

16th World Meeting International Road Federation



DEVELOPING A TEST TOOL FOR ADVANCED ASSISTANCE SYSTEMS IN INTERSECTIONS, PEDESTRIAN AND VEHICLE DETECTION

D. GALLEGOS, F. LIESA & O. MUÑOZ



Applus⁺



Càtedra **Applus⁺** en Seguretat de l'Automòbil
UNIVERSITAT POLITÈCNICA DE CATALUNYA
E.T.S. D'ENGINYERIA INDUSTRIAL DE BARCELONA

Applus⁺
IDIADA

- ✓ **Introduction**
- ✓ **Accidents with pedestrians involved**
- ✓ **Nowadays pedestrian protection**
- ✓ **Technologies and advanced systems implemented in the vehicle**
- ✓ **Design of the installation**
- ✓ **Conclusions**

INTRODUCTION

The European Pedestrian Protection Legislation comprises tests divided into two phases. The first phase was implemented in October 2005 and the second phase of test comes into effect from 2010. The latter phase of tests is anticipated to be a lot more challenging than the former. In addition, legislation demands that these systems have to be installed as a standard in all vehicles, thus driving up the number of pedestrian protection systems in use.

Still under Development, Active and Passive Pedestrian Safety Systems are Likely to Demonstrate High Growth Rates

Unlike passive occupant protection systems, pedestrian protection systems, both active and passive, are still being developed. However, growing concerns for pedestrian safety and government legislation is likely to keep demand steady for these systems. Automobile manufacturers are working on various pedestrian safety solutions such as introducing energy absorption front end, installing deployment solutions (airbags, deploying bonnets or bumpers) or going for more active safety solutions such as driver warning systems and automatic systems.

ACCIDENTS WITH PEDESTRIANS

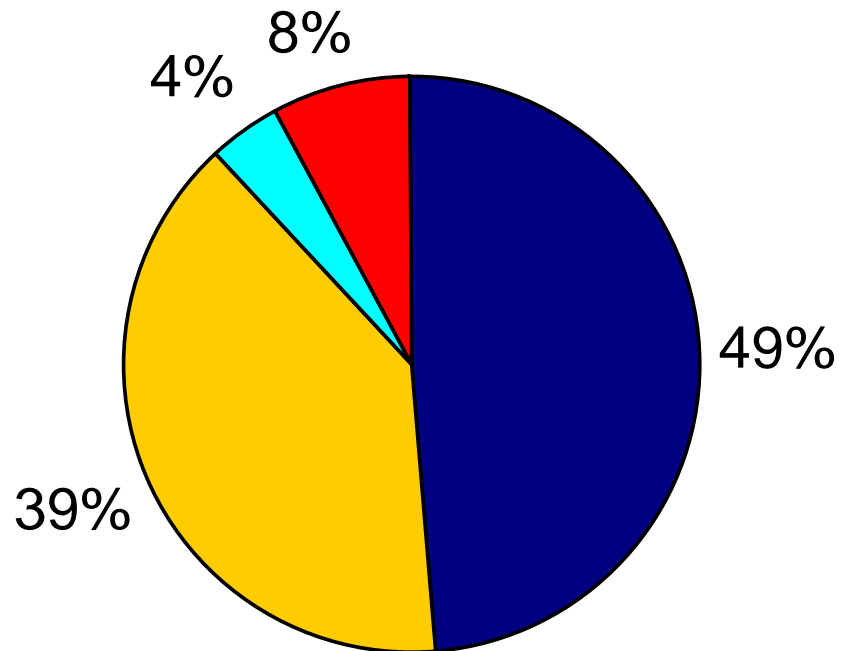
Every year, in Europe, 6.000 people died as a consequence of a traffic accident, while they are pedestrians.

In Spain 2007, from the total number of victim in traffic accidents of 3.821, 589 were pedestrians,

- Representing un 15% of the victims outside the cities, in open roads.**
- Representing un 40% of the victims inside the cities, being 302 pedestrians from 740 people died.**

For instance, in Barcelona, in 2009, 16 pedestrians were died, with a total number of victims of 40.

ACCIDENTS WITH PEDESTRIANS

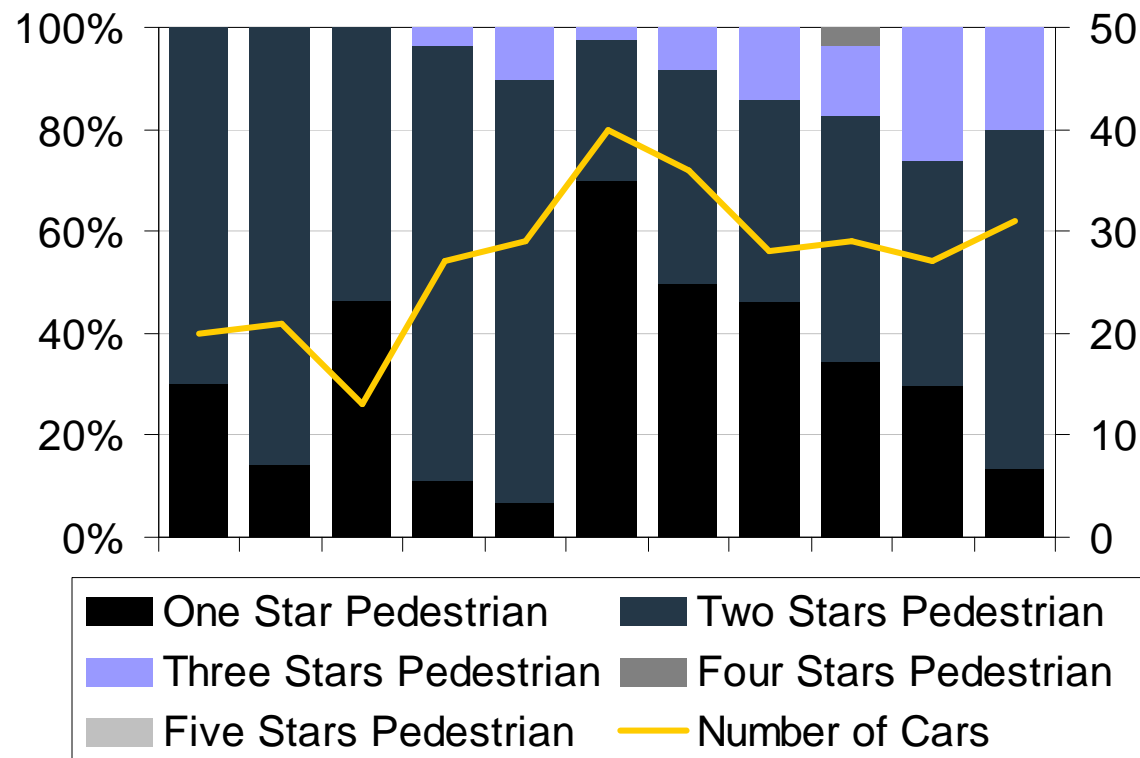


- 1. Pedestrian crossing from left
- 2. Pedestrian crossing from right
- 3. Pedestrian moving along the road
- Other pedestrian situation

PEDESTRIAN PROTECTION

But nowadays, most of the systems applied to the vehicle to improve pedestrian protection are related to the passive safety.

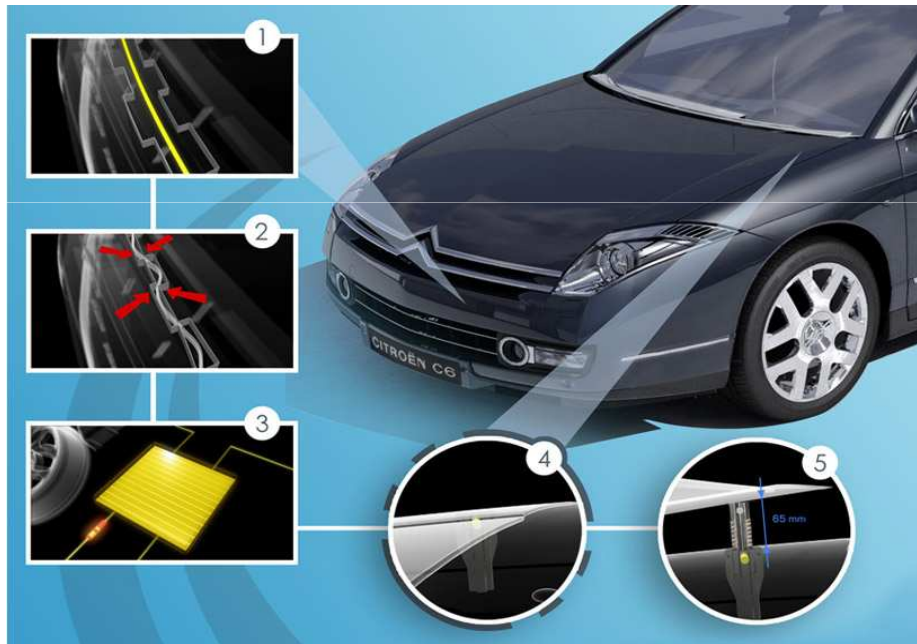
In the Graphic it is showed the evolution of the punctuation in the pedestrian tests of the EuroNCAP, where an improvement of the pedestrian protection level can be seen.



PEDESTRIAN PROTECTION

Although the implementations in passive safety, there are new systems appeared recently that are focused on active safety.

Uppering



Source: CITROEN

Airbag



Source: AUTOLIV

PEDESTRIAN PROTECTION

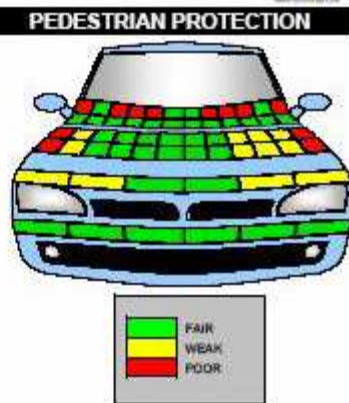
Results obtained by the cars with pedestrian protection advanced systems:

Maximum punctuation obtained in EuroNCAP tests in pedestrian protection area.

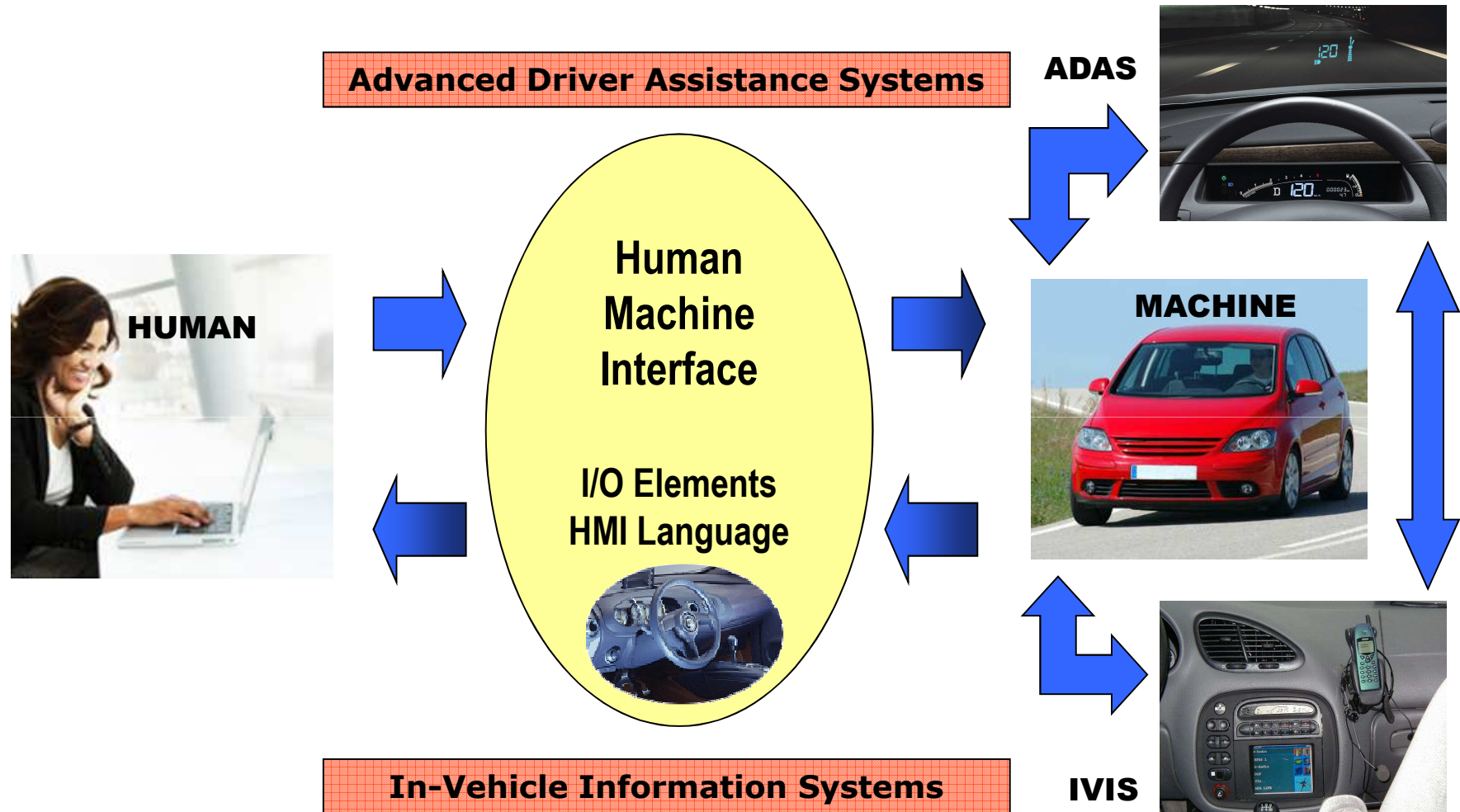


Source: Euroncap

Euro NCAP Category			
EXECUTIVE			
TEST RATINGS			
ADULT OCCUPANT PROTECTION	SCORES:	FRONT 14 (88%)	
		SIDE 17 (94%)	
		SEATBELT REMINDER 3	
		OVERALL 34	
CHILD OCCUPANT PROTECTION	SCORE:	38 (78%)	
PEDESTRIAN PROTECTION	SCORE:	28 (78%)	



ADVANCED SYSTEMS



Technologies used in the development of new ADAS systems are:

Long Range Radar (LRR)

Short Range Radar (LRR)

Infrared-Radar (LIDAR Fixed)

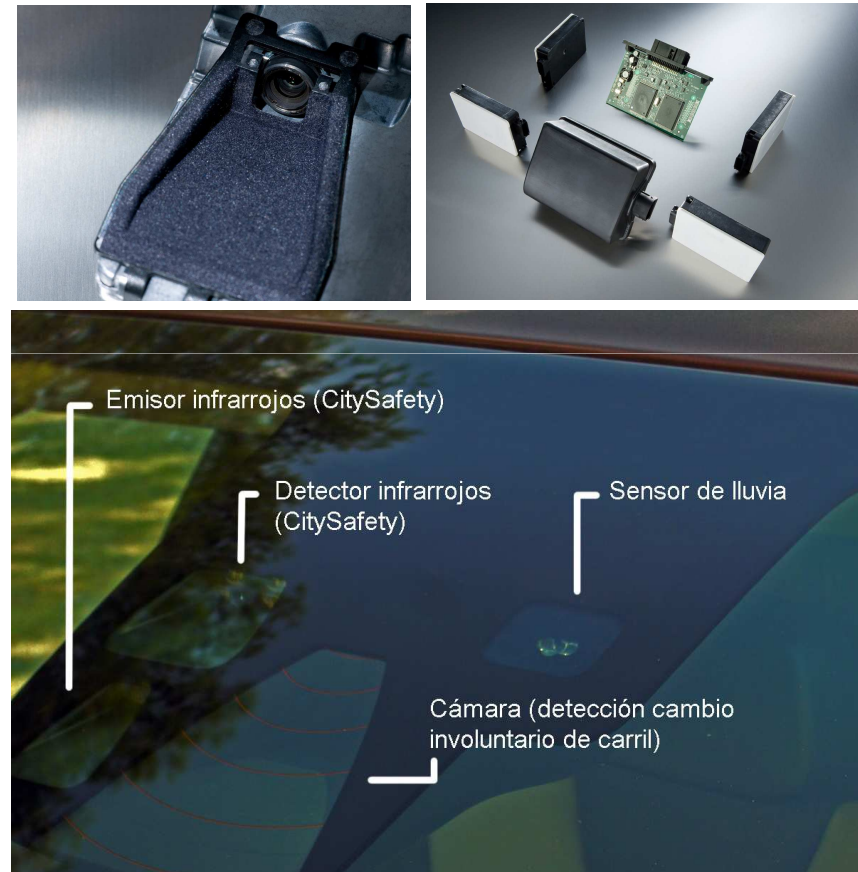
Infrared-Radar (LIDAR Scanner)

Infrared Thermal Image (FIR)

Infrared Vision (NIR)

RGB-Video (Mono-Camera)

RGB-Video (Stereo-Camera)



ADAS SYSTEMS

1. Frontal detection

- ACC (Adaptive Cruise Control)
- ACC Stop&Go
- LDW
- Night Vision
- Pre-Crash
- Ped. Detection

2. Transversal detection

- Intersection assistance
- Pedestrian detection

3. Lateral Detection

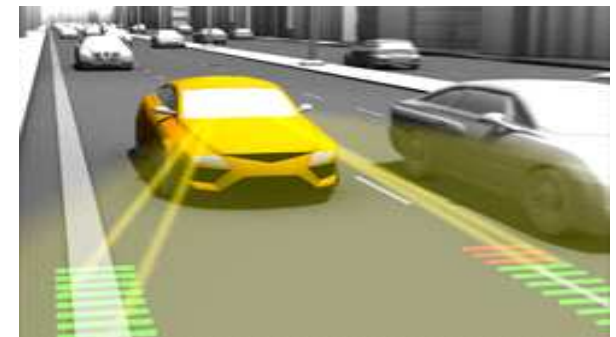
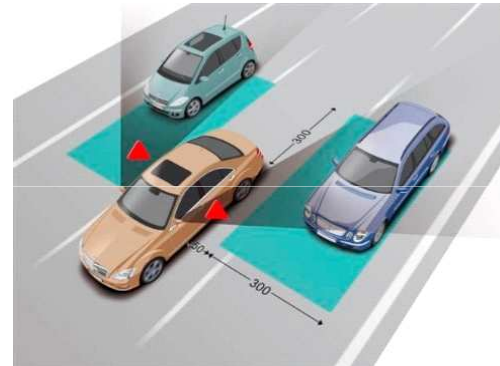
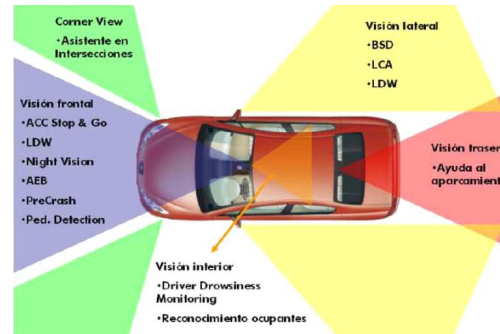
- LCA (Lane Change Assistance)
- LDW (Lane Departure Warning)
- Park Assist

4. Rear detection

- Rear Collision Warning

5. Interior Detection

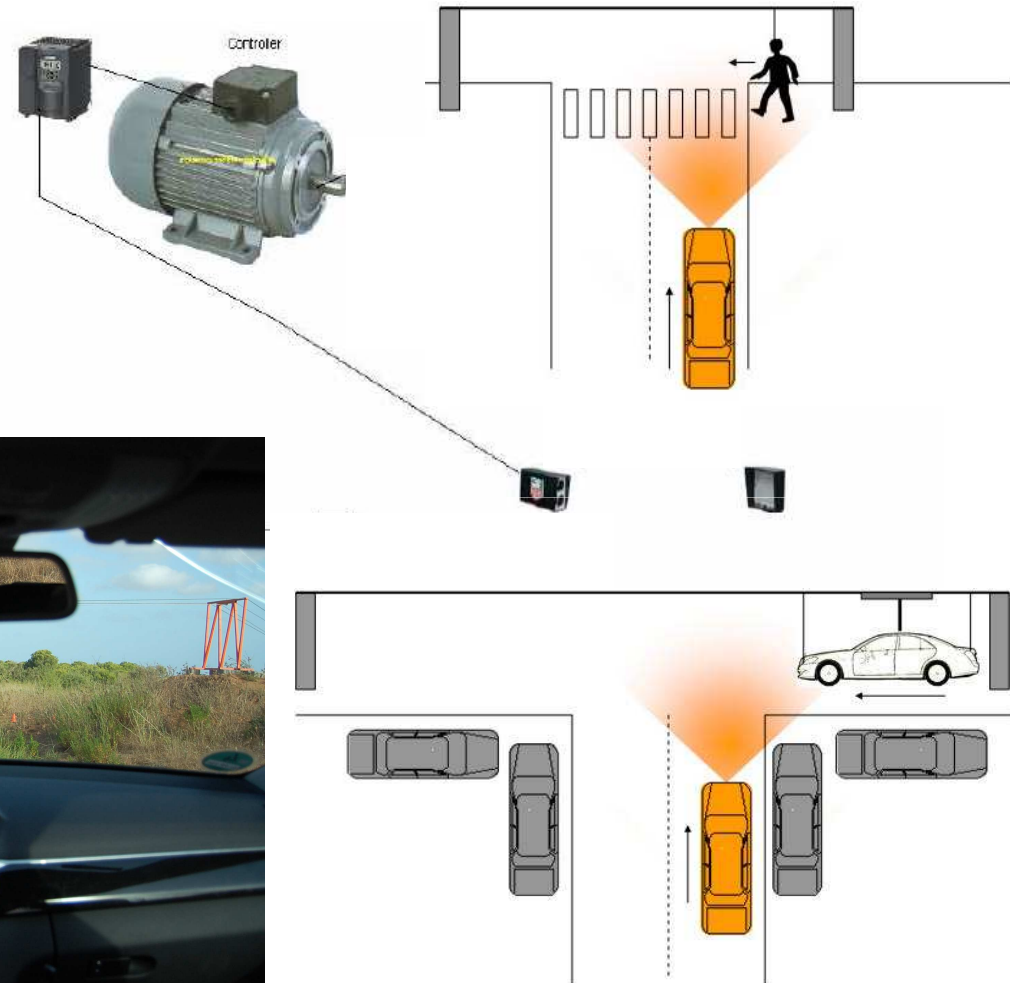
- Driver drowsiness monitoring



THE INSTALATION

Concept

It represents an intersection scenario, to reproduce situations of pedestrian and vehicles crossing by the maximum realistic possible way.



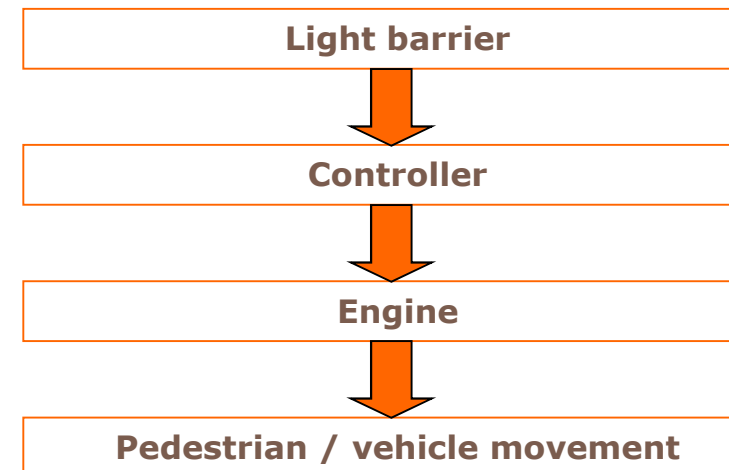
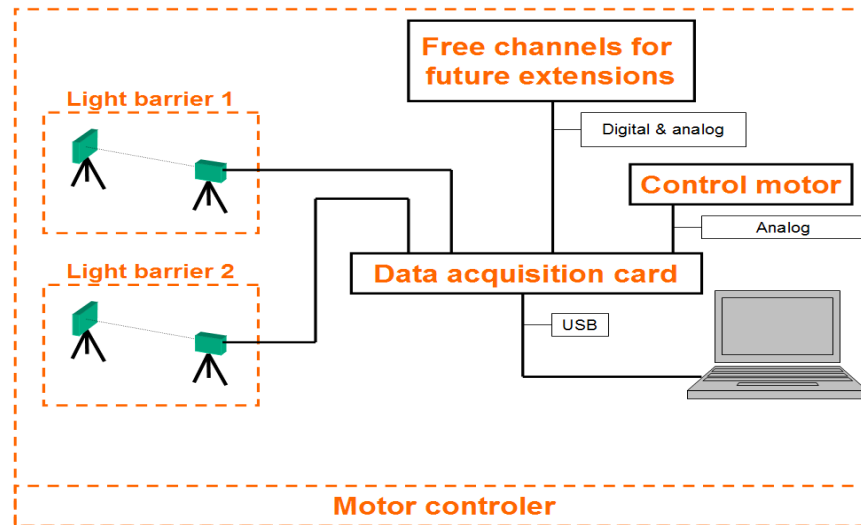
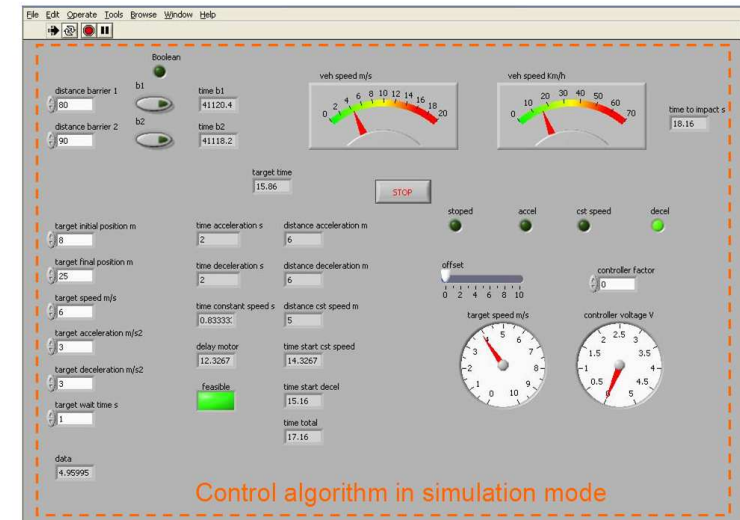
THE INSTALATION

Control

Scheme and equipments of the instalation

Control parameters

Target: to simulate different positions of the pedestrian and the vehicle in case of a possible crash with the test car.



THE INSTALATION

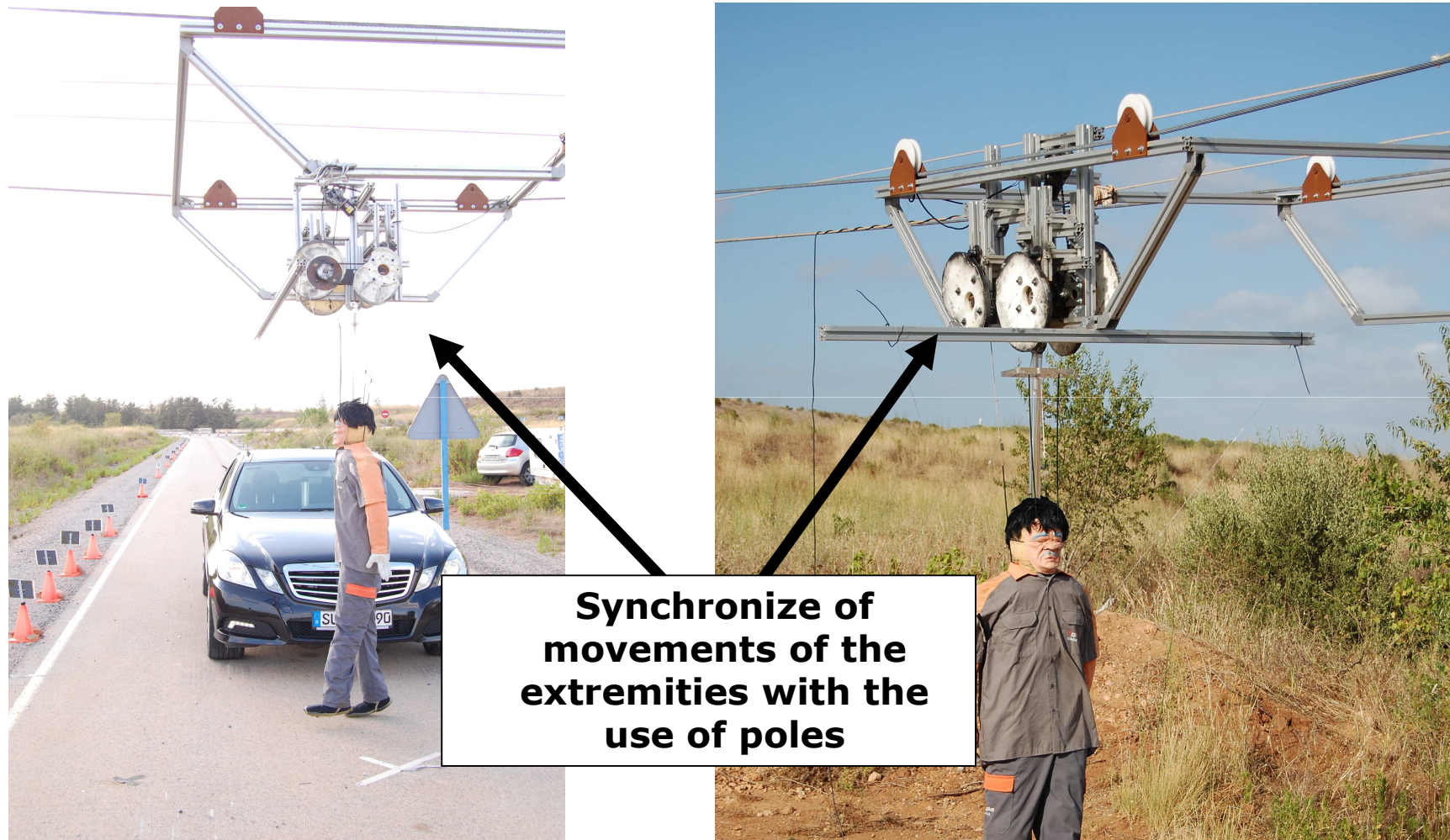
The pedestrian

- Lower extremities movement.
- Synchronized with the longitudinal displacement.
- Detectable by any technology used in this kind of systems.
- “Crashable”; no damages in test vehicle are produced.



THE INSTALATION

Operation



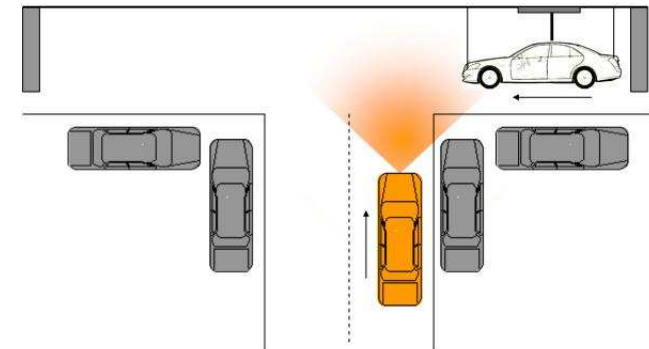
D.GALLEGOS

DEVELOPING A TEST TOOL FOR ADVANCED ASSISTANCE SYSTEMS IN INTERSECTIONS

THE INSTALATION

The vehicle

- Synchronized with the longitudinal displacement of the test car.
- Detectable by any technology used in this kind of systems.
- “Crashable”; no damages in test vehicle are produced in case of contact.



THE INSTALATION



Applus⁺
IDIADA

EVOLUTION

Now in the market	First steps	In development
ESP; ABS Cruise control & ACC Speed limiter Speed alert Advanced front light Brake assist Rear vision Tire pressure monitoring	Night vision Blind spot monitoring ACC stop & go Lane change assist Lane keeping assist Active front steering Adaptative suspension system	Automatic emergency brake Intersection assistance Pedestrian protection (PROTECTOR) V2V & V2I Intelligent powertrain system (PEIT)



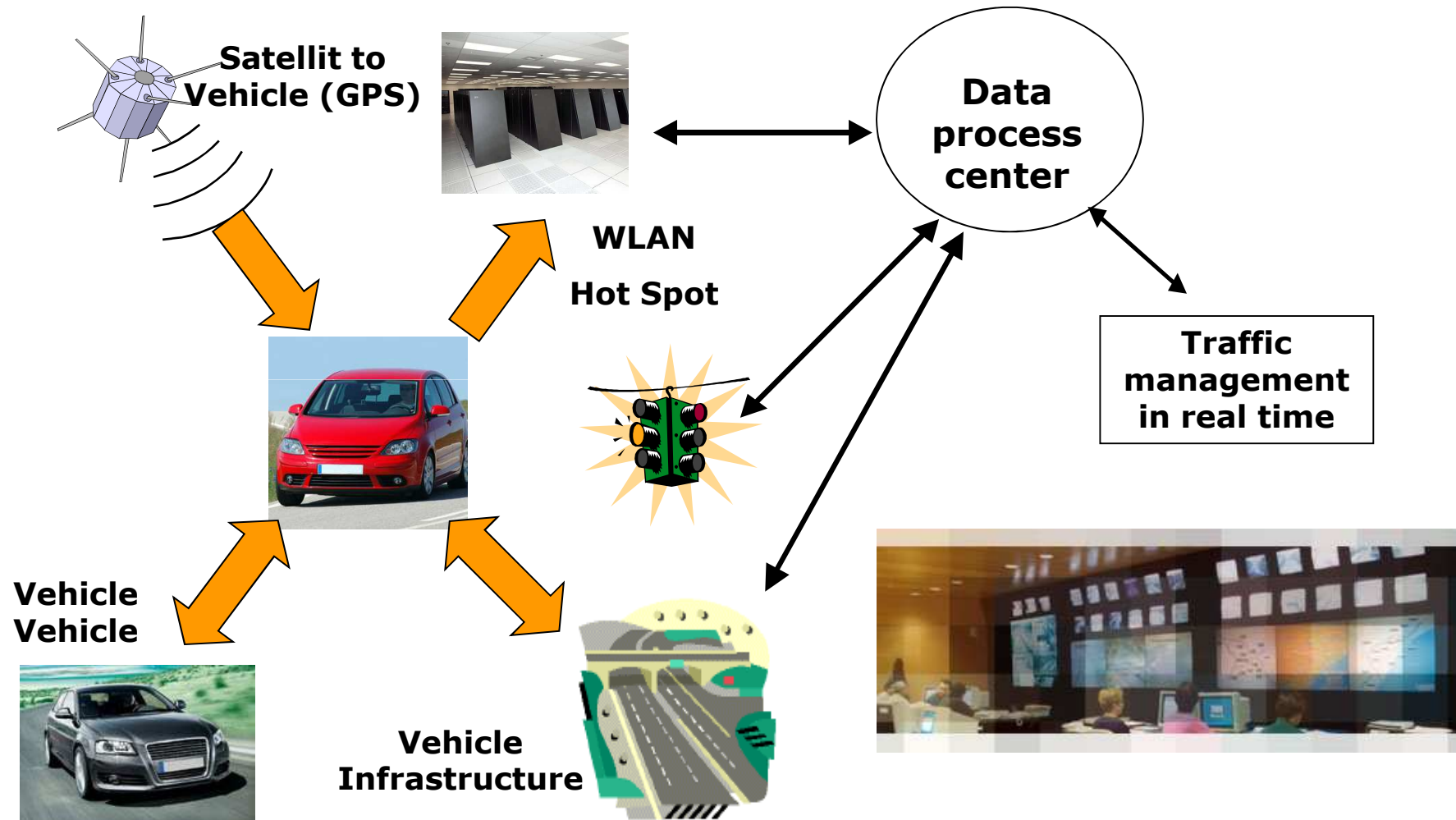
**Driver Assistance
Systems**



**ADVANCED Driver Assistance Systems
ADAS**

THE FUTURE

THE FINAL TARGET



CONCLUSIONS

- ✓ The innovation process in the automotive industry has active safety systems as one of the main lines of research, those systems which try to avoid that the accident happens. Specifically, inside active safety systems, advanced driver assistance systems (ADAS) are everyday with the appearance of new applications that need to develop new tools to test the performances of them, with the final target of doing a standardization.
- ✓ The test tool designed follows the most dangerous situation appearing in an intersection, both situations with a vehicle and with a pedestrian in the intersection as a possible target and the installation has the possibility to test systems with misuse because all the target tools are totally crashed by the test cars.
- ✓ Innovation in the target car and target pedestrian are focused in reproducing by the best way possible the appearance of each element as the system installed in the vehicle should see them with the different technologies that can be applied depending on the OEM.

A person is walking on a paved road, moving from left to right. They are wearing a dark long-sleeved shirt and light-colored pants. In the foreground, the front left corner of a dark-colored car is visible, partially obscuring the view. The background consists of dry grass, some green bushes, and a clear blue sky with a few white clouds. A utility pole is visible in the distance.

**THANK YOU VERY MUCH FOR
YOUR ATTENTION**

16th World Meeting International Road Federation



DEVELOPING A TEST TOOL FOR ADVANCED ASSISTANCE SYSTEMS IN INTERSECTIONS, PEDESTRIAN AND VEHICLE DETECTION

D. GALLEGOS, F. LIESA & O. MUÑOZ



Applus⁺



Càtedra **Applus⁺** en Seguretat de l'Automòbil
UNIVERSITAT POLITÈCNICA DE CATALUNYA
E.T.S. D'ENGINYERIA INDUSTRIAL DE BARCELONA

Applus⁺
IDIADA