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Melanie Löw

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Hannover Messe 2019: New business models rely on the availability of agricultural machinery

Tractors, combine harvesters and other agricultural machinery are associated with high costs and time-consuming maintenance for farmers. It could be simpler for them with new business models, whose feasibility Kaiserslautern researchers have worked on with industrial partners. The agricultural machine is not sold as a product, but only their availability for a certain period. For this purpose, the researchers have developed a technical system that detects the failure of the machines prematurely and provides all status information for service technicians. At the Hannover Messe from 1 to 5 April, they will present their project at the Rhineland-Palatinate research stand (Hall 2, Stand B40).

Farmers usually need their agricultural machinery only a few days a year. Nevertheless, this is associated with major investments. In the future, new, availability-oriented business models could help in this respect. Researchers at Technische Universität Kaiserslautern (TUK) worked on their commercial feasibility as part of the "InnoServPro" joint project. It is funded by the Federal Ministry of Education and Research (BMBF). The overall goal is to develop innovative service products (Product-Service Systems (PSS)) that enable such business models. "The manufacturers of agricultural machinery sell their customers no longer a product, but 'only' its availability as a service product," says Thomas Eickhoff, who works at the Institute for Virtual Product Engineering (VPE) as part of his doctorate at "InnoServPro".

In this model, the supplier has to ensure that the desired machine is as 100 percent as possible available to his customer within a certain booked period. "There must be no failure," says Hristo Apostolov, who is also involved in the project. To guarantee such availability from the technical point of view, Apostolov and Eickhoff have worked together with other colleagues from TUK, IT and telecommunications companies, software system suppliers, consulting companies, industrial suppliers, agricultural machinery manufacturers John Deere and Grimme and drive technology company Lenze. The industrial partners have provided the Kaiserslautern scientists with corresponding machines, equipment and data.

"In the project, we developed an overall system that monitors the machines in such a way that we can recognize early on when a failure might occur," explains Eickhoff. Sensors are used to provide engineers with data about the condition of the devices. In a potato harvesting machine, for example, they can monitor the conveyor belt and collect data. "We evaluate this data in order to predict breakdowns and failures of the conveyor in time," Apostolov continues. In this context, experts also speak of predictive maintenance systems. Such technologies inform the manufacturer prematurely and ensure, for example, that a service technician arrives at the customer before the machine fails and also has all the necessary spare parts with him.

In order to realise these availability-oriented business models, a so-called "digital twin" of agricultural machinery is also important, and the Kaiserslautern researchers have also co-developed it. "Combine harvesters and other machines offer innumerable possibilities for variation, and can be equipped with various accessories depending on the farmers' needs," Eickhoff continues. "If there is a failure, we need a replacement quickly. But this is only possible if you know exactly which part is installed at which position."

With the digital twin, the researchers digitally store all the necessary data from individual components through to repair instructions in a database. For this purpose, they have developed an intelligent and integrated information management system in which all important information about the machines is put together in a user-friendly manner. "The technology generates large amounts of data, for example that of sensors, which has to be analysed and evaluated and automatically sent to a service technician," continues Apostolov. In the future, the system is intended to help manufacturers to keep track of things more easily, for example in order to be informed about a failure prematurely. In addition, service technicians quickly identify the type of machine, its individual configuration and the spare parts needed.

In the joint project "InnoServPro" researchers from the following professorships from the Department of Mechanical and Process Engineering are involved at the TUK: Virtual Production Engineering by Professor Dr. Jens C. Göbel, Institute for Manufacturing Technology and Production Systems by Professor Dr. Jan Aurich, Institute for Measurement and Sensor Technology by Professor Dr. Jörg Seewig and Institute of Machine Elements, Gears, and Transmissions by Professor Dr. Bernd Sauer.

The project will be completed this April. It is funded by the Federal Ministry of Education and Research (BMBF) as part of the research programme "Innovations for Tomorrow's Work - Research for Production and Services of the Future" and supervised by the Project Management Agency Karlsruhe (PTKA).

The researchers will present the results of their work at the Hannover Messe. At their exhibition stand, they will show how their innovative solutions for agricultural engineering, such as modern development methods, intelligent/networked components and sensors as well as innovative and integrated information management, work. Using various real, physical and virtual exhibits, they also explain how the new solutions can be integrated into the service processes of companies and how they improve them.

In addition, the consortium of the "InnoServPro" project will present its final project results during a results conference on April 4 in Pavilion 36 on the grounds of the Hannover Messe. Registration is required. More information about this and the project "InnoServPro" as well as the consortium can be found at: <https://www.innoservpro.de/>

Klaus Dosch, Department of Technology and Innovation, is organizing the presentation of the researchers of the TU Kaiserslautern at the fair. He is the contact partner for companies and, among other things, establishes contacts to science.

Contact: Klaus Dosch, Email: [dosch\[at\]rti.uni-kl.de](mailto:dosch[at]rti.uni-kl.de), Phone (also during the fair): +49(0)631 205-3001

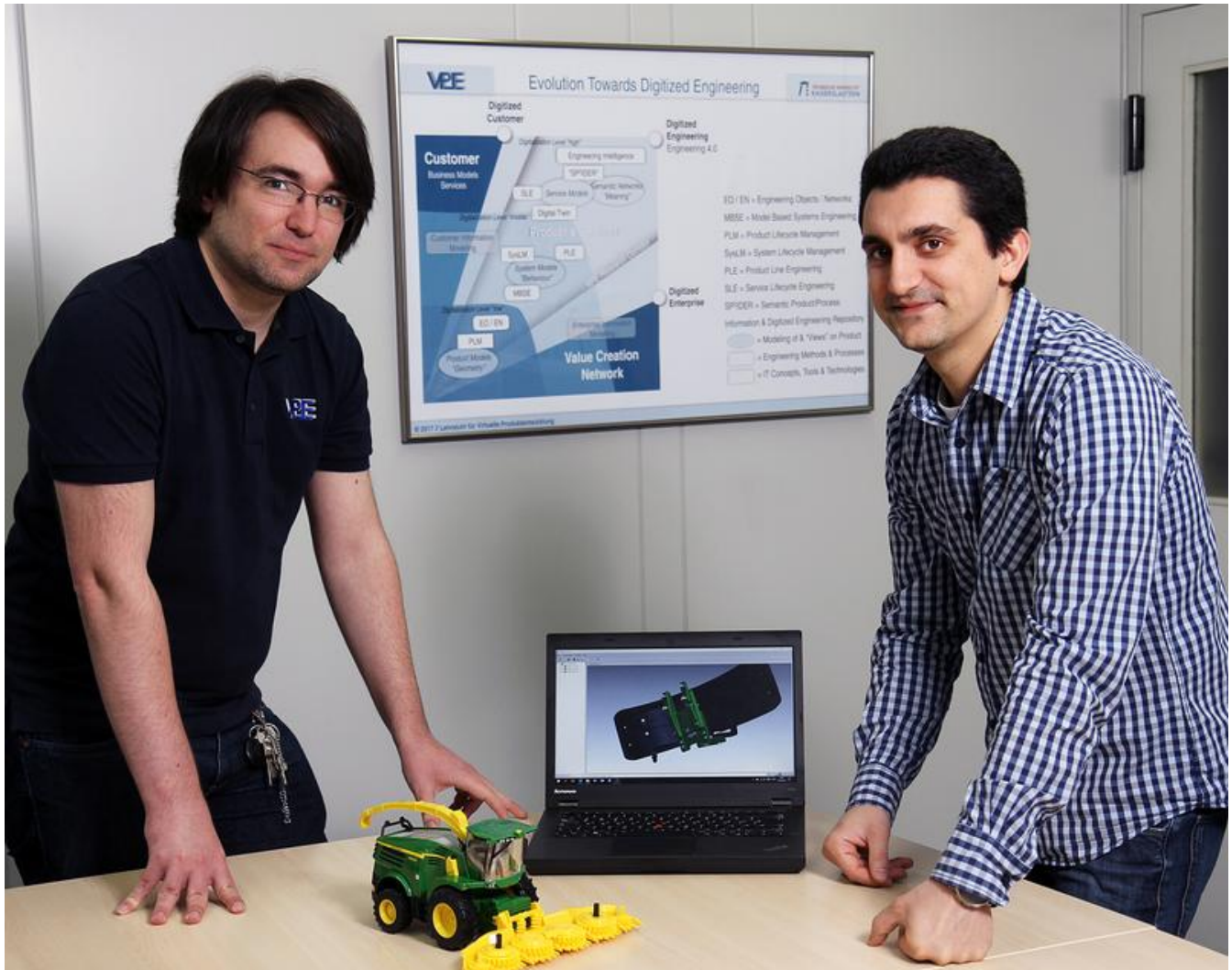
wissenschaftliche Ansprechpartner:

Karl-Gerhard Faißt
Institute for Virtual Product Engineering
Phone: +49(0)631 205-3965
E-mail: faisst@mv.uni-kl.de

Thomas Eickhoff
Institute for Virtual Product Engineering
Phone: +49(0)631 205-3686
E-mail: eickhoff@mv.uni-kl.de

Hristo Apostolov
Institute for Virtual Product Engineering
Phone: +49(0)631 205-3787

E-Mail: apostolov@mv.uni-kl.de



Thomas Eickhoff (left), Hristo Apostolov and their colleagues have worked on these new business models.
Credits: Koziel/TUK