



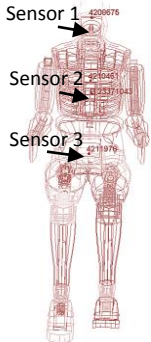
# ODYSSEE - Explore new industrial horizons

## Optimal Decision Support System for Engineering and Expertise

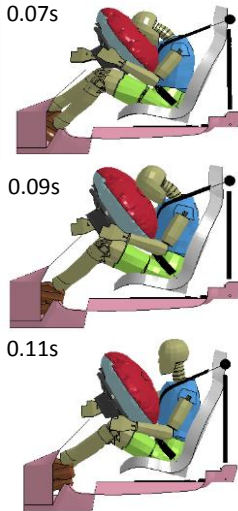
### Case study - Sled Test : Dummy FE model replaced by a reduced model

#### FE model of a frontal sled (car crash)

Initial velocity: 56 km/h = 15.56 m/s; The airbag is activated given a certain deceleration. The car speed and the gas injection are represented by time-curves in the FE model.

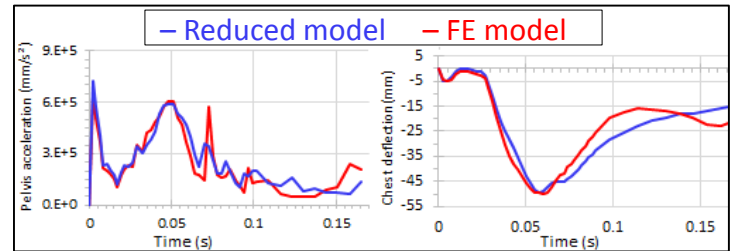


The sensors placed on the dummy provide responses (force, acceleration, deflection) used to estimate the injuries. 9 models have been run with 3 parameters:  
 - 2 slopes of the car speed curve;  
 - 1 coefficient applied at the mass flow rate injected.

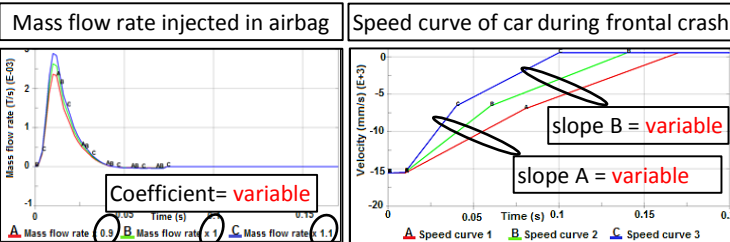


#### Reduced Models versus FE models

Different type of responses have been extracted for each of 9 runs (chest deflection, head acceleration, pelvis acceleration...). This database of 9 (time dependent) responses is used to generate a reduced model for each type of response studied.



Note: These predicted responses (FE and reduced) given a new variable set not used in the creation of the data base.



#### Reduced model with ODYSSEE

CADLM proposes the reduced model with Lunar module integrated in ODYSSEE platform.

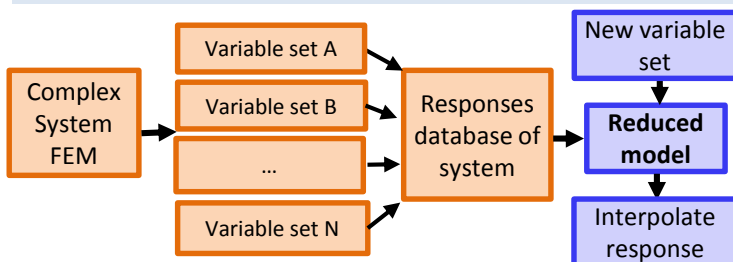


ODYSSEE, is an innovative platform with a rapid ROI, allowing to build specific tools involving industrial data analysis.

#### Reduced model concept

A reduced model is a representative model of a complex time-dependent system with associated variables and corresponding responses. Thus the complex and heavy (in terms of resolution time) FE model may be replaced by the reduced model. The algorithms used by CADLM help to maintain accurate system results. This one leads to the possibility to interpolate responses for new variables.

Contrary to response surface methods, which converge as number of tests increase, reduced models are shown to converge much faster requiring less computations (enough to extract the dominating modes).



#### Strengths of reduced model :

- Real-time behaviour prediction (time saving)
- On-board (Limited computing resource)

These models are useful and efficient for parametric studies, optimization, real-time simulation, etc.

Available as stand-alone modules, it allows to adapt easily to your needs without superfluous options. This optimal decision support system tool based on machine learning technics developed by CADLM was the winner of the 1<sup>er</sup> price innovative product in 2015, voted by the public at the system@tic convention.

#### Why ODYSSEE ?

- Predicting behaviour in real-time ;
- Automation of industrial processes ;
- Decision support ;
- Saving time in complex process execution ;
- Saving time by designing embedded reduced model ;
- Saving time in correlation experiments /calculation ;



CADLM proposes various services around ODYSSEE, customized or your problem and accompanies you to find the best solution to your problem (Studies, Customized products, Training).

#### Conclusion

A reduced model gives a good idea of results for an industrial process and accelerates research and design of new products.

A reduced model can be used in different industries : Automotive; Aerospace and Defence; Consumer products; Manufacturing; Civil engineering and Energy; Healthcare.

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