EuMC07  Special Session

20th Anniversary of the European Microwave Week
“The Future becomes the Present”

(a Look at Developments in Enabling Technologies and Systems over the Last 20 Years)

Holger Meinel* and Steve Nightingale**
*Independent Consultant, **CMS Technologies
holger.h.meinel@gmx.de  steven131@aol.com
1974
Where do we (I) come from ...

35 GHz
Physically separated TX and RX modules
IMPATT- and GUNN-diodes
Milestones

The Future becomes Present

Source: Paul Khanna, NI
1998
The first series
77 GHz
ACC system

installed in the MB E-class

77 GHz MMICs are available and it starts ...

Source: DAIMLER AG
10 years ago

- Comfort
  - fall-safe application
- Single sensors
  - LRR, BSD, LCA, ...
- Standard radar
- SiGe, BiCMOS

Today

- Safety
  - ASIL, SOTIF, etc.
- Multiple function sensors
  - SRR, MRR, LRR in one unit
  - SoC in RF-CMOS
- Sensor fusion
  - radar, LiDAR, cameras
  - with low power consumption
- High resolution radar
  - DBF, micro Doppler detection, etc.
- High performance Radar
  L2+3 vs. L4+5

“from comfort to safety” under enhanced safety requirements

Paradigm change

Safety of the intended functionality

The Future becomes Present
The new Audi A6 gets updated ADAS features

POSTED ON MARCH 1, 2018
POSTED IN: ADAS, AUDI, CAMERA, CAR-TO-X, DATA, LIDAR, PARKING, RADAR, REMOTE PARKING, SENSORS, ULTRASONIC

The new A6 with new and refined driver assistance systems sets new standards in the luxury class. These include the parking pilot and the garage pilot, which are set to extend the range of equipment during the course of the year: They autonomously maneuver the Sedan into and out of a parking space or garage. The driver can get out of the car before activating and monitoring the process using the myAudi app on their smartphone. To do so, the driver must continuously hold down the relevant function key.

The parking pilot and the garage pilot form part of the Park assist package, one of three packages. The City assist package includes features such as the new crossing assist. The Tour assist package comes with the adaptive cruise assist, which supplements the adaptive cruise control by means of gentle steering intervention to keep the vehicle in lane, and the efficiency assist, which promotes an economical driving style.

Behind the extensive assist systems lies a high-tech module from Audi, the central driver assistance controller (zFAS). It calculates continuously a detailed model of the environment from a fusion of sensor data. Depending on equipment, the sensor set includes up to five radar sensors, five cameras, twelve ultrasonic sensors as well as a laser scanner – another major innovation.

Audi connect online services also provide the car-to-X services traffic sign and hazard information. They use the swarm intelligence from the Audi fleet and network the Audi A6 with its environment.

Source: Audi

Audi: March 1st 2018
Geneva
THE END OF DRIVING

Potential evolution of autonomous car sales by level of automation

By 2050, 5% of all vehicles sold should be Level 5-ready!

By 2045, more than 70% of all vehicles sold will integrate autonomous capabilities

Source: Yole Développement - France – 2018

More than 120 Mio. radars are on our streets today
Object resolution as a function of bandwidth - at 500, 1,000 and 2,000 MHz

WARC 2015 – since November 17th 2015:
WARC - World Administrative Radio Conference

Automotive radar at 76 to 81 GHz is a „primary service“ now - other possible users have to make sure, that they do not interfere with this primary service - They have to protect the functioning as a safety feature for automotive use
Innovative Sicherheitslösungen durch Einsatz neuer Technologien

- Die PRE-SAFE® Phase ist wichtigstes Handlungsfeld unserer Integralen Sicherheitsstrategie

Integrale Sicherheit

sicher fahren

bedarfsgerecht schützen

retten und sichern

Aktive Sicherheit

Intelligent Drive

Passive Sicherheit

Intelligent Protect

Basis - Real Life Safety

Daimler AG
Prof. Dr.-Ing. Rodolfo Schöneburg
Einfluss neuer Technologien und gesellschaftlicher Trends auf die Fahrzeug- und Verkehrssicherheit
19.06.2017

Social/ Societal Impact

The Future becomes Present
Innovative Sicherheitslösungen durch Einsatz neuer Technologien

- **PRE-SAFE® Impuls Seite** – Erweiterung des Schutzraumes zur Seite

**Aktion:**
PRE-SAFE® Impuls übt 200 ms vor **t₀** einen dem Hauptanstoß vorausgehenden Impuls auf Insassen aus

**Effekte:**
1. Reduziertes delta-\(v\) beim Hauptanstoß
2. Schafft zusätzlichen Raum, um Insassen auf größerem Weg zu beschleunigen

Daimler AG            Prof. Dr.-Ing. Rodolfo Schöneburg            Einfluss neuer Technologien und gesellschaftlicher Trends auf die Fahrzeug- und Verkehrssicherheit

**Social/ Societal Impact**

The Future becomes Present
Automated Driving and Insurances

Incorporating an AEB-System within a vehicle
– i.e. Automated Emergency Braking
in the UK the insurance fee is reduced by 10%
- being the standard today already

The next step: incorporating an AES-System within a vehicle
– i.e. Automated Emergency Steering (rolling ball followed by a child)
an ongoing fee reduction is to be expected in the UK


Financial Impact
ADAS Effect

Thatcham and AEB

Thatcham has been instrumental in developing AEB test procedures in Euro NCAP and RCAR and analysing the real-world effect of these systems.

New car AEB fitment

<table>
<thead>
<tr>
<th></th>
<th>Low Speed</th>
<th>High Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>XC60</td>
<td>Golf</td>
</tr>
<tr>
<td></td>
<td>43.7%</td>
<td>29.1%</td>
</tr>
<tr>
<td></td>
<td>27.2%</td>
<td>28.4%</td>
</tr>
</tbody>
</table>

AEB testing

Real-world analysis

<table>
<thead>
<tr>
<th>Car Model</th>
<th>Own Damage</th>
<th>Third Party Damage</th>
<th>Third Party Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volvo XC60</td>
<td>-2%</td>
<td>-3%</td>
<td>7%</td>
</tr>
<tr>
<td>Volkswagen Golf</td>
<td>-10%</td>
<td>-11%</td>
<td>-1%</td>
</tr>
</tbody>
</table>

Financial Impact

Source: Matthew Avery, Thatcham Research, February 6-7, 2018.
Further more ....
We all knew it, since a long, long time . . .

ADAS is it!

Thank you for your attention!