Role of advanced ADAS and autonomous driving capabilities in the crashworthiness design of safe urban electric vehicles

Javier Romo[a], Jorge Velasco[a], Marta Ingelmo[a], Pietro Perlo[b], Marco Biasiotto[b], Leonid Skigin[c], Nir Karasikov[c], Aldo Sorniotti[d] and Philip So[d]

[a]CIDAUT Foundation, 47151 Boecillo (Valladolid), Spain
[b]Interactive Fully Electrical Vehicles srl, 10040 La Loggia (TO), Italy
[c]Nanomotion Ltd, 2069200 Yokneam Illit, Israel
[d]University of Surrey, GU2 7XH Guildford, United Kingdom

EPoSS Annual Forum 2022
Turin, Italy

All the work described in this poster is part of Multi-Moby project, a project under Horizon 2020 Programme of the European Commission (GA no. 101006953).

Abstract

Multi-Moby is an ambitious project focused on the development of a ultra-safe light car for both **occupants** and **vulnerable road users** (VRUs). To address this challenge, it advocates the introduction of innovative **active and passive safety** solutions. Specifically, it defends a structural design based on **high strength steel** with a **frontal part** without hard points, as far as active safety is concerned, and introduces single camera **ADAS systems** to avoid dangerous situations. Simulation results demonstrate that ADAS systems are the solution to VRUs' safety problems of urban vehicles.

Vehicle size & safety perceptions

It is widely known that large, high mass vehicles have poorer fuel efficiency and a higher level of pollutant emissions compared to urban vehicles. Despite this, they are preferred by the vast majority of the population. This fact is primarily due to the public perception that bigger is better, in the context of **vehicle safety**.

Unique in the segment of city vehicles, Multi-Moby's car aims to reduce the existing gap between the EU2030 expectations in terms of EU traffic fatalities, and the actual progress.

Research methodology

SIMULATIONS

Thanks to the use of advanced **simulations** tools, within Multi-Moby project, a **vehicle structure** with optimal crashworthiness performance has been developed. On the other hand, pedestrian simulations show that, for the case of urban vehicles, mainly due to their front geometry constraints, pedestrians' head always impacts the windshield or the pillars. Multi-Moby project overcomes this problem, making use of the most advanced **ADAS systems**.

Figure 2. (Left) Frontal crash simulation. (Right) Pedestrian simulation with human model

ACTIVE SAFETY SOLUTIONS

Against this background, Multi-Moby concept integrates two dual-band miniature **gimbals** which are able to detect VRUs and predict potentially hazardous scenarios in real time. Through them, the vehicle is able to understand the surrounding environment in real time and to alert driver if necessary.

Figure 3. Detailed view of the implemented active safety solution

PASSIVE SAFETY SOLUTIONS

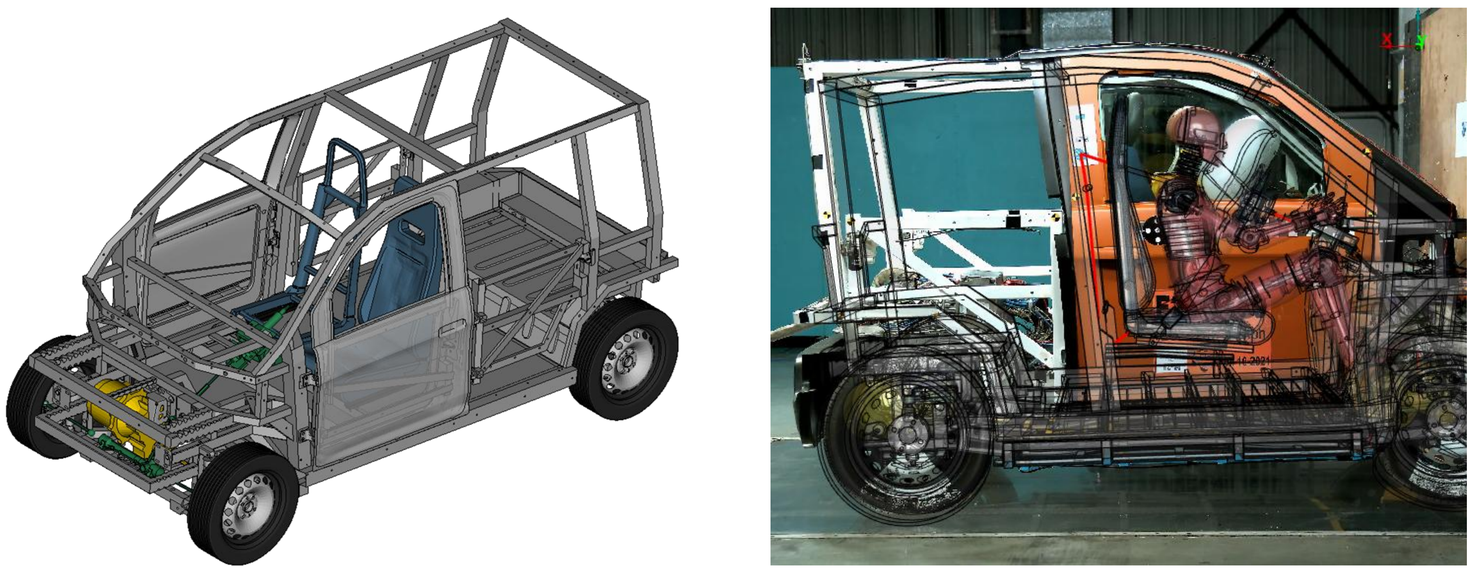

Figure 4. (Left) Multi-Moby's vehicle structure. (Right) Regulation Nº 137 simulation-test correlation

Bearing in mind that accidents cannot always be avoided, Multi-Moby's vehicle structure is made of **high strength steel** to warrant the integrity and energy absorption ability of the car. The behaviour of the car has been tested according to the requirements established in the **standards** (R137, R94, R95 and R135).In addition, the frontal part of the vehicle has been designed to reduce the damage to VRUs in the event of a run over. The design efforts have been focused on avoiding the existence of **hard points** in the impact zones , an on the vehicle panels and bumper.

Conclusions

- Small vehicles are considered less safe than large ones.
- It is possible to design a safe urban vehicle for both occupants and VRUs facing the safety from a holistic point of view.
- Including ADAS systems in urban vehicles is necessary to gurarantee that they are safe for VRUs.

MULTI-MOBY PROJECT

H2020 project

Website

Javier Romo Garcia
CIDAUT Foundation
javrom@cidaut.es