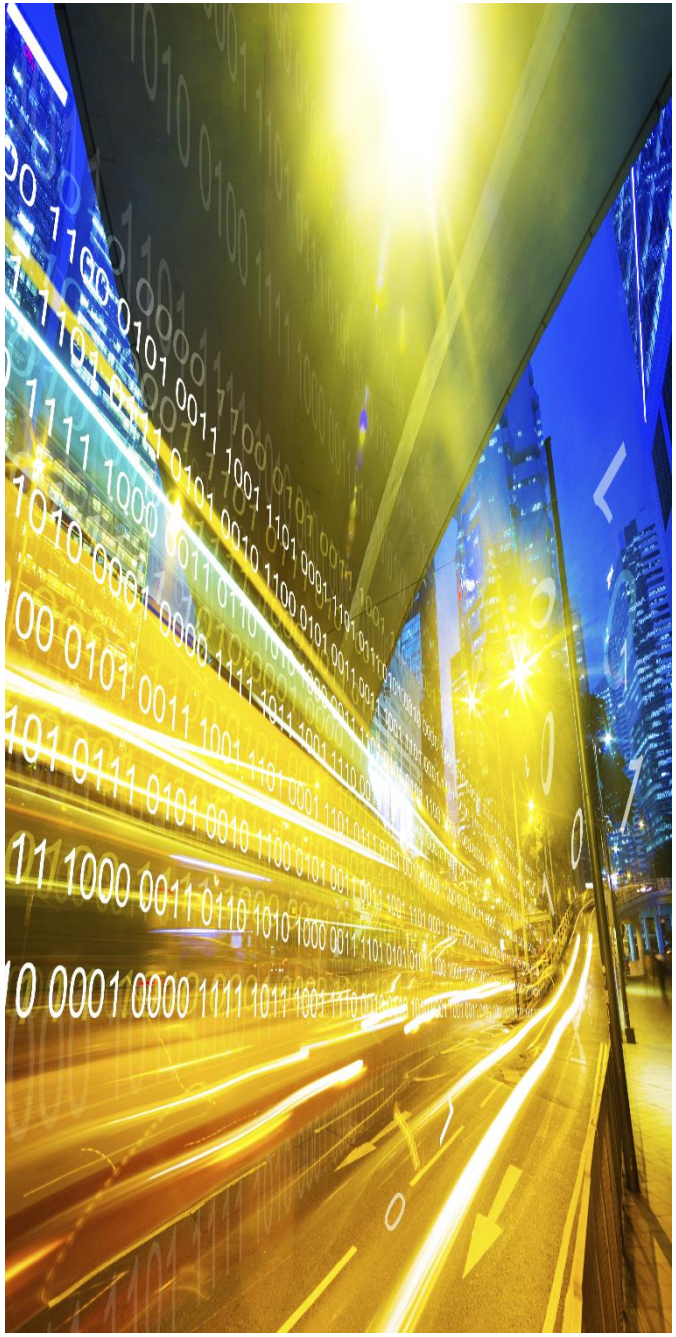

International Conference
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A Classification of Driver Assistance Systems

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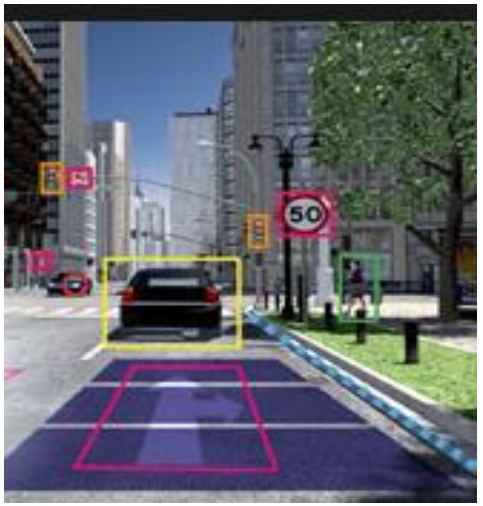
General Considerations

Driver Assistance Systems seem to have a considerable potential for road safety and traffic efficiency improvement



Driver Assistance Systems:
Support the modification of the driving task
by providing

- information
- advice
- assistance

Influence directly and indirectly the behaviour of users of both equipped and non-equipped vehicles

Alleviate accident consequences
by in-vehicle intelligent injury reducing systems

Classification of Driver Assistance Systems

System oriented approach

Based on the road safety features examination, where the **distinct phases in the accident** process are utilized

User oriented approach

Based on their functional analysis, these systems are classified according to the **supported levels of driving tasks**

- individual / professional driver
- fleet owner
- elderly drivers
- etc.

Objective

System oriented approach
User oriented approach

Such classification fails to provide answers on the usefulness of Driver Assistance Systems

Certain parameters not taken into consideration
- impact to traffic efficiency
- road safety

Outline these two different approaches where **priorities** for future developments can be better identified

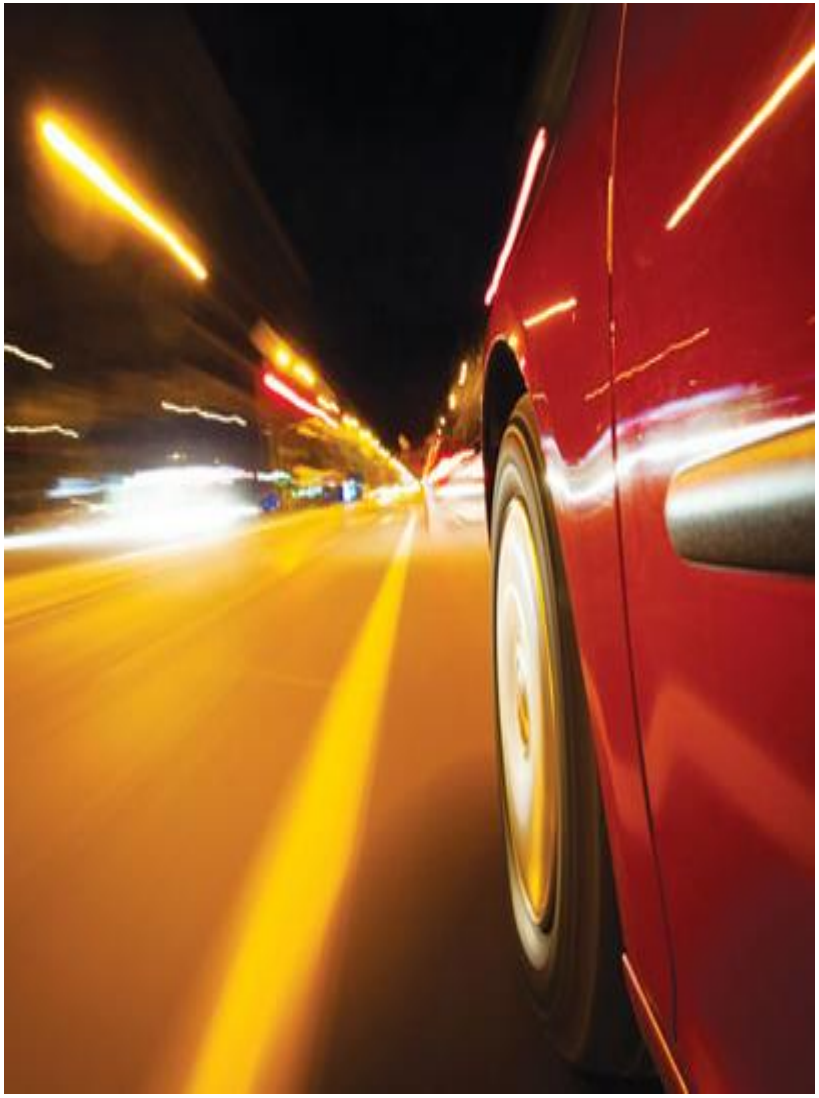
Classification based on Distinct Phases in the Accident Process

Driver Assistance Systems
are meant to **improve** road safety by

- influencing traffic exposure
- reducing the probability of crashes
- reducing injury consequences

Distinct phases in the accident process

- pre-crash
- crash
- post-crash



Pre-Crash Phase

Driver Assistance Systems mainly focused in the **support** provided to the driver

- information
- perception
- convenience
- driver – vehicle monitoring

Pre-Crash Phase

Navigation Systems

- navigation routing
  - location and route guidance
- integrated navigation
  - additional services (signing, warning, or even intervening in the driving process)
- real time traffic and traveler information
  - combine information available to users of traditional navigation systems with real time travel-related information (road surface condition, work zones, congestion, etc.)

Pre-Crash Phase

Elimination of unnecessary and sometimes dangerous deceleration and acceleration areas

- automated transaction systems (electronic toll collection)

Pre-Crash Phase

Driver Performance Monitoring Systems

- driver health monitoring
  - assess several parameters of the driver's health and combines the results to estimate the current health level of the driver
  - if it appears to be below certain pre-selected "safe" levels the driver and possibly some external entity are notified (e.g. doctor, police)

Pre-Crash Phase

Vehicle Status Monitoring Systems

- tachograph recording
- engine condition information services

(e.g. oil pressure, tire inflation pressure, etc.)

Crash Phase

Smart Restraint Systems

- vehicle restraint systems (EN1317)
- passive safety of support structures for road equipment (EN 12767)

Post-Crash Phase

Alerting Systems

- alert emergency services
(e.g. police, ambulance, fire brigades, highway patrols)
- dedicated support services
  - troubled drivers
    get connected automatically

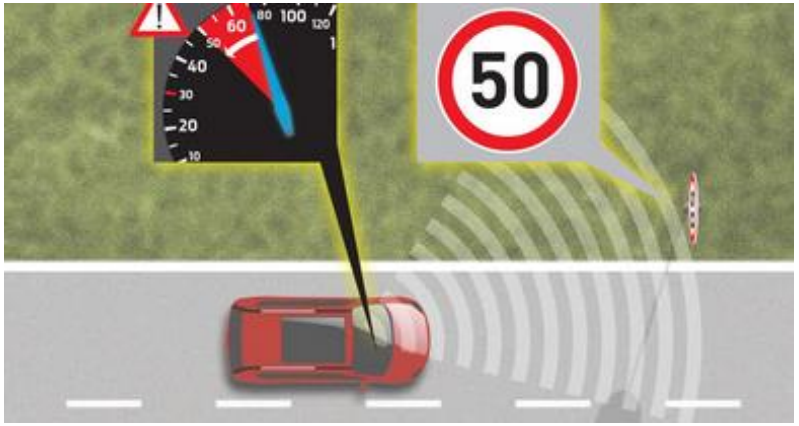
Classification based on Supported Levels of Driver Tasks

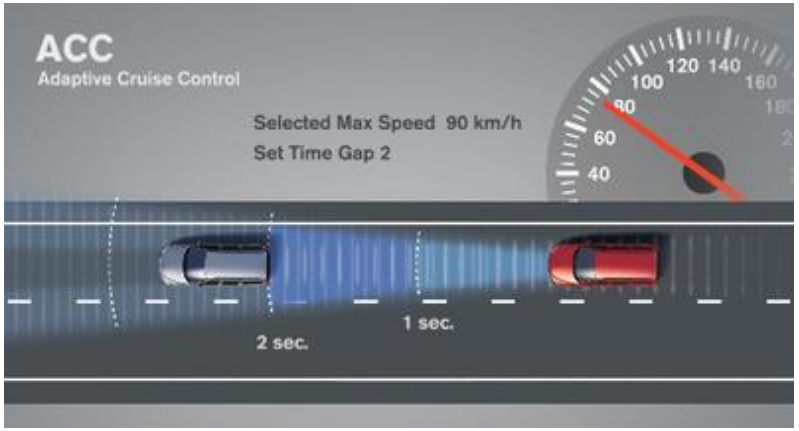
Tactical
Operational

Tactical Levels of Driver Tasks

Longitudinal Control Systems

- intelligent speed adaptation (ISA)
  - external speed recommendations
  - automatic speed reduction function (directly, or indirectly by managing signalization)
- adaptive cruise control (ACC)
  - senses the presence and relative speed of moving vehicles ahead and adjusts the vehicle's speed accordingly



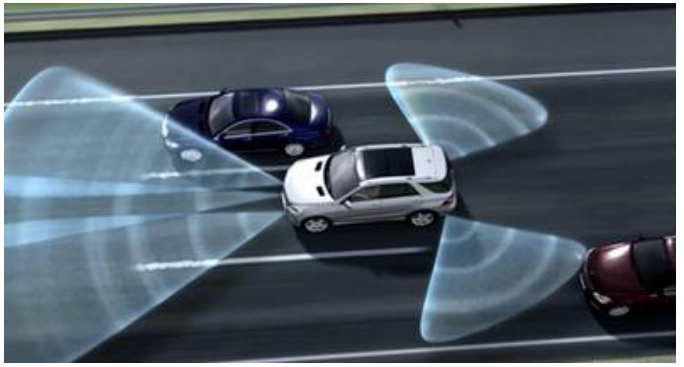


Tactical Levels of Driver Tasks

Lateral Control Systems

- road and lane departure collision avoidance
  - warning and control assistance to the driver (through lane or road edge tracking and by determining the safe speed for the road geometry in front)

- lane change and merge collision avoidance
  - detect and warn the driver of vehicles and objects in adjacent lanes
  - particular valuable during lane change or merging maneuvers



Tactical Levels of Driver Tasks

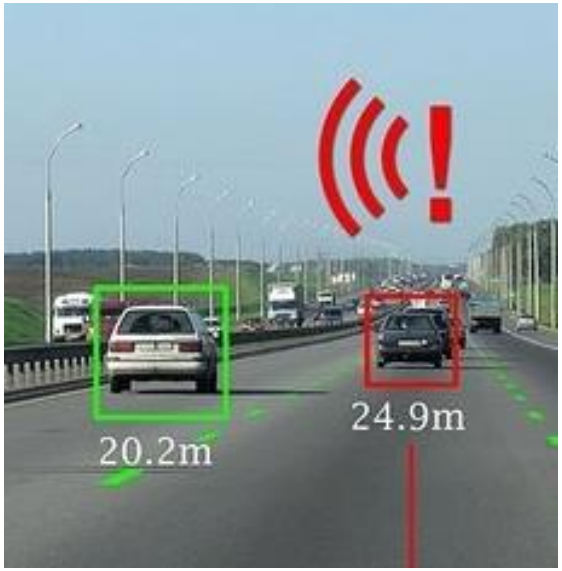
General Vehicle Control Systems

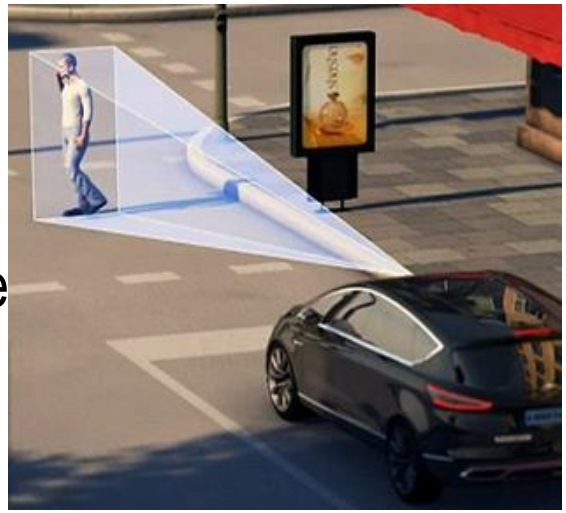
- automatic stop-and-go
  - significant safety benefits
    in hazardous situations
    or frequent stop-and-go conditions
    (e.g. congestion)
- platooning
  - lower level of maturity
  - each vehicle travels keeping
    a constant headway
    from the preceding

Tactical Levels of Driver Tasks

Collision Avoidance Systems

- rear end collision avoidance
  - senses the presence and speed of vehicles and objects in the vehicle's lane of travel and provides to minimise the risk of collisions
- obstacle and pedestrian detection
  - warning of driver when pedestrians or obstacles are in close proximity to the driver's path
- intersection collision warning
  - utilize a cooperation of vehicle and infrastructure
  - mostly beneficial at railway crossing areas

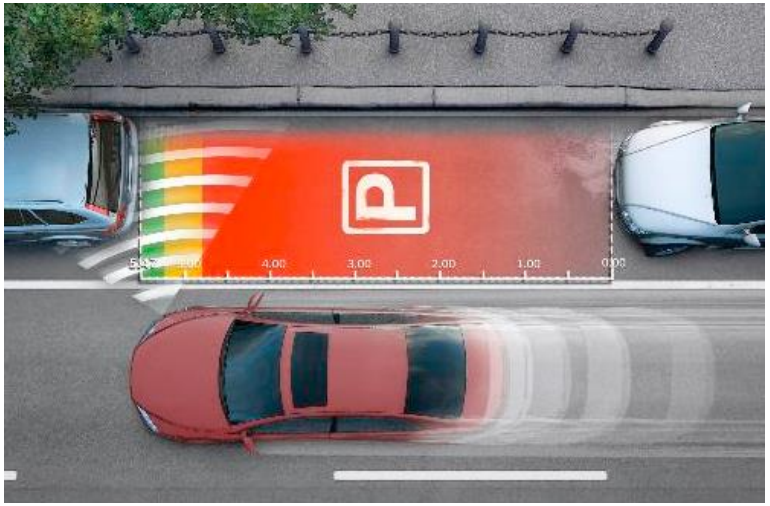




Operational Levels of Driver Tasks

Augment Driver's Perception

- vision enhancement systems
  - headlight design
  - blind spot detection
  - parking aids
  - etc.
- road surface condition info
  - collect and analyze data using vehicle-mounted or fixed infrastructure road sensors



Operational Levels of Driver Tasks

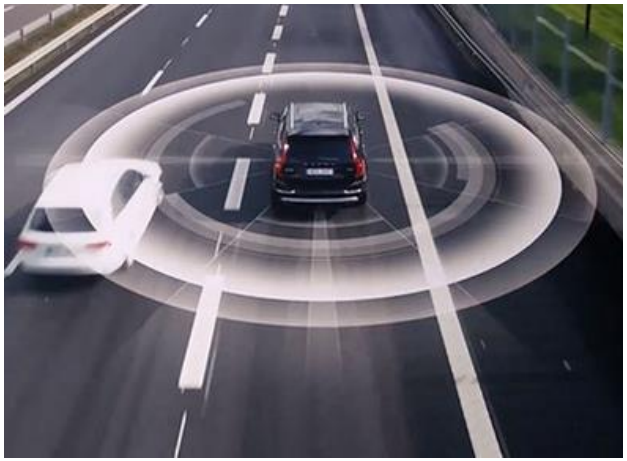
Driver Convenience Systems

- driver identification
  - adjust seat, steering wheel, mirrors, etc.
- hands-free interfaces and remote controls

Conclusions

The specific contribution of driver assistance systems is still under consideration and research

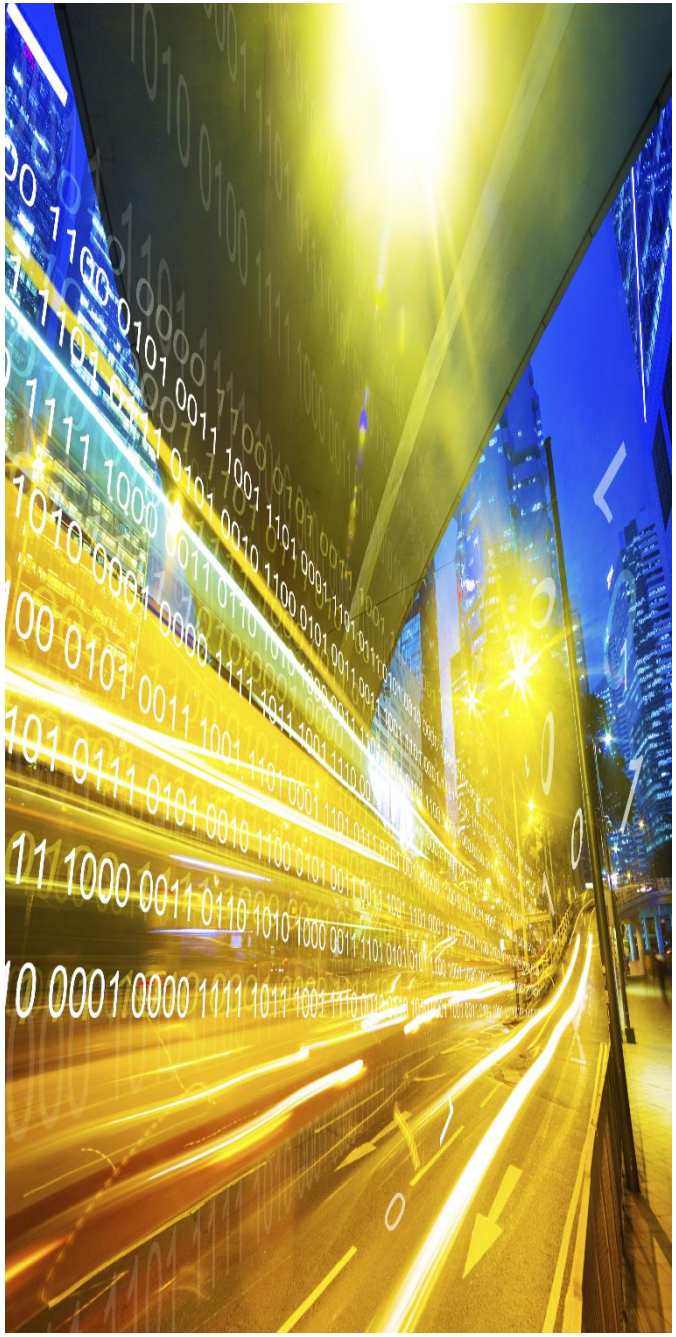
- some systems present a net potential for road safety improvement
- some others have an effect mainly on traffic efficiency improvement



There is a need for **"intelligent" roads** that will support and cooperate with the "intelligent" vehicles

More and more systems tend to **connect** and **collaborate** with **external systems**

In every case the **safety** of the **driver** as well as the **vehicle passengers** is the overall goal



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