Project result

Cluster for Application and Technology Research in Europe on NanoElectronics

CA308 | Project delivers crucial imaging technologies [ICAF]

image capture of the future

Addressing future imaging requirements, the project ICAF researched, developed and demonstrated some key image capture, processing and transmission technologies. Launched in 2011, the project ICAF achieved major advancements in image capture technology and systems to further increase automation in high added-value production processes, state-of-the-art security systems, as well as, in the traffic and automotive areas. Of course, remaining at the forefront of image capture, transmission and processing is crucial for European businesses – especially ICAF's industry project partners – considering the range of applications that support important industries in Europe, which in turn have export markets beyond Europe.

Delivering state-of-the-art imaging elements and applications

ICAF researched, developed and demonstrated advanced image capture, processing and transmission technologies. The first set of deliverables in silicon development produced five chips:

- Image sensor test vehicle to test out the architecture and new intellectual property (IP) blocks (reusable, tested product-design outcomes which can increase design efficiency and quality);
- Three pixel-test chips used to evaluate over 1,500 different pixel variants to significantly improve noise and dark current;
- CoaXPress (an asymmetric, high-speed and coaxial serial communication standard) transceiver chip, which enables communication of up to 12.5Gbps per link (further improvements to increase the cable length are ongoing).

The next set of deliverables included algorithms and processing IP blocks needed for single lens 3D, increased pixel-rate image capture and a video over internet protocol for professional broadcast purposes. These comprise:

- Algorithms for improving the quality of video streams captured by professional 2D/3D cameras as in HDTV broadcasting and surveillance applications;
- Methods for depth-map generation;
- Single lens 3D micro-stereopsis algorithms;
- Improvements in JPEG 2000 compression for the Broadcast Profile standard that increases the efficiency of the code-stream;
- Video over internet protocol IP blocks to be reused in video over internet protocol applications.

ICAF also delivered four key applications that demonstrate and validate:

- Real-time single lens 3D image capture for professional broadcast: depth image-based rendering (DIBR) is added to the single lens 3D camera system, based on the newly developed stereo algorithms. This will allow the dual HD stream generated by the camera system to be absorbed in real-time through a frame grabber in the PC platform;
- Video over internet protocol transmission: which allows an uncompressed stream between a video camera to a base station on a 10G Ethernet fibre link;
- Machine vision (MV) camera platform for 3D

Partners:

Adimec Advanced Image Systems
Axon Digital Design
Delft University of Technology
EqcoLogic
intoPIX
Ghent University
Grass Valley Cameras
Hasselt University
ON Semiconductor Image Sensor

Project leader:

Jochem Herrmann
Adimec

Key project dates:

Start: October 2011
End: September 2014

Countries involved:

Belgium
The Netherlands

Project website:

http://www.icaf.tv/

PROJECT CONTRIBUTES TO

Communication	✔
Automotive and transport	✔
Health and aging society	✔
Safety and security	✔
Energy efficiency	
Digital lifestyle	✔
Design technology	✔
Sensors and actuators	✔
Process development	
Manufacturing science	✔
More than Moore	
More Moore	
Technology node	90nm; 180nm

metrology: used to test and evaluate the silicon developed in the project; together with camera hardware, high-speed processing and interfaces, as well as, frame grabbers to grab images for processing in MV applications;

- Security/surveillance camera platform and three multi-head camera systems: to test and evaluate the silicon developed in the project.

Commercially successful

Project deliverables will not only lead to the manufacturing partners producing new revenue-generating products, but they will also create intellectual property in the form of patents and innovative techniques and technologies. In concrete commercial terms, ICAF's R&D work (which won three awards) resulted in the first 3D single lens stereopsis camera and the first HDTV slow-motion, triple-speed camera that can continuously output a slow motion stream, together with a normal HDTV stream.

The project also introduced the next-generation CoaXPress transceiver solutions, and produced the first rugged surveillance camera using this standard. New methods, techniques and standards (for example, in video compression and automatic transformation of 2D images into 3D) will go a long way in strengthening Europe's position in state-of-the-art, high-speed and industrial imaging.

Important spin-offs as well

ICAF also has some less obvious, yet notable, benefits. Machine vision cameras in 3D media production and immersive internet interaction, for example, could enhance quality of life. Increasing use of 3D in machine vision applications could lead to research in image sensor and processing architectures for applications, such as automated optical inspection in electronics manufacturing. This will result in the next generation of technologies for cost-effective 3D metrology and inspection systems.

Furthermore, some of the technology demands in areas ICAF focused on could equally apply to other fields, such as automotive, which also need cameras for improved safety (distance monitoring, pedestrian detection, sleep detection and airbag control are just some examples). There is also a rapidly developing market for automated surveillance for use in the care of the elderly, an area of concern that address demographic trends.

Effective European collaboration and resources well spent

Importantly, ICAF was a European effort. Its nine-partner consortium comprised six European advanced-manufacturers and three European universities, all with specialist knowledge and experience in the new technologies and efficient use of synergies between these technologies. This consortium researched and developed key methods, intellectual properties, applications and products, while contributing to important standards, generating two patent applications and earning some five awards. The project has also been showcased at all relevant trade shows, and in papers presented at several conferences.

All this will not only benefit the project partners, but also business, consumers and research in Europe and beyond. After all, the industry project partners are important players in their respective European (and worldwide) markets. Products that incorporate results of the ICAF project are manufactured within Europe and shipped worldwide. Moreover, researchers and scientists at the three participating universities will ensure the knowledge and experience gained will be widely shared and productively used.

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