



BETTER INSIGHT FOR SURGEONS

Robotic arm with Kontron computer supports endoscopic operations

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With its robotic arm Soloassist II, Regensburg-based AKTORmed GmbH makes it easier for surgeons in hospitals to work with endoscopes. In minimally invasive procedures, the surgical camera can now be guided by speech recognition. This is a significant improvement for the surgeon, but the underlying software places comparably high demands on the hardware, i.e. processor, memory and interfaces. Therefore, a Kontron motherboard is used, i.e. a full-fledged embedded industrial computer.



// The robotic arm Soloassist II in action: With the help of voice control, the surgical camera is guided by the surgeon to the right place and provides him with a perfect steady image.

More than seven million people were operated in Germany in 2017, registered the Federal Statistical Office (October 2018). Since the 1980s, many operations have been minimally invasive, such as the majority of the 200,000 or so hernia operations performed on men in Germany. Minimally invasive procedures are also called „keyhole surgery“. This is because the instruments and the endoscope, a miniature camera with a diameter of 5 to 10 millimetres, are guided to the surgical site via two tiny incisions. The image is displayed on an external monitor and indicates the surgeon's surgical area. In the clinic, this means that many operations require the presence of a second doctor to guide the camera during surgery, in addition to the surgeon. Only in the case of very simple operations is it sufficient for a doctor to adjust the camera himself.

THE BIG TREMOR: MANUAL ENDOSCOPE GUIDANCE

In the majority of minimally invasive procedures, the endoscope is still guided completely by hand. In practice, this has serious disadvantages, which are reinforced by technological developments: High-resolution cameras produce images in 4K or even 8K quality, even 3D images are now possible. For many applications based on this, however, people lack the necessary steady hand to hold the endoscope, which weighs up to 600 grams, quietly in uncomfortable positions for minutes. Even the smallest tremulous movements are amplified by the magnified reproduction on high-resolution screens to such an extent that they make precise work more difficult than easier. In addition, movements of the entire body, for example to facilitate access to the operating table for a colleague, also set the hand holding the endoscope in motion despite all efforts. In addition, communication problems often make it difficult to work effectively and precisely with the endoscope if it is not quite clear between the surgeon and his colleague at the camera how far or in which direction the camera should be moved.

QUIET IN EVERY OPERATING POSITION: THE ROBOT ARM

The robot arm developed by AKTORmed, which guides the endoscope, already brought considerable relief: It can be guided flexibly with three degrees of freedom, manually and fixed in the correct position. This meant that it was possible to work with an absolutely smooth image even in a fixed position. The joystick also simplified the guidance, so that in some cases a second, endoscope-guiding physician could be dispensed with altogether. This is an advantage not to be underestimated in the case of chronic lack of surgeons in many clinics. AKTORmed's customers now include hospitals in Germany as well as clinics all over the world. AKTORmed is a manufactory for the development and distribution of medical devices, which was founded in 2005 in Regensburg. With at present 16 coworkers, above all engineers, electrotechnicians and Mechatroniker, the robot arm SOLOASSIST is manufactured and driven out as well as new products developed.

RELIABLE VOICE CONTROL REQUIRES HIGH COMPUTING POWER

The robot arm can be used even more flexibly if it can react directly to the operator's voice commands. This allows the operating surgeon to steer the camera in the required direction with just a few simple commands and has both hands free for the operation.

In contrast to the joystick, however, speech recognition and processing requires significantly more computing and memory power. The developers at AKTORmed have therefore decided to rely on an industrial PC that meets these requirements and at the same time the strict criteria for

devices in the operating theatre. In addition to the purely technical features, AKTORmed also had other reasons for choosing Kontron: Since innovation cycles in medical technology are long and procurement projects can take several years, the components of the Soloassist must have a long-term availability of at least seven to ten years, as offered by Kontron for its industrial boards. This requirement alone meant that numerous board manufacturers were eliminated at an early stage of the selection process. There was also a need to be able to access a USB bus on the board; this feature was also not available from many of Kontron's competitors, so the decision-making process was based on Kontron in 2015. AKTORmed was also convinced by the commitment of Kontron's partner Aaronn, who, together with Kontron, can meet all service and support requirements.

KONTRON INDUSTRIAL COMPUTER MOTHERBOARD AT THE HEART OF THE SYSTEM

The motherboard used is the Kontron Mini-ITX Board E38 with Intel Atom® processor of the E3800 series, which has sufficient memory and numerous interfaces required for industrial use. A bootable flash memory is available for the operating system, application data is stored via an SSD storage. Until mid-2019, after three years in clinical use, AKTORmed has not experienced a single failure of a motherboard. Not least because of this, the board differs significantly from the large range of boards for consumer products.

The high reliability also guarantees safety for the patient: The robot arm is protected against uncontrolled movements by algorithms. This guarantees that the endoscope will not injure the patient under any circumstances.

Robert Geiger, Managing Director, AKTORmed: „Availability, safety and reliability play a particularly important role in medical technology; if a component does not function as it should, this can have fatal consequences. Our decision to rely on Kontron as an experienced supplier of industrial computers was therefore absolutely the right one. The Soloassist runs absolutely reliably and error-free with Kontron's industrial computers. The configuration services provided by Kontron and its partner Aaronn allow us to concentrate fully on the development of our robotic arm. In international sales, Kontron's experience on the world markets helps us to quickly pass the necessary, often complex approval procedures for medical devices. With Kontron, we also see ourselves well equipped for the future when topics such as natural language recognition or artificial intelligence for controlling our robotic arm come into play.“

AKTORmed also benefits from Kontron's experience with

demanding customers around the world. Since approvals for medical devices are usually complex, lengthy and different in every country, AKTORmed can already access many of the necessary certifications, such as CE, and confirmations, as well as electromagnetic compatibility (EMC), electrical safety, and radio-specific requirements from the U.S. Federal Communications Commission (FCC). Long-term availability also pays off here, because if something were to change in the once approved component, a costly recertification would be necessary for the next delivery.

KONTRON PARTNER AARONN ENSURES CUSTOM-FIT DELIVERY

The complete voice control software for Soloassist II now runs smoothly under Windows 7 Embedded on the Kontron motherboard. Kontron partner Aaronn adds services to the reliable, secure and long-term available Kontron product: Boards are delivered by Aaronn to AKTORmed ready for installation. Before they are installed, Aaronn adds RAM, a fan and the SSD memory, then the software image is installed and functional tests are carried out.

Stefan Lobmeier, Product Manager Motherboards & SBC at Kontron: „Kontron specializes in industrial computers that meet the reliability, security and availability requirements of our demanding customers, especially in the healthcare sector. Together with our partner Aaronn, we are able to provide our customers with individual support and meet their specific requirements.“

KONTRON IS ALSO THE RIGHT PARTNER FOR AI CONTROL

AKTORmed is working on convincing hospitals all over the world of the advantages of the voice-controlled Soloassist II - Kontron is always present in the background. Kontron will also play a role in the further development of the robot arm. AKTORmed, for example, is already thinking about artificial intelligence applications: The endoscope could find the area of operation to be treated, for example an organ, independently and position itself. It is also conceivable that machine learning could be used to store certain operation sequences and that the robot arm could reposition the endoscope itself.

With motherboards from Kontron, AKTORMed is well prepared for the future and patients and doctors alike benefit from the advances in embedded computing technology.



// For its Soloassist II, AKTORmed relies on a proven industrial PC from Kontron, the Mini-ITX motherboard E38.

About Kontron – Member of the S&T Group

Kontron is a global leader in IoT/Embedded Computing Technology (ECT). As a part of technology group S&T, Kontron offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall.

For more information, please visit: www.kontron.com



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