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Embedded Vision: Success through Collaboration

Hardware and software manufacturers for embedded vision components must work together to promote the effective use of this pioneering technology. The potential applications of embedded vision in combination with machine learning are enormous.

Many future applications - whether in B2C or B2B – will be based on Embedded Vision: small, integrated image processing systems that work intelligently directly from devices enabling them to see and understand. Embedded vision is made possible by compact, high-performance computing platforms that consume very little energy. Thanks to standardized interfaces between computing platforms and image sensors, an increasing amount of image data in real time can be processed. With artificial intelligence, image processing systems are becoming even more intelligent: they are learning by themselves.

"The potential of Embedded Vision is enormous. The growing number of exhibitors and demos with an embedded vision reference, that could be seen at many of the trade fair booths, shows this", summarized Prof. Dr.-Ing. Axel Sikora, chairman of the embedded world advisory board and chairman of the embedded world Conference. "We are delighted that VDMA Machine Vision and the embedded world have organised again a panel discussion and a dedicated track on embedded vision at the embedded world Conference. Together, we are driving this topic forward".

According to the panelists, embedded vision technology will not completely replace traditional, PC- or smart camera-based machine vision systems in the foreseeable future. However, from a technical and economical point of view, it does offer extremely interesting solutions in a multitude of application fields. "The speed of development of the required components, from sensor boards to various embedded platforms to machine vision software for evaluation, is

extremely high. As a result, embedded vision technology has now reached a level of performance that already allows the use of effective systems in many applications today," said Dr. Klaus-Henning Noffz, Chairman of the Board of VDMA Machine Vision, at the panel discussion.

An important and necessary step to make it easier for users to implement this innovative technology is that the manufacturers of the embedded vision components work together with regard to standardization and platform building: "If users have to assemble sensors, processors, software, and other components tediously and individually when developing solutions, the success of Embedded Vision will not reach the extent that it potentially can." However, various camera, embedded board and software manufacturers have already recognized this and are cooperating for the benefit of users.

Further development of the technology is supported by continuous improvements in areas related to processors as well as innovative algorithms and methods such as deep learning and artificial intelligence. On the hardware side, smaller and smaller computers with multi-core processors and lower and lower power consumption guarantee sufficient computing power. Deep learning is becoming increasingly important in the use of embedded vision systems, for example to classify defects. According to Dr. Olaf Munkelt, Managing Director of MVTec Software GmbH, even complex image processing tasks can be solved efficiently in connection with suitable methods for image preprocessing and postprocessing. Participants of the panel discussion all agree: Embedded Vision will establish itself in numerous industries increasingly as a successful and cost-effective technology.

You can find statements and pictures here:

<https://ibv.vdma.org/en/viewer/-/v2article/render/15990775>

Do you have any questions? Anne Wendel, VDMA Machine Vision, will be happy to answer them: Phone +49 69 6603 1466, anne.wendel@vdma.org.

The **VDMA** represents more than 3200 companies in the medium-sized mechanical and plant engineering sector. With 1.3 million employees in Germany and a turnover of 232 billion euros (2018), the sector is the largest industrial employer and one of the leading German branches of industry overall. As part of the VDMA Robotics + Automation association, **VDMA Machine Vision** has more than 115 members: vendors of machine vision systems and components, as well as integrators. The objective behind this industry-driven platform is to support machine vision with a wide range of activities and services. Its focal efforts include statistical analyses and the annual market survey of the machine vision industry, marketing activities, public relations, trade fair policy, as well as networking events and conferences. More information is available at www.vdma.org/vision.

About the embedded world

The embedded world is a trade fair from experts for experts. At the 17th edition, it has again exceeded its previous record figures. The event increased once again in terms of space and number of exhibitors. The embedded world is therefore THE leading trade fair for the international community. This year 1,117 exhibitors from all over the world participated in the fair. And, around 31,000 experts from 84 countries - the second best

visitor result since the trade fair started – visited the embedded world. The success of the event is based on the fact that embedded world is constantly updated with the topics demanded by the market. These are closely linked to the value chain of embedded system technology. New trends and developments such as 'Safety & Security' or 'Embedded Vision' come from the middle of the embedded community.

In addition to the trade fair, embedded world also shines with the two renowned congresses embedded world Conference and electronic displays Conference, as well as the dedicated areas in the halls on the topics "electronic displays", "M2M" and "safety&security". This year, the Start-up area was added for the first time: 15 innovative newcomers presented themselves to the embedded community in Hall 3A. In addition to the already established, top-class discussion rounds "Safe for the future" and "Embedded Vision", two further first-class panels on "Risc-V" and "AI and Machine Learning" were organized for the first time. The Student Day on the third day of the fair addressed the next generation of the community. More than 1,000 students from Germany, Austria and the Czech Republic attended.
More information: www.embedded-world.de

Statements of panelists

"Today's biggest challenge to apply efficient vision capabilities to embedded systems is the camera itself with all the integration efforts. New kind of camera modules and technologies will help embedded engineers to lower NRE costs significantly. At the same time, users benefit from more image processing capabilities directly in the camera module, which improves the allocation of resources on the host side."

Paul Maria Zalewski, Director, Product Management, Allied Vision Technologies GmbH

"Deep Learning on embedded devices is continuously gaining importance in the market. Yet, we do not see deep learning as a one-for-all solution, but rather as an ideal complementary technology for solving specific machine vision applications, e.g. classifying defects. By combining deep learning technology with other approaches, complex vision tasks including pre- and post-processing can be solved efficiently. Thus, a comprehensive toolset available for a broad range of embedded hardware architectures, such as provided by MVTec HALCON, is crucial to build embedded vision solutions in an efficient way and thus reducing time-to-market."

Olaf Munkelt, Managing Director, MVTec Software GmbH

The core component of an embedded vision system is the processor or processing board. Some doubt that small embedded boards with supposedly limited processing power can replace powerful PCs in demanding vision applications. What's your opinion?

"Given the continuous evolution of increased computing power at small sizes, low power advancements, and multi-core processors capable of running multiple software applications, highly intelligent vision systems with centralized computing at the edge will enable a wide variety of volume applications that in the past were limited by the requirement and cost of dedicated PCs. Vision systems powered with serious analytics, using time sensitive networks,

delivering real time performance will enable the next generation of products at a wide variety of market acceptable price points, and the value created will be from Digitization of information.“

Jason Carlson, CEO, Congatec AG

Artificial intelligence – machines that see and learn for themselves. We have heard this dream for years. Is deep learning nowadays really as simple and great as everyone says, or are the expectations exaggerated?

“It is not simple but it is starting to do great things. These systems are the heart of new transportation experiences with autonomous driving. They are developing higher efficiency and better quality manufacturing systems for in-line product inspection. It is simplifying shopping experiences from having no checkout lines to paying at vending machines with facial recognition. There is a lot more to do but real change is happening today because of improvements in imaging quality and advancements of artificial intelligence.”

James Tornes, Vice President Systems and Software, Intelligent Sensor Group, ON Semiconductor Ltd