INFORMATION, COMMUNICATION & COMPUTING

Fields of Expertise TU Graz

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After more than one and a half years of online and hybrid conferences (often with very limited in-person attendance) I just returned from my first presence-only conference just like they used to be in good old pre-COVID times. Many senior persons and close colleagues attended and were actually around in the lecture hall most of the time – as if they had missed the possibility to mingle. During the joint lunch I learned informally about the latest research topics they are currently investigating. We exchanged experience about online teaching during the coffee breaks. We went out in the evening for a glass of wine over which we shared the latest rumors about who had accepted a faculty position at which university. They told me during the social event – in a beautiful collegiate church with an organ whose low notes could literally be felt in the belly – how their families are doing. The welcome reception was held in a smart factory, so we could see and touch the latest equipment they have installed there. During the demo session there were many good hands-on demonstrators where one could touch and play with the prototypes. All this never happened during the online conferences and only to a very limited degree during hybrid conferences, because the "interesting" colleagues joined only online. This reminded me that all these informal side activities during an in-presence conference are at least as important as the paper presentations. Fortunately, there are things in life that cannot be digitalized.

In this edition of TU Graz research, Alice Reinbacher-Köstinger, assistant professor at the Institute of Fundamentals and Theory in Electrical Engineering, gives us some insights into her research. Enjoy reading!

Alice Reinbacher-Köstinger

Identification and Monitoring of Aortic Diseases by Electrical Impedance Measurements

Aortic diseases such as aortic aneurysm or dissection can be life-threatening and are not always detected in time. Therefore, an easy-to-use, non-invasive method to detect such a disease would be of great benefit. A suitable method that is already in clinical use but for a different purpose, is impedance cardiography. With numerical simulations of an adapted measurement system, including patient-specific geometries, the feasibility of such a method to be able to identify and monitor pathologies of the aorta is being investigated.

Electrical bio-impedance measurements are performed by placing adhesive electrodes on the body surface and injecting a low-amplitude alternating current. As shown in Fig. 1, additional sensor electrodes measure the voltage drop in the region of interest, which is proportional to the impedance and varies during a cardiac pulse wave. Since blood has a higher electrical conductivity compared to the surrounding tissue types, the impedance changes are mainly due to the pulsatile blood flow in the aorta. The blood pulsation causes volumetric changes of the aorta and also flow-induced conductivity changes. >

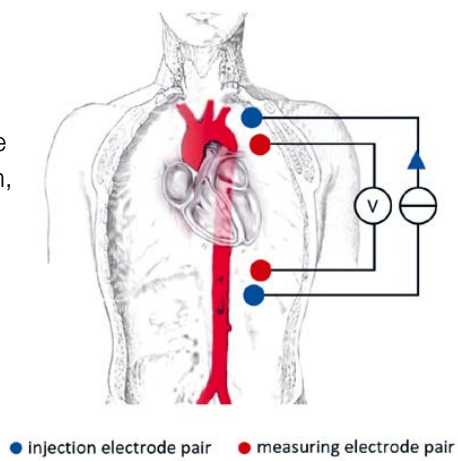

Figure 1: Principle of thoracic bio-impedance measurements.
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