

PROJECT PROFILE

CAT120

Improved image-capture technology will enhance digital broadcast, security/surveillance and multi-spectral imaging [CISTERN]

Deploying advanced image-capture technology, CISTERN will deal with societal and technological needs in such areas as broadcast and entertainment, civil security and surveillance, and analytical applications in food and agri-food.

Image capture is a generic technology that is used in several key business applications – like digital lifestyle (broadcast and entertainment); high-end security and surveillance; and multi-spectral imaging for food sorting and agricultural mapping to improve production quality and productivity. Considering that these are crucial to European industry, there is, of course, a need to remain on the cutting edge through joint R&D and optimisation of such technologies as optics, image capture and video processing.

Aiming for enhanced advanced image capture

The CISTERN project responds to these demands by improving the performance of advanced image-capture systems (imagers), such as time-of-flight cameras, high-resolution/high sensitive and hyper- and multi-spectral security cameras, and broadcast cameras. Crucially, improved image quality allows for the extraction of more detailed information and a wider range of applicability. In particular, CISTERN prototypes complementary metal-oxide semiconductor (CMOS) sensors for each application domain, which will be subsequently demonstrated together with sensor-related processing. (CMOS is a technology used in constructing integrated circuits.)

All this translates into the following project objectives:

- To develop CMOS imager sensors with improved performance, functionality and spectral sensitivity for ultra-high definition television (UHDTV) and time-of-flight for broadcast, entertainment and security applications;
- To develop real-time image-processing techniques needed to improve the quality of the digital output signal of the sensor demonstrators;
- To develop and demonstrate the capability to produce multispectral imagers by the hybridisation of multispectral filter arrays on top of the CMOS sensor. Both matrix filters and hybrid assembly process will be developed;

- To demonstrate the improved performance of the CMOS imagers combined with related processing in a number of demonstrators;
- To develop and demonstrate an integrated camera lens-assembly (CLA) for UHDTV security applications based on an off-the-shelf zoom lens originally designed for high-definition television (HDTV) systems;

This will result in the following breakthrough innovations (and deliverables):

- For security: UHD image sensors with four times more resolution, integrated with a zoom lens and image processing to improve image quality. Through smart integration and the use of digital image processing, the CLA will deliver UHDTV performance with lower size, weight, power and costs than a full UHDTV solution;
- For broadcast and security: UHDTV-resolution CMOS sensor with rolling and global shutter function in 2.5µm pixel. In addition, a higher frame-rate for better motion portrayal; a wider colour gamut for better colours; and a dynamic range of up to 800% video for better contrast. Pixel attenuation functionality and pixel-area temperature sensing are new;
- For broadcast and security: high performance 320k time-of-flight imager, resulting in four times more lateral resolution and increased depth resolution for future 3D broadcast and security applications;
- For multispectral imaging: a new technology to produce multispectral sensors by hybridisation of a CMOS sensor and a multispectral filter at the pixel scale. This technology is developed to offer a high flexibility in multispectral configurations for small production volumes;
- For food and agri-food processing: deploying the multispectral camera in key areas: normalised difference vegetation index (NDVI) mapping measurement; dry-matter measurement in feed; and fat measurement in soybean.

PROJECT CONTRIBUTES TO

- ✓ Communication
- ✓ Health and aging society
- ✓ Safety and security
- ✓ Energy efficiency
- ✓ Digital lifestyle
- ✓ Design technology
- ✓ Sensors and actuators
- ✓ Process development

PARTNERS

Grass Valley
 Adimec
 SoftKinetic Sensors NV
 Delft University of Technology
 University of Burgundy

COUNTRIES INVOLVED

-  The Netherlands
-  Belgium
-  France

PROJECT LEADER

Klaas Jan Damstra
 Grass Valley

KEY PROJECT DATES

April 2015 - March 2018

Good for Europe

As previously mentioned, Europe has a strategic interest to remain at the forefront of image capture. This is due to the diversity of applications that support many key industries in Europe, which in turn have export markets beyond Europe. Similarly, the industrial partners in the project all have significant export markets outside Europe with their respective image capture and related technologies. This project supports the competitive power of the related European industry sectors, and CISTERN also sees these deliverables as a way of addressing societal needs, a key project objective.

Importantly, CISTERN targets small- and medium-sized enterprises, together with corporations and research institutes, all important players in their respective markets and research fields. However, individually they simply lack the critical size to independently develop or adapt the plurality of technologies needed in professional image-capture applications. This is where CISTERN comes into its own: it can deploy its technologies, products and expertise, but also leverage its contacts and people network.

Impacting lifestyle, security and food sectors

This project is expected to play an important role in securing Europe's competitiveness in these markets, where demand is substantial and growing in some of these markets. The broadcast and digital cinema markets are driven by UHDTV and by the reduction in capital expenditure. The main growth areas are Asia-Pacific, Latin America and Russia. For example, outside broadcast is annually good for US\$ 88m and studio cameras US\$166m, and for digital cinema high-end zoom lenses, US\$200m.

Depth-based gaming is driven by close-range imaging and higher-resolution augmented reality. In addition to hardware sales (sensors and cameras), income is expected from licences connected with feature detection in depth images. Growth areas include the USA and Asia-Pacific.

The security industry is still developing different technologies to provide improved picture quality: HD, full HD and even UHDTV. Image sensor breakthroughs and related software have improved camera performance in extreme-light or low-light environments. Along with technological advancements, work on boosting user-friendliness is underway. Greater interoperability, ease of installation, and efficient network transmission for seamless streaming will also be addressed.

And the internet-protocol (IP)-based video surveillance market is expected to grow rapidly, at a CAGR of 24.2% during the forecast period from 2013-2019. Growing installations of IP cameras, together with the need for surveillance cameras with better video quality, is driving the demand for IP-based video surveillance systems globally. Among end-user application areas, the transportation segment, which comprises city surveillance, public transits and highways, is the largest segment. It accounted for around 15% share of the total market in 2012, and is expected to grow at a CAGR of 21.2% during the forecast period 2013-2019. Other important application areas for video surveillance include residential, retail, hospitality, stadiums, and healthcare.

Finally, multispectral/hyperspectral technology is very active in food and agri-food. These markets are currently limited because commercially available products are expensive, with high footprints or only well-suited in a lab environment. However, they are expected to grow at a significant rate as soon as small footprint, light and low-cost multispectral imagers become available.

