



SMARTSPECTOR® AURORA

Smartspector: Motivation and Objectives

If Edison had a needle to find in a haystack, he would proceed at once with the diligence of the bee to examine straw after straw until he found the object of his search. ... I was a sorry witness of such doings, knowing that a little theory and calculation would have saved him ninety per cent of his labor.

Nikola Tesla about Thomas Alva Edison, NY Times, 1931

Genius is one per cent inspiration, ninety-nine per cent perspiration.

Thomas Alva Edison, Harpers Monthly, 1932

The development of innovative approaches and technologies is an essential stimulus for mankind; innovation has always been an indispensable pillar for social evolution.

Numerous technical accomplishments in the last decades, in particular in the area of information systems and technology, are both the basis and a reflection of modern society. They allow for a more efficient analysis and modeling of complex structures than ever before.

Managed innovation, methods and tools for systematic innovation processes and path dependency of strategies are the apparently logical answers to the simple question as to how innovation happens nowadays. It is not only historic reality that methodologically driven progress at the best only leads to advances within pre-existing fields of competence and established markets.

100 years after Tesla and Edison and more than 2,000 years after Archimedes pure innovation is still triggered by the ingenious act. The willingness and readiness to raise an idea within interminable steps of iteration and concretion are unbudgetable prerequisites to convert new findings into an enduring benefit of whatever kind.

By having spent two decades of my career in following this path of innovation, I was able to learn and act in globally operating technology ventures together with mentors who encouraged me to create and to develop several innovative technologies over the years.

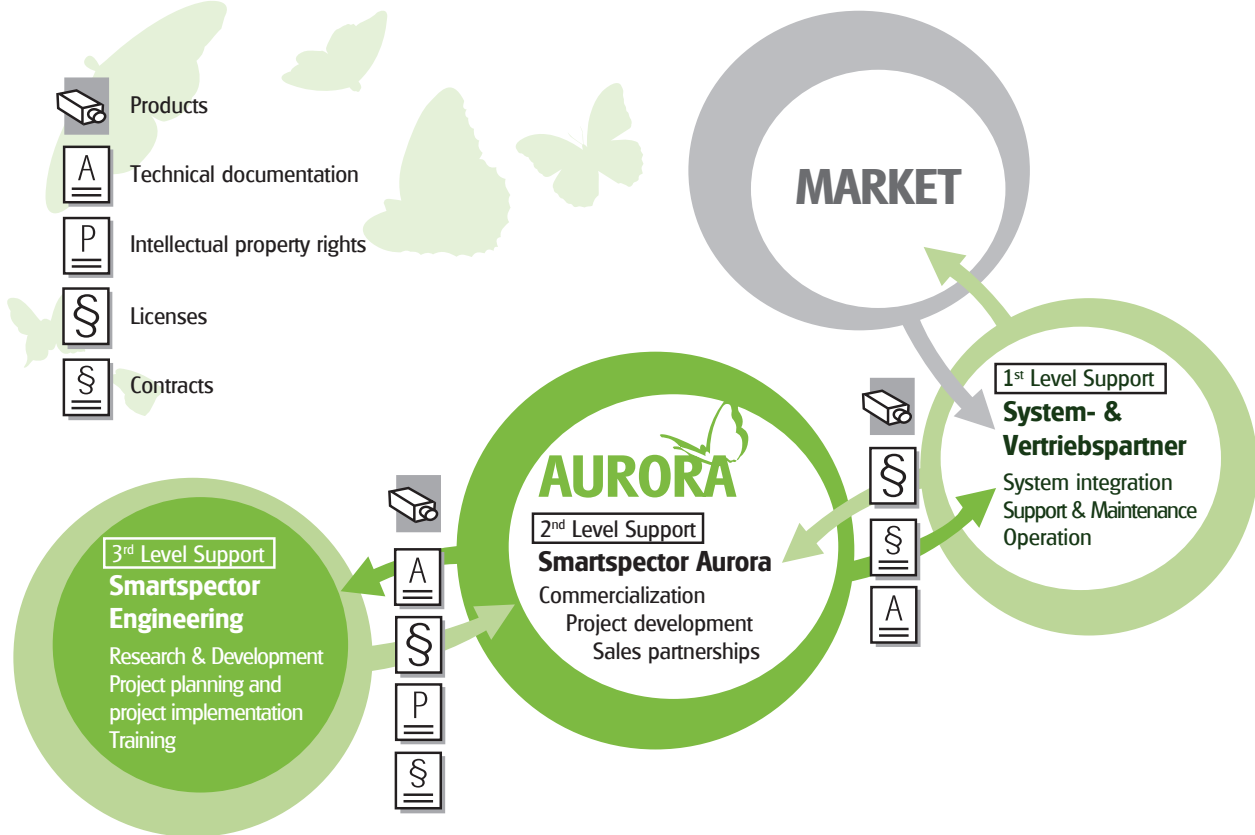
In this spirit, Smartspector artificial perception engineering GmbH was founded in the year 2006. Today, one of my major targets is to establish Smartspector as a domain for creative scientists, a platform that shall act decoupled from daily business and bullet-proof business plans, but still performing effectively according to economic standards.

With the completion of a new generation of market-ready sensor technology it is now time to provide the next organizational basis for the implementation of this vision: **Smartspector Aurora** is the name of our first commercialized hardware platform. The name stands also for a **new team** concentrating on the development of new business models, projects and sales partnerships for the new technology and **providing our partners with optimal support for our products.**

Dieter Schmidradler, CEO Smartspector artificial perception engineering GmbH



Efficient cooperation for market and innovation



- **Efficient interfaces and clear responsibilities** are determining the interplay of all participants for the sake of optimal performance in customer service and innovation.
- **Strategic cooperations** in local markets ensure an eminent **value add for our partners**.
- Extensive and **regular product trainings** seize profound on-site-support and maximal **customer satisfaction**.
- **Technical specification** is carried out in close coordination **with the engineering team** in order to minimize the risk in new projects. A clear awareness for real-world requirements ensures the **utility of future applications**.

The Aurora team consists of specialists in the following areas:

- Engineering and support
- Marketing und Sales
- PR and public affairs
- Legal and economic affairs

Smartspector: the technology

Smartspector traffic detection and vehicle identification systems have been developed in order to

- *solve pre-existing measuring tasks more efficiently*
- *open up a variety of new fields of application*

To meet above goals, an extreme compact device technique and new, highly effective algorithms have been designed.

Mastering **evaluative motion-analysis** within a compact smart camera, Smartspector is trend setting for traffic sensors of the next generation. With Smartspector's novel approach, the capability to precisely determine the trajectory and the identity of a vehicle within a single sensor has come true.

Each **Smartspector camera system** is based on the new **Pumilio™-technology**. In the stand-alone version with a miniaturized lens and light source, **Smartspector Pumilio™ LPR is the by far smallest fully integrated licence plate recognition (LPR) system in the world**. With only **185 grammes** and a power consumption below 3 watts, the device is capable to analyse **up to 25 pictures per second**. Its outstanding performance even competes with today's most powerful and complex customary systems.



Smartspector Pumilio™ LPR

For unrestricted outdoor-operation we have developed Smartspector Aurora FC-1, an intelligent camera system with unique features in multiple domains:

- **Smartspector Energy-Saving:** *an average power consumption of 4 to 6 watts in temperate and hemiboreal climates is unique in the given field of application. We thereby score with environmental protection and facilitate autarkic applications in the most efficient way.*
- *Specifically optimized algorithms enable acquisition and real-time analysis of **up to 30 pictures per second**.*
- *Aurora is capable to match LPR-results with an **integrated database**: in real-time and with each measuring cycle.*
- *Aurora is equipped with a high quality **hybrid connector**, comprising a power supply, Ethernet, and a digital signal being contacted via a single system cable.*
- *Aurora is capable to directly **interface digital signals**. It indicates detection results via a digital output and accepts digital signals from external sources.*
- *High contrast pictures at different daylight and weather conditions are an essential basis for reliable day and night performance. For this reason, Smartspector Aurora **controls shutter and flash duration with each image acquisition**.*
- *The integrated **infrared flash with its butterfly-construction** (patent pending) having a horizontally widened directional characteristic to enhance illumination within the real field of view.*
- **Smartspector IR-lenses** and **ClearShield® technology** ensure the optimal performance along the entire optical path.

Safe management of confidential data

When designing our systems, we particularly put our focus upon **data protection and data security**. With proven mechanisms that are in well known from electronic banking, Smartspector hinders unauthorized access as well as the manipulation of data on the level of the device.

SVE Toolbox

The aspect of system security was also one of the key requirements for the realization of device administration: **Smartspector SVE Toolbox** supports different user groups to grant **appropriate access levels** for specific users. All security-measures at the device-level are seamlessly extended to the domain of **remote maintenance**.

With the **SVE Toolbox** the user has **all tools and an online compendium** in order to **efficiently administrate Smartspector camera systems**.



SVE Toolbox: Screenshots, German Version



AURORA FC-1

With an average power consumption of apx. 4 ... 6 watt, **SmartSpector Aurora FC-1** is presumably the markets most energy-efficient LPR-system. Pumilio™-technology, SmartSpector Energy-Saving and highly performant algorithms are three major cornerstones for this unequalled overall efficiency.

Many more design elements make Aurora FC-1 a highly valuable and robust sensor-device for a remarkable variety of ITS-systems.

6



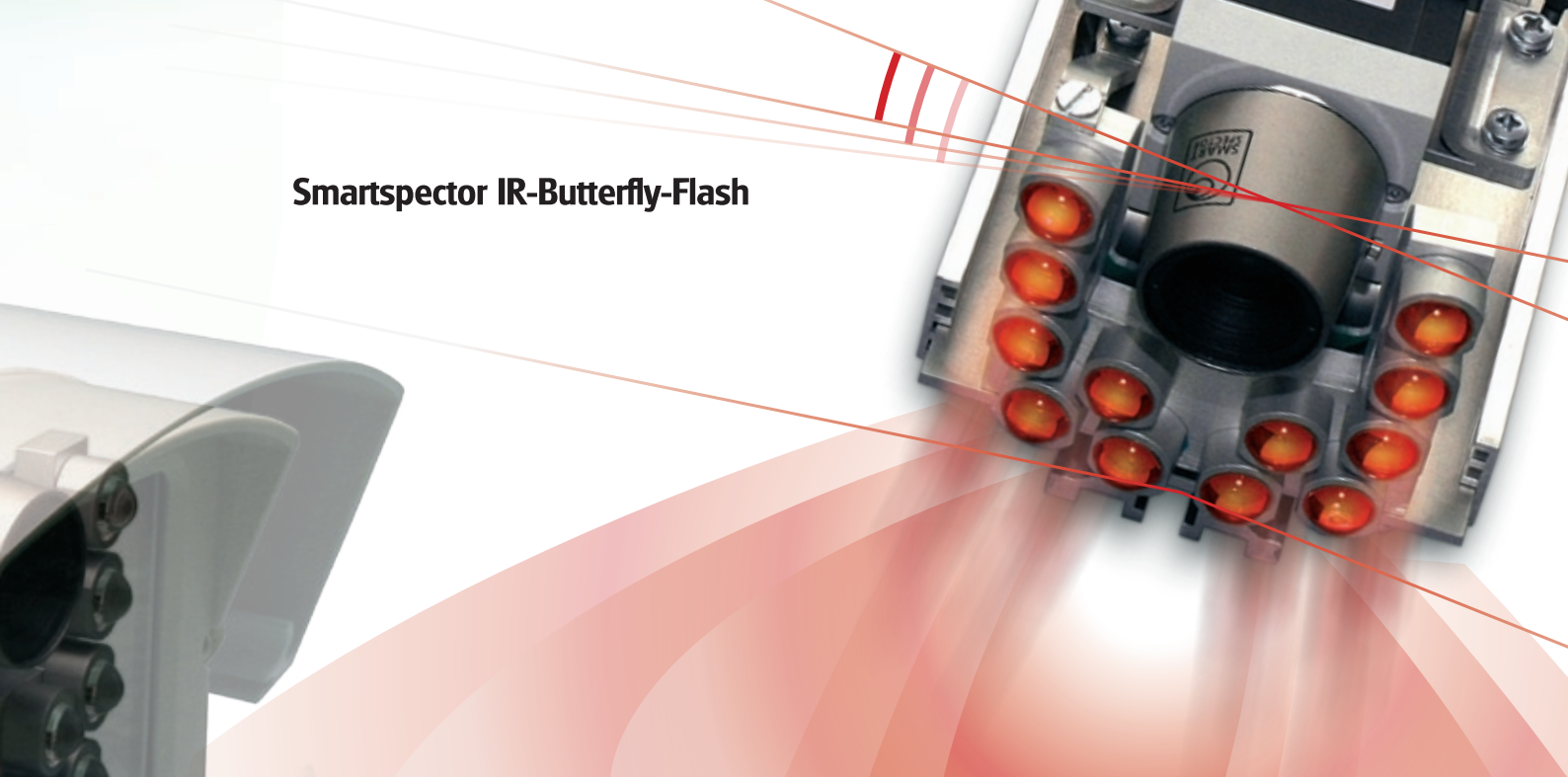
full-size illustration

PUMILIO™ technology

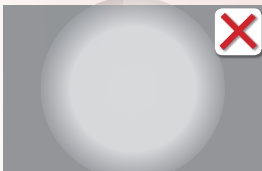
SmartSpector Pumilio™ LPR is the most compact licence plate recognition system in the world.

Pumilio™ is also the core-technology of SmartSpector Aurora. Latest-generation microprocessors, combined with high-quality modules from production and automotive industry have been a solid basis to design Pumilio™ as a highly performant and ruggedized smart camera. Latest CMOS image sensors show a high quantum efficiency in the near IR-range. Above that, the new sensors rule out significant imaging errors from conventional CCD-technology.

Smartspector IR-Butterfly-Flash



Radiation pattern of conventional light sources



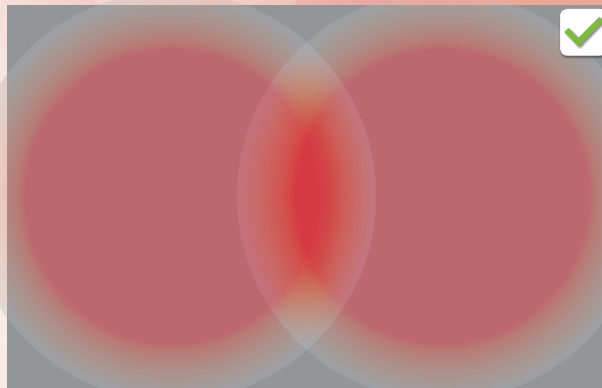
Vignetting: inhomogenous radiation with dark borders



Waste of light-energy:

- lack of overall efficiency
- poor range

Radiation pattern of butterfly-design



- optimal exploitation of available light energy
- mated mechanical layout for particular lenses and LEDs

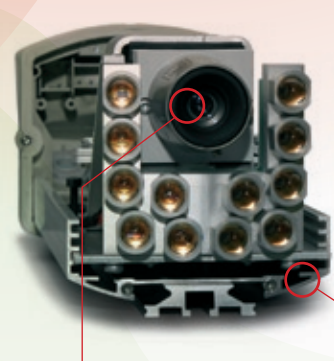


- ClearShield®-technology
- Proven high quality standard camera housing



DIG I/O-connector for interfacing external sensors or PLCs

- Hybrid-connector
- Ethernet
 - supply 24VDC
 - digital output



External flash (option)

Smartspector IR-lenses for best day & night performance

- Ruggedly designed aluminium elements
- No moving parts, i.e. no mechanical wear
- Easy installation

Typical areas of application

Consolidation of passage data across locations

Unlike common traffic detectors, Smartspector Aurora is capable of providing pictorial passage data as a solid piece of evidence and to determine the identity of a vehicle by means of licence plate recognition.

Smartspector cameras derive an anonymous, yet unambiguous signature for each passage. This capability allows for setting up a decentralized sensor network being capable to continuously determine the real flow of traffic:

- *Optimized traffic management and navigation systems rely on actual, up-to-date traveling times.*
- *Complete traffic flow analysis significantly raise the reliability of traffic models.*
- *The use of Aurora technology enables a highly efficient determination of travel time and related speed enforcement (,section control')*



Electronic toll collection, toll stickers, and access management

Today, toll systems and access management systems are mostly based on technologies that require particular devices in the vehicle, toll stickers (vignette), smart card or tickets. The powerful database functionality of Smartspector Aurora brings about new and convenient supplements and alternatives.

Aurora camera systems localize and read the licence plates that are mandatory on vehicles. They are capable to match read results with comprehensive databases (black-lists', 'white-lists') in real-time.

Common plate reading systems usually match a single LPR-result per passage with a database. Smartspector cameras compare every identification per detection cycle with the database and thereby offer a superior matching performance.

Upon black-list or white-list match, Smartspector's camera systems independently signalize the detected passage rating. Based on unambiguous pictures of the passage, the results of the detection are eventually documented in a way as suitable for evidence and by put to archive in accordance with project related privacy protection guidelines.



Steps to the joined success

The live cycle of butterflies is one of the miracles of our world. In the process of a complete metamorphosis, the butterfly develops from a caterpillar to a fully developed imago. Slowly and very concentrated, the butterfly leaves the cocoon. Resting only briefly on the branch, the insect unfolds its goodness and takes off into a stunning world of joy and risks. Evolution over millions of years has been the quiet companion for millions generations of butterflies.

Our system has been developed in a comparably unlasting work with the purpose of creating an intelligent and flexible camera system based on newest technologies. Not to be a flash in the pan, but a product that establishes essential innovation in our target market. It is a step in technical evolution with respect to compactness, stability and function.

The time of pupation is behind us, a system that was sufficiently tested enters the market now. We spread our wings and we are ready to fly.

In the 60ies, Edward N. Lorenz inferred from weather models, that even slightest differences in the initial state of complex systems lead to unpredictably big changes. Our target is to show innovative technical possibilities with our smart cameras and, together with our partners, to contribute to the improvement of traffic management systems.

If you are interested in our technology, if you want to enter markets together with us or if you want to satisfy your customers together with us with particular products, there is one important question:

Do you want to flap away with us?

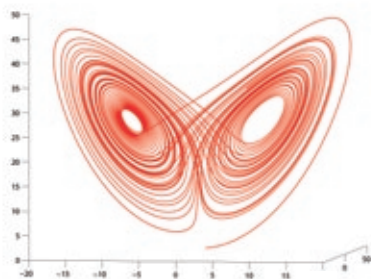
We focus on strategic partnerships. By means of a long-term success oriented strategy, we aim at concerted markets, projects and satisfied customers.

In the center of our cooperation there is mutual respect, a jointly defined cooperation based on trust and a well-grounded common knowledge-base.

Strategic partnerships are welcome in the following areas:

- *Sales partnership*
- *System integration*
- *Project cooperation*

Are you interested? We are happy to get in touch with you! →



Lorenz Attractor

In 2002, Warwick Tucker proved that the renowned Lorenz equations possess a strange attractor. By doing so, he delivered a conclusive evidence for Edward N. Lorenz' ,butterfly effect'.

The Lorenz Attractor was one of Smale's problems, a list of 18 challenging mathematical problems for the 21st century.

Each butterfly changes the world.



SMARTSPECTOR® AURORA
Sonnenhofgasse 6/14
A-1050 Wien

Telefon: +43 (0) 664 8559 281
E-Mail: office@smartspector.com
Internet: www.smartspector.com