PRESS

FOR IMMEDIATE RELEASE:

From image to vision: when software disrupts hardware

Extracted from: Embedded Image and Vision Processing report, Yole Développement, November 2017

LYON, France – November 21, 2017: Vision systems are becoming increasingly important and under this context, Yole Développement (Yole) the "More than Moore" market research and strategy consulting company investigated the software world to analyze the tight links between embedded software and hardware at the technology and market levels. A new report titled Embedded Image & Vision Processing has been released this month by Yole's team. A detailed description is available on i-micronews.com, imaging reports section.

According to Yole's analysts, software for vision system applications can be divided in two market segments.

The first segment image processing, very close to the hardware, inscribed inside standalone FPGA[1] or ASIC[2] chips, or integrated into more complicated architectures.

"This layer, not often considered, is the most important step in any image treatment after image acquisition by pixels," comments **Yohann Tschudi, Software & Market Analyst at Yole Développement**. And he adds: *"Image processing, realized in the ISP[3], has a quite simple function: the transformation of the sensor's signal to an understandable image for the human eye."*

The second layer is completely different, with much more diverse and complicated functions. Under its new report, Yole focused on embedded software and, more precisely, inference software derived from the latest AI[4] methods. This kind of technology necessitates a lot of memory and computing power.

What are the software technologies? How do they impact the hardware? Which hardware is impacted? What kinds of markets are affected? And how will they evolve? Yole's analysts offer you to discover the embedded software industry and its impact on the hardware side in vision systems at the technology and market levels.

AI has completely disrupted hardware in vision systems, and has had an impact on entire segments, like Mobileye has in automotive, for example. Image analysis adds a lot of value and image sensor builders

---

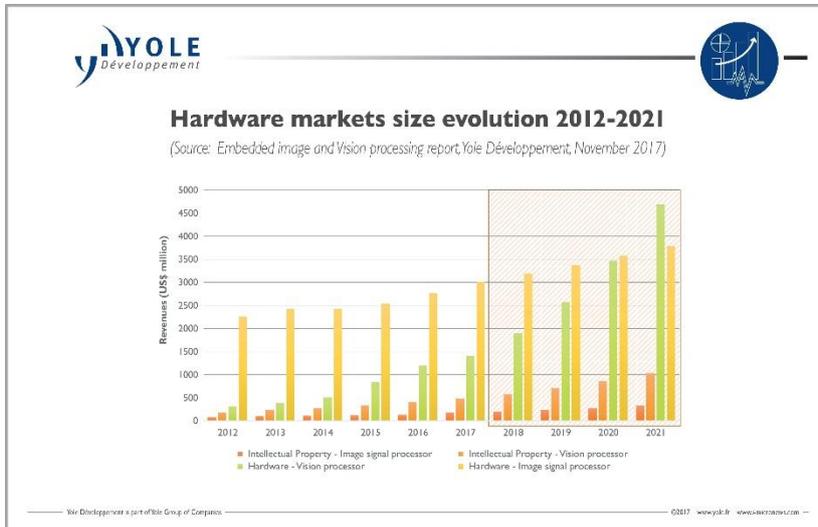[1] FPGA : Field Programmable Gate Array
[2] ASIC : Application Specific Integrated Circuit
[3] ISP : Image Signal Processor
[4] AI : Artificial Intelligence

are therefore increasingly interested in integrating a software layer to their system in order to capture it. Today, image sensors must go beyond taking images – they must be able to analyze them. However, to run these types of software, high power computing and memory are necessary, which led to the creation and development of vision processors. ISP[5] market offers a steady CAGR[6] of 6.3%, making the total market worth US$4,400 million in 2017. Meanwhile, the vision processor market is exploding, with a 30.7% CAGR and a market worth US$653 million in 2017!

Hardware markets size evolution 2012-2021
(Source: Embedded image and Vision processing report, Yole Développement, November 2017)

Today, optimization requires software and hardware to be developed in parallel. Depending on the issues and specifications, companies can invest more in hardware than software or vice versa. However, software is easier to specify, tune and update, and so its growth is more important than hardware. The AI market is therefore expected to reach US$35 billion in 2025 with an estimated CAGR at 50% per year from 2017-2025.

"At Yole we carefully evaluates ISP and vision processor market shares and their evolution in order to correctly understand how AI technology impacts the hardware", explains Yohann Tschudi from Yole. This market has been divided in two different business models: IP[7] companies, which don't have physical products, and hardware companies, which sell the processors physically. The leaders are pretty easy to identify for each category. ARM and Synopsys lead the IP segment and Omnivision, Mobileye and On Semiconductor lead the hardware segment.

The AI market, particularly in vision systems, is new and still moving, with hundreds of startups created each year. It has no clear leaders but a lot of highly specialized companies.

AI technologies promise a bright future in many areas, with rapid software and hardware progress. In autonomous vehicles, AI allows cars to understand the world around them, predict trajectories, communicate and drive. This has led to the development of sensor fusion boards. For example, NVidia's Drive PX boards provide very high performance computing and memory, giving the ability to compile

---

[5] ISP : Image Signal Processor
[6] CAGR : Compound Annual Growth Rate
[7] IP : Intellectual Property

information from many completely different sensors. In surveillance and security, face and iris recognition have never been as powerful, entering the consumer world through the iPhone X this year, and behavior recognition is on track. More information: How is AI propelling the hardware market to new heights in vision systems? (Source: i-micronews.com, Nov. 2017)

AI is very exciting for the entire area of vision systems. Yole's report is showing the importance of technologies evolution and its impact, and how companies should adapt their strategies. AI is in vision systems, from technology to market. To discover in detail the content of this report, visit i-micronews.com website, imaging reports section.

ABOUT THE REPORT:

Embedded Image and Vision Processing

From algorithms included in the image processing pipeline to neural networks running in vision processors, focus on the evolution of hardware in vision systems and how software disrupts this domain. - Produced by Yole Développement (Yole) part of Yole Group of Companies.

Companies cited in the report:

Algolux, Amazon, Altek, Ambarella, AMD, ARM, Apple, B-Secur, Biowatch, CEVA, Canon, Chips&Media, Cognitec, Delta ID, Ergoneers, EyeLink, Eyesmart Technology, Eyetech, Face++, Facebook, Fotonation, Google, IBM, Intel, Imagination, Irisys, Iritech, ISCAN, Kairos, LC Technologies, LG, Microsoft, Mobbeel, Mobileye, Movidius, Nec, Nextchip, Nvidia, NXP, Omnivision, ON Semiconductor, OpenCV, Parrot, Pixelworks, Princeton Identity, Qualcomm, SensorMotoric Instruments... Full list

Author:

As a Software & Market Analyst, **Dr. Yohann Tschudi** is a member of the MEMS & Sensors business unit at Yole Développement (Yole). Yohann is daily working with Yole's analysts to identify, understand and analyze the role of the software parts within any semiconductor products, from the machine code to the highest level of algorithms. Market segments especially analyzed by Yohann include big data analysis algorithms, deep/machine learning, genetic algorithms, all coming from Artificial Intelligence (IA) technologies.

After his thesis at CERN (Geneva, Switzerland) in particle physics, Yohann developed a dedicated software for fluid mechanics and thermodynamics applications. Afterwards, he served during 2 years at the University of Miami (FL, United-States) as a research scientist in the radiation oncology department. He was involved in cancer auto-detection and characterization projects using AI methods based on images from Magnetic Resonance Imaging (MRI). During his research career, Yohann has authored and co-authored more than 10 relevant papers.

Yohann has a PhD in High Energy Physics and a master degree in Physical Sciences from Claude Bernard University (Lyon, France).

ABOUT YOLE DEVELOPPEMENT – WWW.YOLE.FR

Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide covering MEMS and image sensors, Compound Semiconductors, RF Electronics, Solid-state lighting, Displays, software, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The "More than Moore" market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business. . For more information, visit www.yole.fr and follow Yole on LinkedIn and Twitter.

▪ Consulting & Financial Services: Jean-Christophe Eloy (eloy@yole.fr)
▪ Reports: David Jourdan (jourdan@yole.fr)

Yole Group of Companies - Press Relations & Corporate Communication: Sandrine Leroy (leroy@yole.fr)

###