

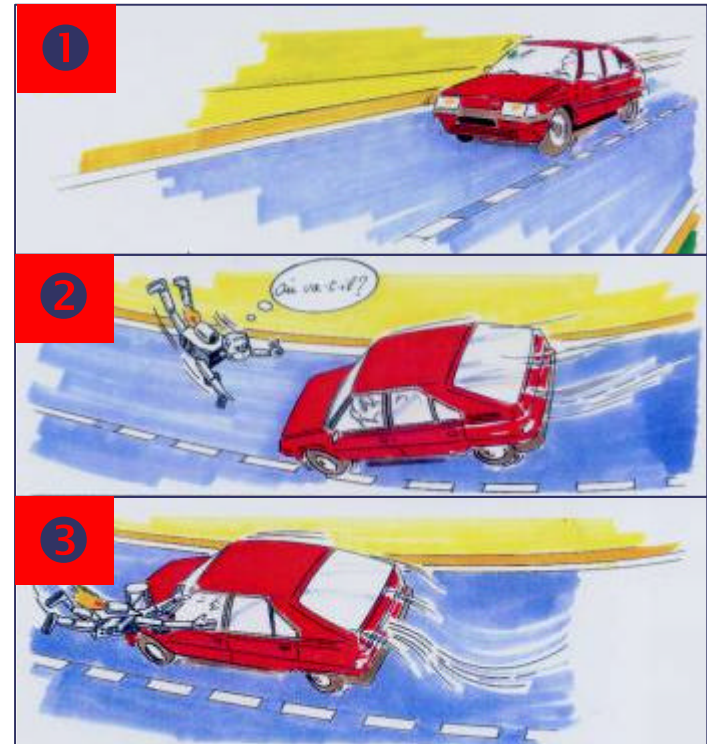


# Lane departure warning system developed by PSA Peugeot Citroën

*Jean-Christophe RIAT*

# Functionality developed

- ➔ Car position supervision in the traffic lane
  - *warning of the driver when the car goes out the traffic lane (result of drowsiness, careless mistake...)*
  - *no warning when the driver puts the turn indicator on*
- ➔ System for motorways and express ways
- ➔ Two innovations in the system developed by PSA Peugeot Citroën :
  - *Sensor technology to detect the lane*
  - *HMI solution to warn the driver*

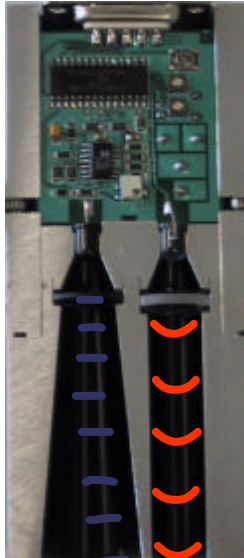


## Analogy with Virtual Rumble-Strips

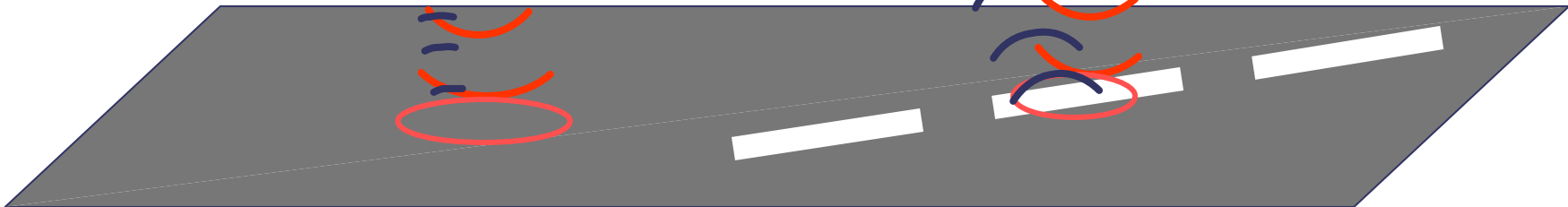
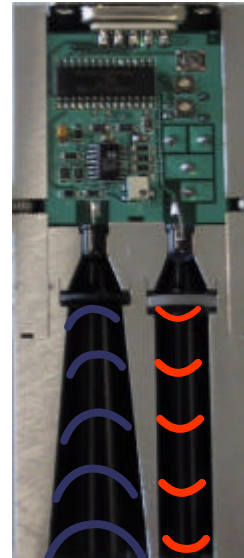
# Sensor technology

# Infrared sensor technology

No detection



Detection of the marking

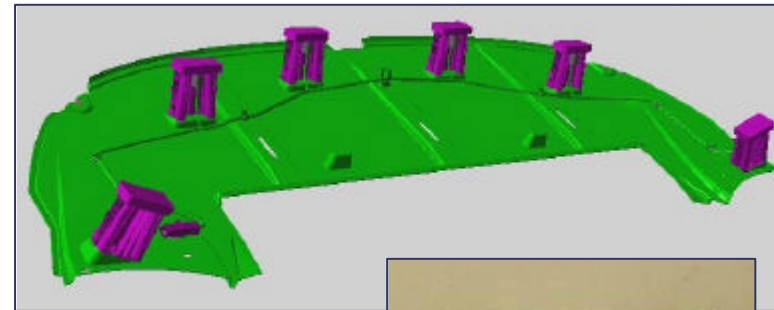


# Sensors integration

To guarantee a robust detection for continuous and dashed lane, and to filter specific markings (directionnal arrow, town name,...) six sensors are integrated under the front bumper :



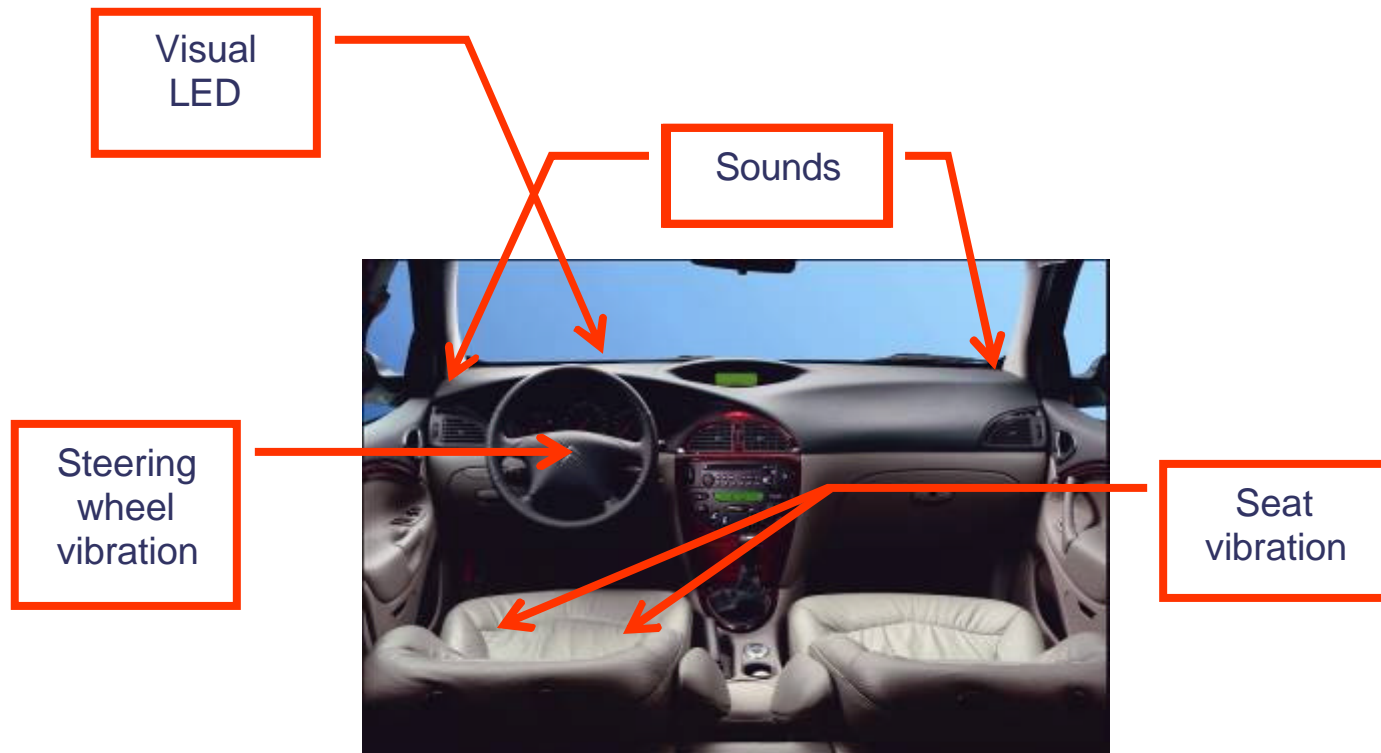
6 sensors



# HMI solution

# Ergonomic study

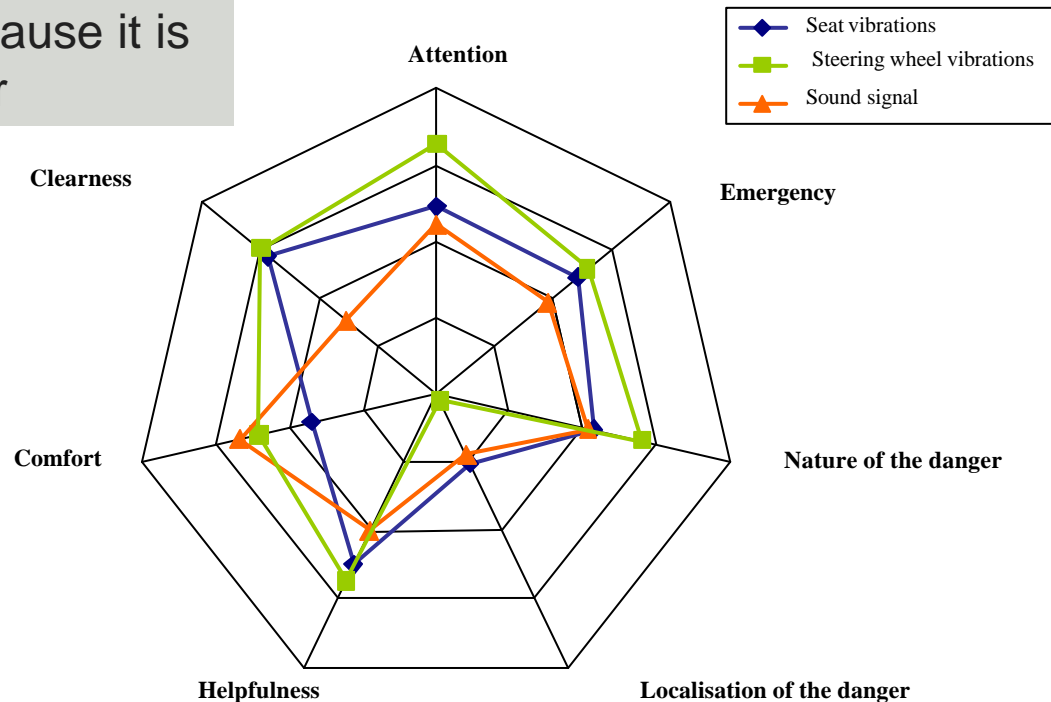
An ergonomic study was made in order to choose the best HMI (Human Machine Interface) :





# Conclusion for the HMI

- Visual HMI is not suitable because we are not sure the driver sees it !
- Sound HMI is not suitable because it is too uncomfortable for the passengers
- Seat vibrations was chosen because it is easy to understand by the driver





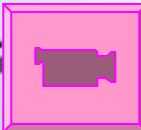
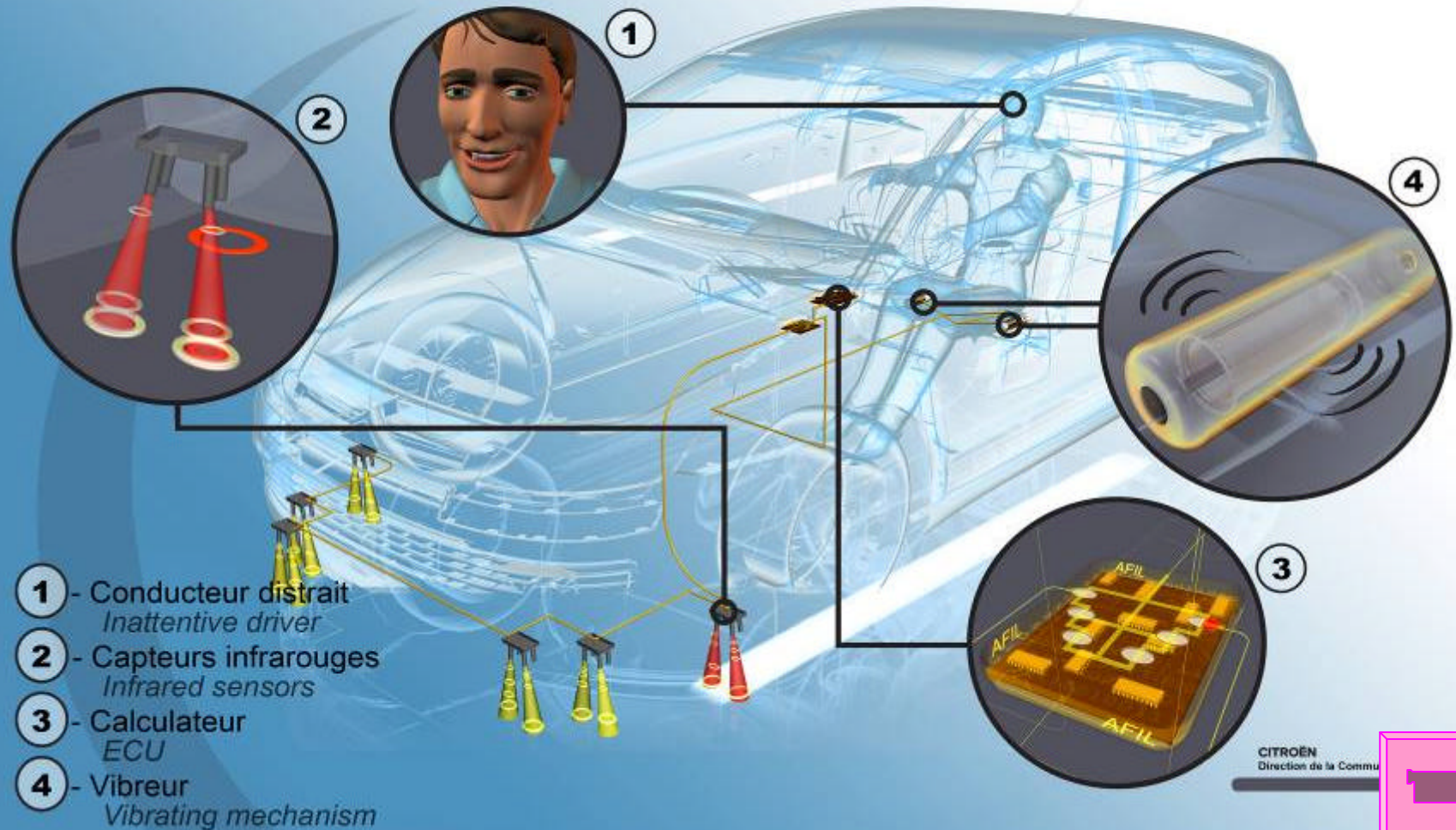
## IHM integration



# Complete fonctionnality

# CITROËN C4

## ALERTE DE FRANCHISSEMENT INVOLONTAIRE DE LIGNE LANE DEPARTURE WARNING SYSTEM





# System available on new Citroën cars

Citroën C4



Citroën C4 coupé

Citroën C5



Citroën C6



# Conclusion

- ➔ Citroën proposes the first “lane departure warning system” available on cars in Europe (for the customer the price of the system is 390 €).
- ➔ We have chosen infrared sensors instead of video solution because this technology is less expensive and more robust in adverse weather conditions (rain, sun,...)
- ➔ A specific work has been made on the HMI in order to chose the best compromise for safety and to make the system acceptable by the driver and the other passengers in the car.





EX-A-1