reproduce the shape of the user's face, and based on the created 3D model, it is possible to effectively design a tight and individually tailored mask shape.

MASSQ Group also made sure that the masks were an interesting and original element of everyday stylization, which is designed to not only protect the health but also emphasize the individual style of the user. The mask, as a part covering the face, strongly affects the image of the wearer.

Acquiring facial geometry

The project began with scanning by the SMARTTECH3D med scanner faces of the people for whom the masks were designed. Non-contact 3D scanning allows precise measurement, is non-invasive, completely safe and does not cause discomfort. Thanks to the 3D scanner, a precise measurement was made, the structure and color were faithfully reproduced and then the mask designed for the specific and irregular shape of the human face was ideally adjusted based on the virtual model.
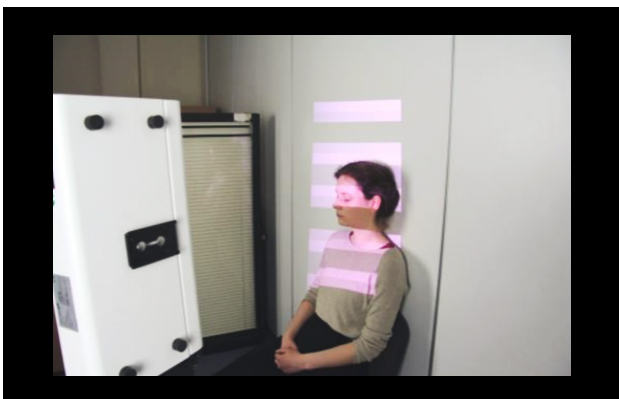
As a result of a single scan, a cloud of points was obtained where each point is described by X, Y, Z coordinates and RGB (Red Green Blue) color components. One measurement lasted only about 0.2 seconds, while the whole face scanning process took about 1 minute. Based on a series of partial scans, SMARTTECH specialists created a 3D model using the dedicated SMARTTECH3Dmeasure software.

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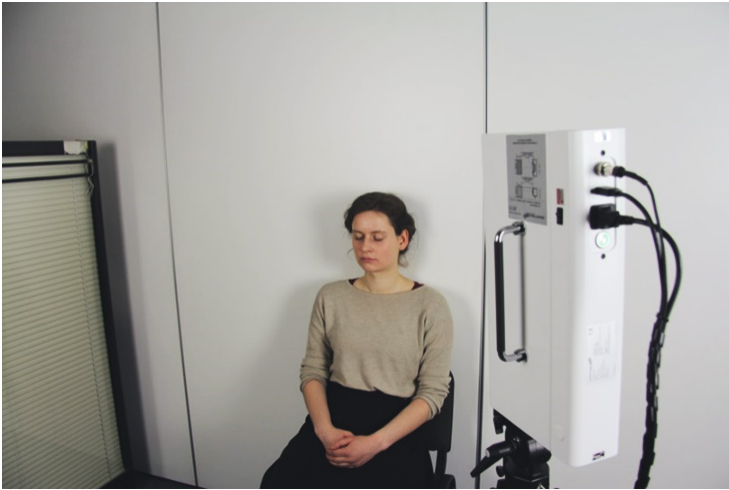
Thanks to the software, the measurement results in the form of a cloud of points are displayed on the computer screen. Individual partial scans were fitted to each other, and then a triangle mesh was obtained. SMARTTECH3Dmeasure software made it possible to create a complete 3D model, analyze its cross-section, calculate the volume and surface area. The effect of this stage of the project was the result in OBJ format - a file compatible with all 3D printers available on the market. Based on the digital 3D model, the students of the Academy of Fine Arts designed and printed on the 3D printer an anti-smog mask adapted to the recipient.

Security and aesthetics

The biggest advantage of wearing anti-smog masks is definitely their effectiveness. Because it sticks tightly to the face, it is important to design it properly and precisely match the nose-mouth part. The mask is therefore extremely hermetic and provides comfort while wearing. This would not be possible without the use of a modern 3D scanner targeted at the medical industry - SMARTTECH med, which allows precise mapping of the human body's geometry. 3D scanning technology is a promising alternative to traditional cost-time-consuming methods of creating useful things.
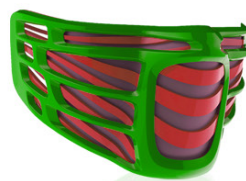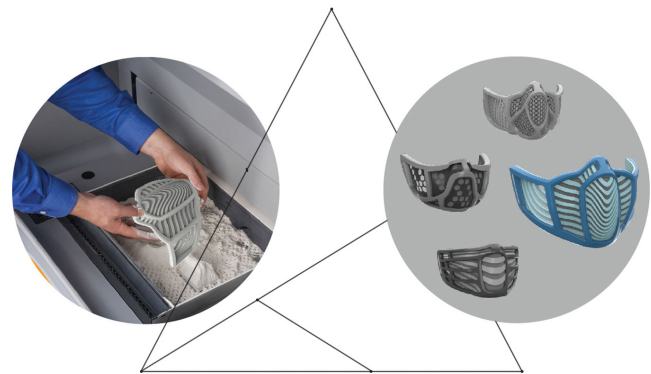
CASE STUDY

Masks are additionally adapted for urban use and are designed to look good in this space. They are produced in various colors, can be decorated with interesting patterns and a wide range of styles which allows the style to suit the recipient. In addition, a removable carbon filter is located under the 3D printed construction. All this makes the interestingly designed anti-smog mask can be both an element of clothing and provide security.

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INDIVIDUAL CHARACTER OF THE MASK
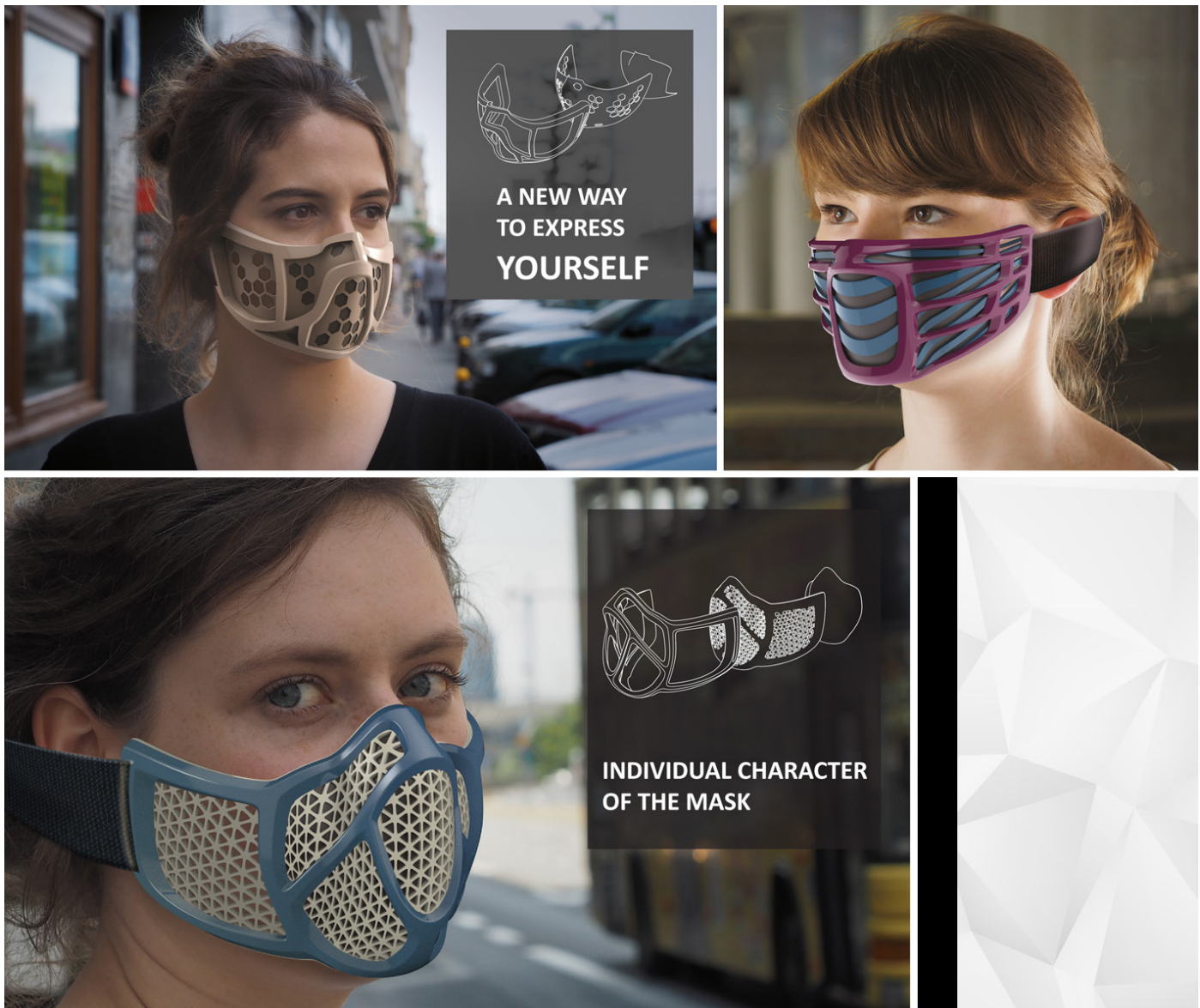
SMARTTECH was established in year 2000 by the group of doctors and researcher from Warsaw University of Technology under the leadership of Prof, dr. hab. Mrs. Malgorzata Kujawinska who also was the inventor of the technology. The Company from the very beginning was focused on 3D data acquisition, using optical method using fringes projection systems. Since almost 20 years we have been upgrading the measurement method by redesigning and implementing the latest optical and projection solutions, to our measurement algorithm, providing the most accurate and reliable results for the most demanding customers of total 300 number of implementations all over the world.

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