Global Auto Industry Conf, Deutsche Bank

Dan Galves, Sr VP – Communications, Mobileye

January 17, 2018
This presentation occurs during Intel’s “Quiet Period,” before Intel announces its financial and operating results for the fourth quarter of 2017. Therefore, presenters will not be addressing fourth quarter information during this program.

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Computer Vision Expertise
Strateg
ey

Philosophy: a single effort

Level-4/5 Automation derivatives L2, L2+, L3

Economical Scalability

- Automating HD-maps through a crowdsourcing approach
- Controlling the explosive computational demands of Driving Policy (Planning)
- Scalable, workload-diverse and low-power SoC together with powerful ATOM CPU

Model for Safety Guarantees

- Decouple Sensing from Planning mistakes that could lead to an accident
- RSS - a formal model of the human judgement of common-sense of Planning
- Using RSS to provide safety guarantees
New Design Wins 2017

Nearly 70 vehicle models, 27 OEMs, 30 design wins
(in 2016 there were 12 design wins)

<table>
<thead>
<tr>
<th>Main Features</th>
<th>Main Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEB EUNCAP 2018, LDW</td>
<td>AEB, LDW</td>
</tr>
<tr>
<td>AEB, ACC, LKA</td>
<td>AEB, LDW, ACC</td>
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<tr>
<td>AEB, VOACC, LKA</td>
<td>AEB, ACC, LKA</td>
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<tr>
<td>AEB EUNCAP 2020, Traffic Jam Assist, Road Profile</td>
<td>AEB, ACC, LKA</td>
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<tr>
<td>AEB, ACC, LKA, FreeSpace</td>
<td>AEB, ACC, LKA, TJA</td>
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<tr>
<td>AEB, LKA</td>
<td>AEB, ACC, LKA, Lane Changes</td>
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<td>AEB, ACC, FreeSpace, Road Edge</td>
<td>AEB, LDW, ACC</td>
</tr>
<tr>
<td>AEB, ACC, LKA, TSR</td>
<td>AEB, LKA, ACC</td>
</tr>
<tr>
<td>Base: L2/3 premium: L3/4</td>
<td>AEB, ACC, LKA, Lane Changes</td>
</tr>
<tr>
<td>AEB, VOACC, Glare Free HB, 3D VD, REM</td>
<td>AEB, LDW, ACC</td>
</tr>
<tr>
<td>AEB, pedal confusion, Enhanced LKA</td>
<td>AEB, LDW, ACC</td>
</tr>
<tr>
<td>AEB EUNCAP 2020, Traffic Jam Assist, Road Profile</td>
<td>Full EUNCAP2020 compliance, 3D VD, FreeSpce, Objects</td>
</tr>
<tr>
<td>AEB, LDW</td>
<td>AEB, LKA, ACC</td>
</tr>
<tr>
<td>AEB EUNCAP 2020 &amp; NHTSA, Road Edge, REM</td>
<td>L3, surround, Road Profile, REM</td>
</tr>
</tbody>
</table>

24M EyeQs shipped to date
2018 Program Launches

15 programs to be launched during 2018 (vs 6 launches in 2017)
- 14 OEMs (4 of which are Chinese)
- 4 programs with EyeQ4 (12 additional launches starting from 2019)
- ALL programs have full-feature bundles (high-end)

New features launched in 2018
- 3DVD
- Traffic Lights Detection and Recognition
- Advanced Road features: Semantic Free Space, Holistic Path Prediction
- REM
Recent News

• Pushing the Technology Forward in 2018
  – Road Experience Management launch
  – Integrated, super-efficient compute platform (2x EQ5 plus 1x Atom)
  – 100 Vehicle Fleet. 12 Cameras + 6 Radar + 6 LIDAR + RoadBook

• REM Expands to China and to Aftermarket
  – REM agreements with SAIC and NavInfo. L4/L5 with SAIC.
  – EyeQ4-enabled Aftermarket product for data collection

• Bringing Near-term Value to Customers and Consumers (L2+ / L3)
  – 11 Design Wins with OEM’s at cumulative >50% market share
Strategic Value of REM

Leveraging ADAS
- Introduce REM software on EyeQ for front-facing cameras (leverage existing real-estate in the car)

Leveraging Crowd-sourcing
- Bandwidth of data from car to cloud is very low \(~10\text{kb}\) per kilometer of driving

Automation
- The process for creating and updating maps is automatic.

Density of data sources
- Volume of ADAS-enabled vehicles enable very low “time to reflect reality” everywhere, rather than merely in “geo-fenced” neighborhoods.

REM introduces highly scalable “live” HD-map at low-cost
RB data projected onto image space. Road edge, lane marks, lane center, landmarks (in Yellow).  

RB data projected onto Google Earth.
REM 2017 Achievements

- Preparing harvesting for 2018 production programs (BMW, Nissan, VW)
- Preparing RB covering all Japan highways in cooperation with Zenrin and Nissan
- Cooperation with NavInfo and SAIC for bringing REM to China
- Deals ongoing with OEMs for Harvesting 2019 and beyond
- Deals ongoing with OEMs for RB usage for L2+ (new ADAS category)
- Aftermarket “Mobileye 8 Connect” REM supported and deals for 2018 deployment
- Mapping neighborhoods across the globe for supporting internal L4 development as a turn-key solution
REM already being built in Japan

Mapping of Japan highways - with Zenrin/Mapbox/Nissan for L3 launch in 2019
## Deals that have been signed with REM deployment

<table>
<thead>
<tr>
<th>Partner</th>
<th>City</th>
<th># of Vehicles</th>
<th>Goal</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>KoMoD Research Project (Germany Ministry of Transport)</td>
<td>Dusseldorf, Germany</td>
<td>750</td>
<td>Prepare the city for smarter &amp; safer driving</td>
<td>Q1</td>
</tr>
<tr>
<td>Gett</td>
<td>London</td>
<td>500</td>
<td>Map City of London</td>
<td>Q2</td>
</tr>
<tr>
<td>Buggy</td>
<td>New York</td>
<td>2,000</td>
<td>Map City of New York</td>
<td>Q3</td>
</tr>
<tr>
<td>Road Safety Authority DGT (Directorate-General of Traffic) – Spain</td>
<td>Undisclosed, Spain</td>
<td>~5,000</td>
<td>Make Spain Autonomous Ready™</td>
<td>Q2/3</td>
</tr>
<tr>
<td>Guard Insurance</td>
<td>Across the US</td>
<td>1,000-2,000</td>
<td>tow trucks</td>
<td>Q3</td>
</tr>
</tbody>
</table>
REM enables ADAS 2.0 (L2+ / L3)

Front-facing camera + Roadbook enables a leap in ADAS L2 features (LKA/ACC).

Sensing alone (righthand image) cannot robustly detect the drivable path to enable safe hands-free control. The Roadbook data can bridge the gap as localization is based on a high degree of redundancy of landmarks and is therefore robust.
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EyeQx Family: Terra OPs/W

**EyeQ3**
4 x VMP + 4 x CPU, a 40nm, series prod since 11/2014

*0.25 TOPs @ 3W*

**EyeQ4H**
6 x VMP + 2 x PMA + 2 x PMC + 4 x CPU, 28nm, series prod from 3/2018 launches by 4 OEMs in 2018, 12 OEMs in 2019 and onwards

*2.5 TOPs @ 6W*

**EyeQ5H**
7nm, 1st silicon 8/2018, series prod from 3/2020 design wins by 4 OEMs from 2020 and onwards.

*24 TOPs @ 10W*

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**Nvidia Parker:**
1.5TOPs / 15W

**Nvidia Xavier:**
30TOPs / 30W
Harnessing The Power of Intel

EyeQ5 → Intel → EyeQ6 w/ Atom

open to 3rd parties as an “open compute” platform with SDK and Libraries

Solution Architecture

SENSE
EyeQ5® (Vision + REM)

PLAN
EyeQ5® (Fusion & Policy)

ACT
Intel Atom® SoC

Fleet
Intel → 100 vehicles for testing, data collection, validation and customer support

Data Center
Intel → 250Pb for supporting Fleet, validation and customer support

Fail Operational Channel

To actuators

Cameras/sensors

Radar/LIDAR

Intel

An Intel Company
Partnerships

L3 Production (series development) 2019+

- Audi, BMW, Fiat-Chrysler, Honda, NIO, Nissan, SAIC

L4 Production (strategic partnerships) 2020+

- BMW, Fiat-Chrysler, SAIC, NIO
- 3 x OEMs ongoing sourcing decisions

L4 Turnkey solution

- CSLP platform with Delphi (Aptiv)
- Intel/Mobileye internal fleet of 100 vehicles ramping up throughout 2018
Master Plan 2018

**L4 partnerships**
- Turnkey solution: perception, driving policy, safety, MDC prototype (2 x EQ5+Atom) - platform derived from the 100-car fleet.
- Perception turnkey (EQ5) whereas Fusion, Driving Policy on open-EQ5 (software as joint collaboration or solely by partner OEM/Tier-1).

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Intel → Open-compute + libraries: open-EQ5, Atom, Xeon, FPGA.
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**L2+ programs:**
Front-Facing sensing + Roadbook (“ADAS 2.0”)

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Intel → REM as a “data strategy”
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Intel → RSS with industry and regulatory bodies
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THANK YOU
Drive Safe!