OPTOMOTIVE

VISIONARY IMAGING
SOLUTIONS

YOU DON'T ONLY NEED EYES TO SEE, YOU NEED VISION…

VISION IS THE ART OF SEEING WHAT IS INVISIBLE TO OTHERS.

JONATHAN SWIFT

Vision is a set of processes that make sense of information received through the visual system. But to have vision also means to be visionary, to have clear, sharp and bright imagination of the future. To imagine what does not yet exist, but might exist someday. And to envision future advances in technology.

Vision solutions to optimize your process and to improve **YOUR OUTCOME.**

Innovative customizable **HIGH-SPEED HIGH-RESOLUTION** cameras.

Large on-camera **FPGAs** for real-time image processing.

CUTTING-EDGE imaging for optimal solutions.

Developed for **DEMANDING** applications.

You certainly know that…

… A DIGITAL CAMERA IS THE EYE OF A MACHINE VISION SYSTEM.

> THE EYE OF THE MASTER WILL DO MORE WORK THAN BOTH HIS HANDS.
>
> BENJAMIN FRANKLIN

The functioning of a machine vision camera can easily be compared to workings of an eye in the human vision system. Both cameras and eyes focus the light from external objects in the field of view onto a light-sensitive medium. In the case of the camera, the medium is an electronic sensor, while in the case of the eye, it is an array of visual receptors. The camera and the eye both work as a transducer, converting light waves into electric signals.

But what we see with our eyes is not simply a translation of the image on the retina. Human visual perception is the ability to interpret information and surroundings from the effects of visible light reaching the eye – our sight is a psychological manifestation of the visual information in our brain's cortex. And the same is true for cameras. After the eye's lens and its retina and after the camera's objective and its sensor, there must be a vision system. Our eyes and cameras are useless without a vision system. The vision system interprets the information from visible light to build a perception of the surrounding world. The quality of the visual system depends on the sharpness, brightness, contrasts and colours of the images and videos. Its quality depends on the quality of vision.

The human visual system accomplishes a number of complex tasks in a single 'box', including the reception of light and the formation of representations, the identification and categorization of visual objects, assessing distances to and between objects and guiding movements in relation to visual objects. And a high-speed smart camera does it, too. All of this in a single box!

COMMITMENTS

- Offering products and solutions of superior value
- Innovating continuously
- Excelling in what we do
- Building vision of the future

VALUES

- Creativity
- Flexibility
- Competence
- Integrity
- Reliability
- Partnership

But did you also know that…

…KNOWLEDGE ABOUT THE HUMAN VISUAL SYSTEM IS ESSENTIAL FOR BUILDING A MACHINE VISION SYSTEM?

> THE REAL VOYAGE OF DISCOVERY CONSISTS NOT IN SEEKING NEW LANDSCAPES, BUT IN HAVING NEW EYES.
>
> MARCEL PROUST

Various physiological components involved in the human visual system are the focus of much research in physiology, psychology, cognitive science, neuroscience, and molecular biology.

The major breakthrough in the field of human visual system happened in the 1970s, when David Marr, a British neuroscientist and psychologist, developed a multi-level theory of human vision. The theory described the process of vision on different levels of abstraction. In order to focus on the understanding of specific problems in vision, he identified three levels of analysis that happen in our visual systems. The processing level addresses, at a high level of abstraction, the problems that the visual system must overcome. The algorithmic level attempts to identify the strategy that may be used to solve these problems. The implementation level attempts to explain how these problems are overcome in terms of the actual neural activity necessary.

In 2006, a study at University of Pennsylvania calculated the approximate bandwidth of human retinas to be about 8960 kilobits per second.

In 2007 Qasim Zaidi, professor of vision science from State University of New York and his college-researchers on both sides of the Atlantic discovered that there are two pathways for sight in the retina and peak spectral sensitivity was measured at 481 nm.

All observations on human visual perception and their findings are the main source for the development of machine vision. Special hardware structures and software algorithms provide machines with the capability of interpreting the images coming from a camera's sensor on the same principals as human vision works. Artificial visual perception as the result of development on this basis is nowadays increasingly used in industrial automation, non-industrial automated processes and even in our everyday life.

VISION

To be among world’s best machine vision companies by our creativity and flexibility, and by faithfully following the concept of joining large FPGAs, high-performance imaging sensors and image processing within FPGAs.

MISSION

To equip customers with the most creative, innovative, flexible and customizable high performance machine vision solutions, which are pioneering the path of future development in machine vision.

And did you also know that…

…WHEN BUILDING MACHINE VISION SYSTEM ONE NEEDS TO THINK OF THE FOLLOWING:

> DESIGN IS NOT JUST WHAT IT LOOKS LIKE AND FEELS LIKE. DESIGN IS HOW IT WORKS.
>
> STEVE JOBS

The basics of machine vision science as a discipline is a conceptual model describing all of the factors that must be considered when developing a system for creating visual renderings, images, for creating vision system.

Machine vision designers should take as an example the psychophysical processes that take place in human brains as they make sense of information received through the human visual system.

When developing machine vision system, which is a digital vision system, machine vision designers must consider the observables associated with the subjects which will be imaged. These observables generally take the form of emitted or reflected energy, such as electromagnetic energy or mechanical energy.

Once the observables associated with the subject are characterized, machine vision designers can identify and integrate the technologies needed to capture those observables. In digital cameras, these technologies include optics for collecting energy in an appropriate band of the electromagnetic spectrum, and electronic detectors for converting the electromagnetic energy into an electrical signal.

For all digital vision systems, the electrical signals produced by the capture device must be manipulated by an algorithm that elaborates signals in such a way that they can be displayed as an image. This manipulation is called image processing. Different and multiple processors may be involved in image processing for the creation of a digital image, but output can also be only a set of characteristics, or parameters related to the image.

OPTOMOTIVE APPLICATIONS

- Industrial and Non-industrial Applications
- Test and Measurement
- Quality Control
- Traffic Control
- Video Surveillance
- Augmented reality

INDUSTRIES

- Automotive and Aerospace
- Food and Beverage
- Logistics
- Printing
- Metal
- Medical and Pharmaceutical
- Military
- Scientific research
- Education

And did you also know that…

…FPGA-BASED CAMERA CAN SAVE YOUR LIFE?

IT'S REALLY HARD TO DESIGN PRODUCTS BY FOCUS GROUPS. A LOT OF TIMES PEOPLE DON'T KNOW WHAT THEY WANT, UNTIL YOU SHOW IT TO THEM.

STEVE JOBS

In the field of digital image processing, most operations on an image are simple and very repetitive. FPGAs are more than suitable for such tasks. It is more than convenient for time-critical functions to be implemented in FPGAs, so that it is possible to even accelerate their speed.

FPGA (field programmable gate array) is an uncommitted group of logical gates. The device is programmed by connecting the gates together to form multipliers, registers, adders, etc. Multipliers, included in FPGAs can operate at frequencies higher than 100MHz. Whenever the data rate of the system needs to be higher than 100 Mbyte/second, FPGA will handle it better than any other solution on the market. Integrating an entire embedded system in a single FPGA helps to speed up computation, reduces production costs, simplifies board design and eliminates long lead times.

In the automotive and aerospace industries, FPGAs are used in many safety-critical applications where fast response times and reliability are crucial. Such applications include collision-avoidance systems, blind-spot detection, alert systems and in rear-view cameras. Due to their low power consumption, such FPGA-based solutions are suitable also for hybrids, electric vehicles or fuel cell-powered cars.

FPGAs are suitable in applications that require real-time response and highly reliable electronics, that need high computing power, consume little energy and can survive the harshest environments. Another advantage of FPGAs is their capacity for parallel processing. Certain parallelizable algorithms, running at mere ~100MHz in parallel in the FPGA, have shown performance boosts of 10 times compared to the same code running on a 3GHz x86 CPU. Some FPGAs are manufactured as radiation-hardened versions and can even operate in high radiation space applications. All these attributes make FPGAs a crucial element of the high-speed smart cameras of the future.

PRODUCTS

Customizable high performance FPGA cameras

OptoMotive's cameras are cameras with the stereoscopic eye of the Cameleon, the extensibility and flexibility of the Camelopard and the speed of the Velociraptor!

And did you also know that…

… AN FPGA-BASED CAMERA CAN SAVE YOU MONEY AS WELL?

> WE DO NOT NEED MAGIC TO TRANSFORM OUR WORLD. WE HAVE THE POWER TO IMAGINE BETTER.
>
> J. K. ROWLING

Implementing new features and responding to changing market requirements by using FPGAs is easy. Because processors are implemented as soft-hardware, board redesigns are not necessary. The ability to update firmware over Ethernet or USB is a common feature in today's FPGA systems. Upgrading such a vision system is simple and minimizes time-to-market and thus minimizes costs of application. When an application needs to be moved to high-volume production due to reducing production costs, it is easy to migrate from FPGA to ASIC in a matter of weeks and thus even further reduce production costs in a very short time.

In an FPGA-based camera all of the abovementioned very much counts as well. But the benefits of such a system in image processing also means the possibility of image processing inside the camera itself. That also results in reducing data transmission costs. Where there is a need for high-resolution and high-speed, in combination with demands for real-time reaction, FPGAs are the best solution.

Furthermore on an FPGA-based camera two major bottlenecks are avoided at the same time. There is no longer any problem with the transmission of data to the host computer, nor is there is a problem with real-time processing ability of the host PC. Several different machine vision tasks can be implemented in the FPGA of such cameras. From pixel-processing pipelines which include look-up tables, to 1D, 2D and 3D filtering, image statistics cores, such as auto-exposure, auto-gain, auto-white-balance etc., and at last, but not least, a higher level processing of data remainder with the soft CPU. This means that an FPGA-based camera can operate as autonomous device, doing everything that complex machine vision systems do. It can even do object recognition and character recognition by itself.

Our cameras are composed of housing, imaging sensor, processing unit and communication interface. In every piece of the camera, we put maximum effort into producing an engineering masterpiece.

OptoMotive camera housings are made of CNC-machined aluminium and anodized in special OptoMotive blue colour.

We use high-speed industrial CMOS imaging sensors, which can acquire video at rates up to 5000 frames per second.

The image processing unit is a programmable logic device FPGA, coupled with high-speed memory. With this reconfigurable image processor, parallel real-time image processing is possible.

Pre-processing includes colour processing and filtering. Postprocessors are running in parallel to perform image compression, image statistics and other higher level detections. When image processing is finished, the relevant data is buffered in memory and transmitted through the communication interface to the host PC.

Camera functionality and image preview is controlled by the SHARKi Windows-based software, or API for user-based programming. Compliance with GigE Vision and GenICam standards enables cameras to be operated by all major available software.

All of this makes our cameras unique computer vision machines, which are also capable of standalone operations.

And did you know that…

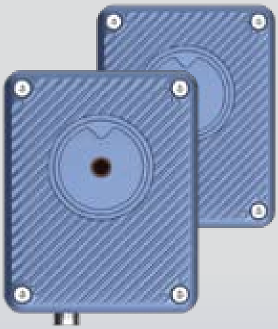
…CUTS ON BREAD HAVE AN IMPORTANT MEANING?

> IF AT FIRST THE IDEA IS NOT ABSURD, THEN THERE IS NO HOPE FOR IT.
>
> ALBERT EINSTEIN

In every automated process, computer vision is needed to automate productions and to improve quality and throughput. Bread making, too, has become a fully automated industrial process in modern factories. One might wonder where to find applications of computer vision in automated bread baking. But there are actually numerous examples.

One of the examples really stands out for its complexity and actuality. Bread loafs have different cuts on top. Bakeries use their own distinctive pattern to mark their products. This way they know what kind of recipe was used to bake it, and which store it has to go to. Making cuts on the top side of the dough before baking is a simple task for a human, but not so easy for a robot. If the robot wants to cut the dough precisely, it needs the precise trajectory of its knife. But dough position and shape varies.

How can this be dealt with? The best way is to perform a 3D measurement of the dough. For this purpose, a laser line projector, an FPGA-based camera with laser triangulation core, which does image processing and outputs only profiles instead of images, are needed. These profiles are used to generate a 3D model of dough in its real coordinates. Such a 3D model is basis for calculation of robotic knife trajectory. It's as simple as that.



CAMELEON

Cameleon is fast-adaptive, has flexible imaging and stereoscopic view.

Cameleon is **flexible imaging platform** based on Spartan-3E FPGA and USB communication. It offers **simple entry point** to FPGA imaging. The FPGA can be used for real-time high-speed image processing. **The package includes the FPGA reference design and PC software with source code.** Examples in C#, MatLab and Xilinx tool suite are available. The image-processing core library includes 3D laser triangulation (3D scanning) and a 2D FIR filter. It is extremely versatile and rich in free IOs, which can be used for VGA, SPI, I2C, encoders, etc.

SENSOR

Aptina MT9V034, 1/3'' CMOS colour or monochrome sensor, 752 × 480 pixels, 6 µm pixel size, 64 FPS continuous video acquisition, global shutter, linear or high dynamic range response

CONNECTIVITY, I/O

Mini USB2.0 connection to PC (USB powered ~ 1.5 W), header for external USB connector, 40-pin header for head connection, 34-pin header for add-ons connection

FPGA

- 1.6 Mgates Spartan-3E with 64 MB DDR SDRAM
- 4.5 or 7.5 Mgates Spartan-6LX option
- Xilinx EDK system-on-chip maximizes system flexibility
- Reference design included.

DIMENSIONS

64 × 80 × 41 mm (housing), 64 × 80 × 43 mm (M12 LED housing), 47 × 54 × 31 mm (OEM with M12 lens holder)

USAGE

compatible with Optomotive SHARKi software (full source included), usable through CAM_API dynamically linked library in custom applications (C++, C# examples included) and 3rd party applications (MATLAB(R), LabView(R), etc.).

SPECIAL FEATURES:

Up to 2 additional sensors per camera, perfectly synchronized.

46 general purpose user-programmable digital I/O pins.

Included IP core for 3D laser scanning - real time laser profile extraction algorithm with image rotation, 16x sub-pixel resolution and intensity.

Custom user firmware upgrade (soft-hardware and software) creation utilities included.

Complete open source reference design available.

Lenses: M12 lens mount and 6-pack of lenses included in OEM package.

Targeted to academic, scientific, medical and industrial use

OPTIONS

- Custom LED ring lighting
- Additional camera heads
- Opto-isolation board
- C or CS lens mount
- Housing with LED ring and M12 lens mount (IP67 option)
- C or CS housing (IP67 option)

ADDITIONAL IP

Additional IP cores available on demand

And did you know that…

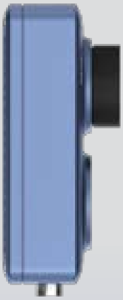
…A SINGLE CAMERA CAN SEPARATE FRESH VEGETABLES FROM ROTTEN ONES?

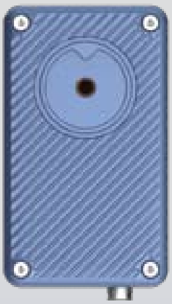
> ONE PICTURE IS WORTH A THOUSAND WORDS.
>
> ALBERT EINSTEIN

In order remain competitive with the rest of the world, crop harvesting in Europe is becoming a fully automated process. How can we make sure that the individual vegetables or pieces of fruit are of good quality and ready to be sold? A single rotten item in a crate or basket can spoil all the others before they reach customers. Computer vision can be employed to solve this problem.

People usually rely on the colour of vegetables to determine their quality. For this application, the colour reproduction of a vision system's camera is essential. In such a camera, sensors with high resolution and brilliant colours have to be used.

When this camera is FPGA-based, the on-board FPGA contains an image processing engine to distinguish between good and bad vegetables. The camera passes information on the quality of the product to a controller, which throws away rotten ones, or sorts products in different baskets.





CAMELOPARD

Camelopard has bright and colourful sight.

Camelopard is a **high-performance USB camera** based on Xilinx Spartan-3A DSP **FPGA.** It uses **high-performance system-on-chip** (SOC) technology, combined with latest **high-speed industrial Sony CMOS sensors.** Sensors exhibit **high sensitivity, low noise and brilliant colours** at high speed. **A large camera buffer** enables capturing a sequence of events at very high speed.

SENSOR

Sony IMX035, 1/3" CMOS colour or monochrome sensor, 1313 × 1041 pixels, 3.63 µm pixel size, 120 FPS burst video acquisition,

Sony IMX036, 1/2.8" CMOS colour or monochrome sensor, 2080 × 1553 pixels, 2.5 µm pixel size, 60 FPS burst video acquisition

CONNECTIVITY, I/O

Mini USB2.0 connection to the PC (USB powered ~ 2.5 W), header for external USB connector, 40 pin header for add-ons connection, opto-isolated digital input and output (trigger/flash)

FPGA

- 1.8 or 3.4 Mgates Spartan-3ADSP with 128 MB DDR SDRAM
- Xilinx EDK system-on-chip maximizes system flexibility.
- Reference design included.

DIMENSIONS

56 × 96 × 39 mm (housing), 48 × 68 × 30 mm (OEM with M12 lens holder)

USAGE

compatible with Optomotive SHARKi software (full source included), usable through CAM_API dynamically linked library in custom applications (C++, C# examples included) and 3rd party applications (MATLAB(R), LabView(R), etc.).

SPECIAL FEATURES

20 general purpose user-programmable digital I/O pins.

Custom user firmware upgrade (soft-hardware and software) creation utilities included.

Complete open source reference design available.

Lenses: M12 lens mount and 6-pack of lenses included in OEM package.

Targeted to academic, scientific, medical and industrial use

OPTIONS

- C or CS lens mount
- C or CS housing (IP67 option)

ADDITIONAL IP

Additional IP cores available on demand

And did you know that…

…IT IS POSSIBLE TO READ 1000 2D BARCODES PER SECOND IN REAL-TIME?

> YOU CAN NEVER SOLVE A PROBLEM ON THE LEVEL ON WHICH IT WAS CREATED.
>
> ALBERT EINSTEIN

2D barcode reading has become a common task in logistic industry. 2D barcodes are replacing 1D barcodes for a simple reason: they contain more information. But what can be done, when an image containing barcode is huge, but the barcode is really tiny? What if it is not possible to predict its position? What if there are many products to inspect in a very short time? The answer to all these questions is high resolution and high frame rate.

But high resolution and high frame rate results in massive bandwidth. And massive bandwidth is difficult to process in real time. What will process this amount of data? Perhaps a costly cluster of mainframes for distributed computing with enormous usage of electricity? No one anywhere is likely prepared to buy a supercomputer for image processing, unless there really is no other alternative.

Is there anything less expensive that also consumes less power? Yes: FPGAs. And, yes, a camera with a large FPGA, high-resolution and high-speed sensor can do the job. Such a camera can (pre)processes data at the source for an affordable price. And this way all bottlenecks are avoided.

VELOCIRAPTOR

Velociraptor is fast running and fast grabbing.

Velociraptor is the **ultimate** FPGA camera with a **very large** Xilinx Spartan-6 FPGA and **high speed imaging sensor.** It is based on new GigaBee modules, which incorporate **dual DDR3 memory** and **Gigabit Ethernet**. It is **ultimate-performance system-on-chip (SOC) technology,** combined with **latest turbocharged** industrial CMOSIS imaging sensors. With high performance FPGA system-on-chip (SoC) technology, Velociraptor **opens new dimensions in computer vision.** It is global shutter **industrial camera with incredible frame rates** and range of image-processing cores (**JPEG compression,** colour processing, etc.).

SENSOR

CMOSIS CMV2000, 2/3” CMOS colour, monochrome or NIR sensor, 2048 × 1088 pixels, 5.5 µm pixel size, 340 FPS at JPEG video acquisition,

CMOSIS CMV4000, 1” CMOS colour, monochrome or NIR sensor, 2048 × 2048 pixels, 5.5 µm pixel size, 180 FPS at JPEG video acquisition

CONNECTIVITY, I/O

Gigabit Ethernet (isolated Power over Ethernet), 4 pin trigger connector (3x bidirectional IOs)

FPGA

- 10 or 15 Mgates Spartan-6LX with 2x128 MB DDR3 SDRAM
- Ultimate FPGA System-on-Chip
- Super speed FPGA image processing (JPEG)
- Capable of intensive real-time image processing

DIMENSIONS

54 × 94 × 54 mm (housing), 40 × 78 × 37 mm (OEM with C-mount)

USAGE

compatible with Optomotive SHARKi software (full source included), usable through GEV_API dynamically linked library in custom applications (C++, C# examples included) and 3rd party GigE Vision applications (MATLAB(R), LabView(R), etc.).

SPECIAL FEATURES:

Compliant with all major available software

Compliant with GigE Vision and GenICam

Built to support the upcoming GigE Vision v2.0 specification

Real time JPEG compressor

3 general purpose user-programmable digital I/O pins.

Targeted to metrology and industrial use.

OPTIONS

- C or CS housing (IP67 option)
- Real-time JPEG compression core

ADDITIONAL IP

Additional IP cores available on demand

And did you know that…

…THE GRAPHICAL USER INTERFACE ON A PC CAN ALSO BE USED TO SETUP A CAMERA'S IMAGE PROCESSING?

IMAGINATION IS THE HIGHEST FORM OF RESEARCH.

ALBERT EINSTEIN

Traditionally, graphical user interfaces (GUIs) are used to visually present acquired images. But are they still necessary in cases, where camera does not send images to the host computer, but processes the data by itself? They are necessary, but just as necessary as buttons on consumer digital cameras. Nowadays, consumer digital cameras have LCD displays integrated to immediately control the recorded data (photos as well as video) and to immediately correct settings when necessary.

Similar to consumer digital cameras, industrial digital cameras use GUIs for this purpose. In most cases, this means to display the image, and for users to verify image-processing steps, as well as to setup image-processing parameters. When the parameters are finally set, user can save them in the camera. When image visualisation is no longer needed, it is then actually possible to unplug the communication cable, and the camera is ready for standalone operation.

SOFTWARE

All our cameras are fully compatible with our own in-house developed GUI interfaces, which are shipped with every camera:

QTCAMERA

- MS Windows-based Graphical User Interface (GUI) for video/image acquisition, storing and camera control.
- Written in C++ using the excellent Nokia Qt toolkit.
- Full source code included.

SHARKI

- Latest MS Windows-based Graphical User Interface (GUI) for video/image acquisition, storing and camera control.
- Written in C# using Windows Presentation Foundation and Silverlight achieving a highly modern professional look.
- Full source code included.

Our users are encouraged to use and modify our own existing code base to develop applications that use our cameras in a specific custom ways. By freely giving the source code of these two GUI interfaces, our users can save a lot of time when developing their custom application that uses our cameras.

Furthermore, we provide user application access to our cameras through a simple and documented C API by providing a dynamically linked library:

CAM_API

- •For use with our USB-based cameras (Cameleon, Camelopard).
- MS Windows Dynamic Link Library (DLL)-based Application Programmer Interface (API) used to communicate with USB-based OptoMotive cameras for using cameras in your custom application and in third party applications that allow calling of external DLLs (MATLAB(R), LabVIEW(R), etc.).
- Full source included.
- Examples of usage in C++, C#, MATLAB and LabVIEW included.

GEV_API

- For use with our GigE Vision compliant camera (Velociraptor).
- MS Windows Dynamic Link Library (DLL)-based Application Programmer Interface (API).

And did you know that…

… A SMALL FPGA-BASED CAMERA CAN AUTONOMOUSLY RUN A 3D LASER SCANNER?

NECESSITY IS THE MOTHER OF ALL INVENTION.

ALBERT EINSTEIN

Precision is everything in 3D scanning applications, where an acquired model is used for measurements. Laser triangulation is one of the best methods, since it offers high precision at large measurement range. For laser triangulation of a camera, a laser line projector and a device for scanning over the measured object are needed. In order to have high precision of the measured data, scanning needs to be synchronised to image acquisition. That is true for linear movement, and for rotation as well. When it comes to synchronisation, FPGAs are a perfect fit.

But that is not all! At the same time, FPGAs can be used also for other purposes, and not just for image processing itself. There can be an integrated image synchronous stepper motor controller, FPGAs can also simultaneously read an encoder, control power of laser projector and, of course, also process the image.

In this way, an FPGA-based camera in a 3D laser scanner does most of the job, as it sends already processed profiles to the host computer. One day, the host computer will essentially be just a display for viewing the results. And this day is not as far as one might think!

OPTOMOTIVE TECHNICAL SERVICE

Providing the industry with most innovative Machine Vision systems is the aim of OptoMotive's service.

You can choose from our existing range of various IP cores, hardware and software solutions.

Or you can employ our competent development team to provide you with solutions that most suit your needs.

OPTOMOTIVE TECHNICAL SUPPORT

By delivering competent technical support, OptoMotive ensures its customers complete and reliable after sales service.

OPTOMOTIVE DEVELOPMENT

OptoMotive employs highly competent engineers from different technical fields, from physics to mechanical engineering, from computer science to electrical engineering.

With its broad research and development network, which includes different highly professional high-tech companies, institutes and university laboratories, no task is too difficult for OptoMotive.

OPTOMOTIVE'S RESEARCH AND DEVELOPMENT PARTNERS

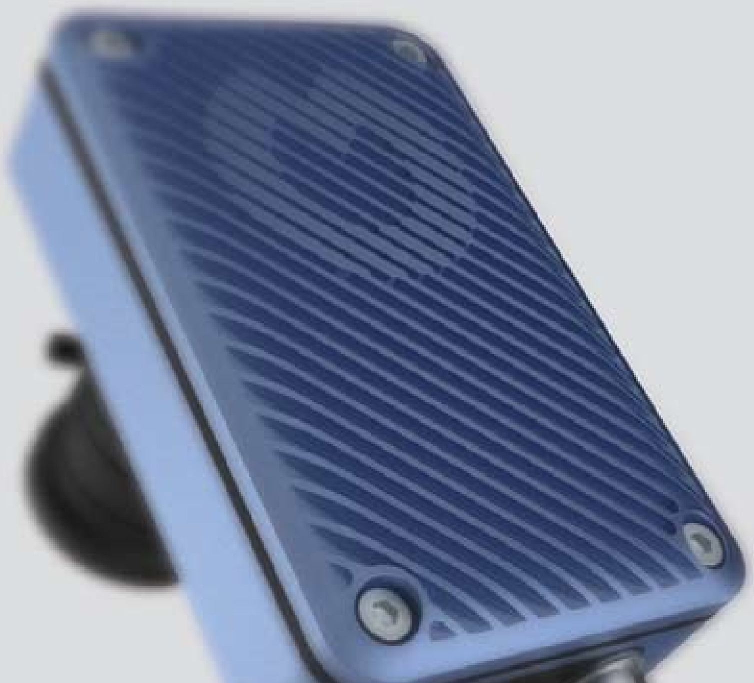
University of Ljubljana, Faculty of Electrical Engineering, Laboratory for Integrated Circuit Design, Slovenia, EU

University of Ljubljana, Faculty of Mechanical Engineering, Laboratory for Manufacturing Cybernetics and Experimentation, Slovenia, EU

Beyond Semiconductor, d.o.o., Slovenia, EU

DeweSoft, d.o.o., Slovenia, EU

Trenz Electronic, GmbH, Germany, EU



OPTOMOTIVE IS A MEMBER OF

Technology Park Ljubljana, Slovenia, EU

EMVA – European Machine Vision Association

AIA – Automated Imaging Association

AWARDS

OptoMotive is very proud to announce that its development partner Dewesoft's DEWE-43 data acquisition instrument, for which all FPGA architecture was developed exclusively by OptoMotive, received the NASA Techbriefs Product of the Year 2009 Award.

OptoMotive is very proud to be awarded The Business Idea of the Year 2011 by Finance, Slovenia's largest financial and business newspaper.