IMAGING FOR AUTOMOTIVE 2019

Market & Technology Report - June 2019

Paramount to the future of safety and autonomy, the automotive imaging market is at a key crossroads.

## AUTOMOTIVE HAS BECOME A KEY MARKET FOR IMAGING TECHNOLOGIES

Cameras are now standard equipment for automobiles, with 124M image sensors shipped in 2018. Automotive camera modules have reached $3B and are expected to grow at an 11% CAGR, reaching $5.7B by 2024.

Over the past five years, viewing applications have been at the core of market growth - with rearview, surround-view, and black box becoming ubiquitous. Advanced Driver Assistance Systems (ADAS) cameras, which currently represent 40% of the business, will provide additional growth for years to come thanks to growing adoption rates.

Formerly considered as a secondary market for imaging companies, automotive is now central to every key player's strategy: firstly because revenue and volume have reached a significant level even when compared to mobile, and secondly because of artificial intelligence's (AI) far-reaching impact, which powers ADAS.

As the first full-scale edge computing application, imaging for automotive has positioned itself as a key "center of gravity". Imaging technologies are transitioning from imaging to sensing applications. This second Imaging for Automotive report from Yole Développement presents an all-new picture of an industry where AI-powered vision computing provides additional momentum to various applications and technologies.
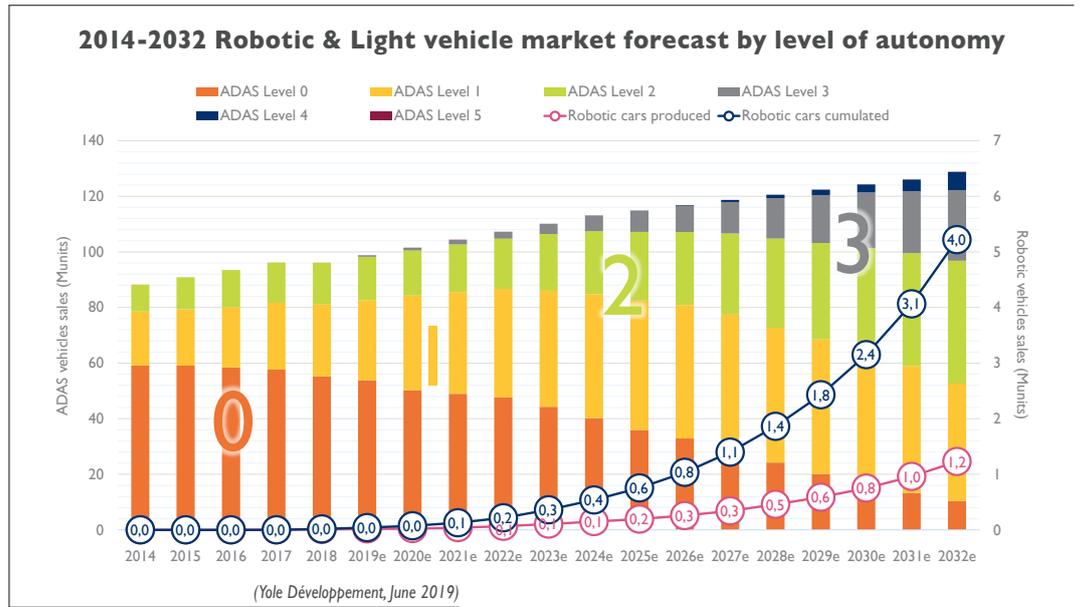

(Yole Développement, June 2019)
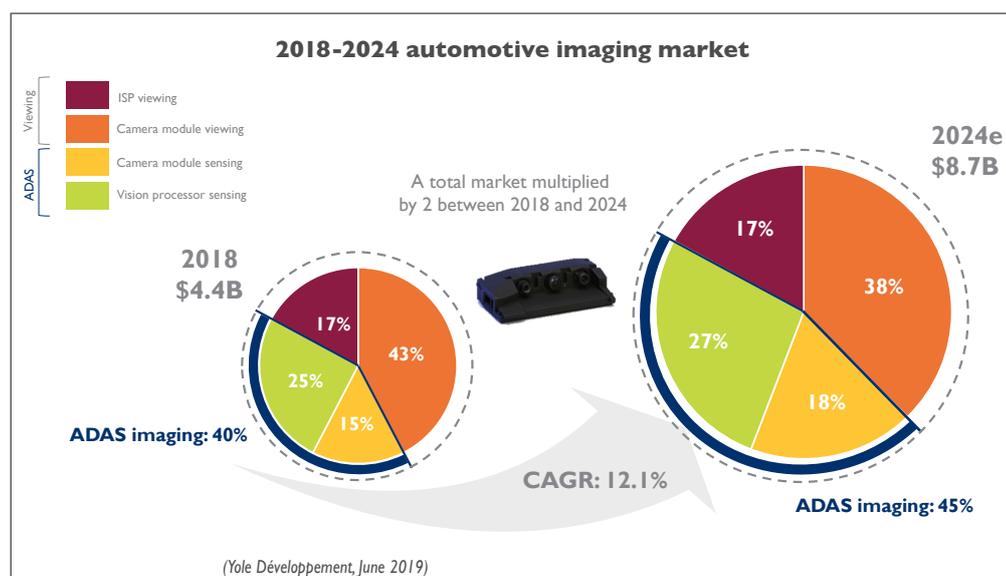
AUTOMOTIVE IMAGING MARKET PLAYERS ARE THRIVING

Over the past decade, the ecosystem has gradually structured itself according to traditional OEM and Tier-1 links. Nevertheless, automotive imaging's impact has been tremendous, with mega-merger & acquisitions (Mobileye, TRW, Wabco, Harman) revolving around the topics of ADAS and autonomous driving (AD).

Interestingly, the eruption of imaging in automotive has not fully benefit big incumbents like Bosch, Denso, Sony, and Samsung, which now must double their efforts in order to get back in the game. Intel and Sony will certainly use their respective strength and #1 overall position to gain market share in automotive, but already-established players like ON Semiconductor, and Omnivision definitely have an edge in this conservative, price-sensitive market.

The biggest difficulty ahead for the industry is the transition to AD, with the steepest step to climb being the transition to Level 3 autonomy. In this respect, the knowledge some players may gain from robotic vehicle approaches should become a key asset in the ongoing market-share battle. Also, new companies offering innovative imaging approaches will have a window of opportunity before 2025.

2014-2032 Robotic & Light vehicle market forecast by level of autonomy

*(Yole Développement, June 2019)*

Today's image processing approach is to use "brute force" computing to solve deep learning algorithms "on the edge". Image sensors serving the current paradigm already offer far superior resolution, frame rate, and dynamic range than even the latest supercomputing chips can process. For this reason, the industry is seeking the next AI paradigm to fully deliver on AD's promises. No doubt there will be more "Mobileye success stories" to come.

NEW FUNCTIONALITIES AND NOVEL TECHNOLOGIES ARE TRANSFORMING THE ENTIRE INDUSTRY

Automotive applications used to be straightforward: rearview cameras and forward ADAS cameras, for the most part. But the situation has changed dramatically and the technological consequences may prove dramatic as well. For example, on the viewing side of the market, surround-view cameras crave expansion in lower-end markets, which should change the number of ISPs. Then there are the mirror replacement cameras, also called "e-mirrors" requiring anti flickering and HDR. That is why technical performance should far transcend the current viewing cameras.

On the ADAS side of the market, the in-cabin application is being highly scrutinized by many CIS players, mostly pushed by regulations. Moving forward, market acceptance will be interesting to monitor. The big question for reaching Level 3 autonomy is the technology selected for ADAS surround cameras. Data overload is obviously around the corner, and high performance computing approaches, i.e. using a 144 Tops ASIC (such as the FSD from Tesla) will not be possible or preferred for every OEM.

Automotive imaging – Device & technology segmentation

(Yole Développement, June 2019)
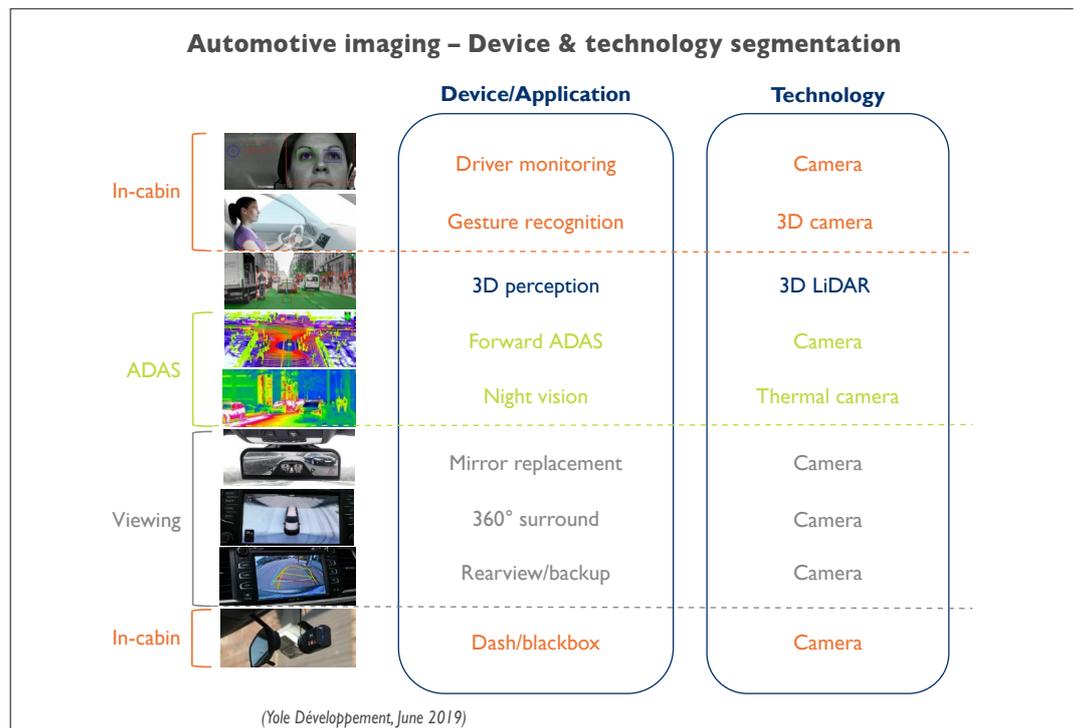
A new technology paradigm is brewing, but typical of automotive technology's slow rate of introduction, it could take 3 - 5 years to manifest. The industry's future is at sake at a time when autonomous driving is often dubbed as "still distant". Of course, this chatter may just be a disinformation scheme to disguise a forthcoming radical transformation of the worldwide transportation business model. However things unfold, imaging technology will be at the center of transformation.

REPORT OBJECTIVES

- Provide market data on key automotive imaging metrics and dynamics
- Deliver an in-depth understanding of the automotive camera value chain, infrastructure, and players
- Present key technical insight and analysis regarding future technology trends and challenges

AUTHORS

Pierre Cambou has been part of the imaging industry since 1999. He first took several positions at Thomson TCS, which became Atmel Grenoble in 2001 and e2v Semiconductors in 2006. In 2012 Pierre founded Vence Innovation, later renamed Irlynx, to bring to market an infrared sensor technology for smart environments and interactions. He has an Engineering degree from Université de Technologie de Compiègne and a Master of Science from Virginia Tech. Pierre also graduated with an MBA from Grenoble Ecole de Management. In 2014 he joined Yole Développement as Imaging Activity Leader.

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