

# Technology Update

## Experiment on clone for Medical Treatment



Photo: Dassault Systems

Originating from industrial sector, the digital twin possesses a huge potential in the public health domain. Whether it can fully unfold that, it depends on several factors. The activity with digital twins in medicine is manifold. They reflect with that the exact definite component area of real world further and render it possible through that very accurate analysis and forecast. This means that on the basis of definite parameters coming after or mode of operations of organs human body is reproduced digitally in order to simulate the influence of definite diseases, medications or treatment methods without interfering with real persons.

**Pulsating output:** In the project living heart about 100 institutions work with virtual image of heart and the corresponding application scenario in the medicine.

The pharmaceutical industries as for example use that on the twin in order to experiment the mode of operation. Here the health undertakings GSK work with Siemens and the consulting firm Atas on the digitization of its processes for the development and manufacture of vaccine. The images of the product, production and performance are linked with one another. Through the tie up of digital twins with the running process the performance of processes are predicted, each deviation is anticipated and the corrections are served up back in the real production, explained Rebecca Vangenechten, the executive personnel in pharmacy segment with Siemens. So that not only the digital twin but also the products and processes are steadily optimized through which time is gained and vaccines are quickly developed and can be manufactured.

An additional application example is the

Project, Living Heart. Here about 100 institutions, industries, medical care and licensing authorities work together. Jointly with software providers Dassault Systems, they have developed the first realistic 3D simulation of a complete beating heart. This simulation can accelerate and optimize the development cycles and series of tests. So as for example, in case the artificial heart collapses, with the help of virtual hearts it is possible to adjust better the disease conditions of patients as clarified by Steve Levine, the competent person with Dassault Systems for the human modeling.

In view of that many of the time consuming physical tests on animals and specially manufactured laboratory models were dropped. Already today personalized heart models are utilized for the support of treatment. As for example, before an actual operation, many virtual operations are conducted. The virtual twin of the heart can aid also in education and further education of medical students and clinical personnel.

A team at the Research Institute Empa in Switzerland develops a digital twin of Skin. It should render possible a better treatment of pain affected patients and diabetics. With one in silica – double duct (canal) we can more precisely go on with individual patients, as clarified by Thijs Defraeye of the Empa department. “Biomime Membranes and Textiles” in St. Gallen. The objective is to bring in medication like pain killer and insulin on intelligent fibres and membranes on the skin of the body that in course of which the sensors simultaneously measure the vital parameters of the patients.

In the mathematical models on which the complex digital twins danger in based the researchers have manifold variables of real human beings such as age and lifestyle. Then the action of a medication is affecting a whole corporal parameters which can be individually extremely diverse.

The Multiple Sklerose Zentrum (MSZ) in the

clinic for neurology of the University clinic Carl Gustav Carus, Dresden develops one MS twin from which not only manipulator therapist but also an MS diseased should gain. With the consent of our patients we have built up in the last 20 years enormous data store which grows further steadily as said by Tjalf Ziemssen. He is the founder and manager of MS centre at the clinic for neurology.

Several Fraunhofer Institutes in the framework of leading projects Med<sup>2</sup>icin (Medical Data Driving and Integrated cost Intelligent) have set up a first prototype of digital patient models. With this digital twin among others, the clinical criteria and public health economic aspects are considered. With the digital images already at the University clinic Frankfurt am Main where as for example chronic inflammable skin diseases are evaluated and implemented. For the purpose there are data of more than 600 affected with about 200 different parameters.

In the first impression the digital twin could be convinced of in the clinic. The collective conduct of the data and also the integration of clinical criteria offer a distinct surplus value for the doctors – says Stefan Wesarg who is the manager of the competency centre of visual Healthcare technologies at the Fraunhofer-Institute for graphical data processing (IGD) and coordinator of Med<sup>2</sup>icin. They receive support depending on their decision which therapy for actual patients has the best prospects for success.

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