



A chair for fighting viruses: An invention by a student from Kraków

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A self-disinfecting chair that prevents the spread of viruses, in particular the SARS-CoV-2 virus, is an innovative idea of Angelika Kopcińska, a student at the Faculty of Mechanical Engineering of the Krakow University of Technology. The prototype of the invention was designed and constructed as part of a successful defence of her master's thesis.

"The chair that disinfects itself using UV-C light could be used especially in public places, such as hospitals, clinics, schools, restaurants, trams, trains, airports and office buildings, not only during the coronavirus pandemic", says the designer of the unique chair.

The smart chair can be disinfected every time the user gets up, and the disinfection procedure resembles the operation of a printer mechanism. The chair upholstery material, like paper in a printer, runs through rollers and passes through a disinfecting unit.

How exactly does the self-cleaning chair work? "There is a pressure sensor on the seat which detects a user sitting in the chair. Ten seconds after you get up from the chair, the motors and the UV-C diode are automatically activated. The DC motors drive special rollers that move the seat upholstery material. The material passes through a disinfection unit equipped with UV diodes hidden inside the device", explains Angelika Kopcińska.

As she says, it was extremely important to ensure the disinfection was effective and the solutions were safe. "In my master's thesis, using a fluorescence technique, I analysed which parts of the chair are most frequently touched. I also researched and compared the available disinfection methods. After analysing all strengths and weaknesses, the author chose UV-C light technology for disinfection. Research shows that UV-C ultraviolet light is effective in neutralising viruses and is widely used in hospitals to sterilise surgical instruments. However, this type of ultraviolet light is dangerous to human skin and eyes, so it can be used for disinfection only with proper precautions", she says.

In the prototype chair, UV LEDs are hidden in the disinfection unit so that human skin and eyes are not exposed to UV-C rays. The chair is also equipped with an OLED display that shows messages about the progress of the disinfection procedure.

In her master's thesis at the Faculty of Mechanical Engineering, the student not only created a prototype and an automatic disinfecting system, but also proposed different configurations of the chair, depending on the location, such as in public transport, restaurants or hospitals.

A chair that would disinfect itself every time the user leaves it is an idea not only for the current pandemic. "In medical facilities, such as clinics or hospitals with many patients, bacteria and viruses may travel not only through contact with infected people, but also with contaminated surfaces. In such places, every chair should be disinfected every time it is used. For obvious reasons, this is not possible. The use of chairs with automatic disinfection mechanism in such facilities would be an ideal solution to increase people's safety and reduce disinfection costs", says Kopcińska.

Her inspiration to start working on the self-disinfecting chair came when she participated in a



student exchange under the Erasmus programme. “At the Polytechnic University of Valencia, I participated in the ENP programme (*European Project Semester*) in which, together with an international group of students, I designed a prototype of a chair that could be disinfected with liquid disinfectant. My task was to programme the microcontroller, design the electrical system, select the electrical components and visualise the prototype. These experiences inspired me to design a more advanced device as part of my master's thesis”, says the graduate of the Krakow University of Technology.

Starting in October, the automation and robotics graduate will work as a designer in Barcelona. During the recruitment interview, she presented her master's thesis and the prototype of the original chair she created.

“This is really a unique diploma thesis, a perfectly prepared theoretical project with great application potential, also due to the fact that the prototype made by the graduate student is already part of the thesis”, says the thesis supervisor, Józef Tutaj, PhD, Eng., professor of the Cracow University of Technology's Faculty of Mechanical Engineering.