



Position and Personalize Advanced Human Body Models for Injury Prediction

NEWSLETTER 1

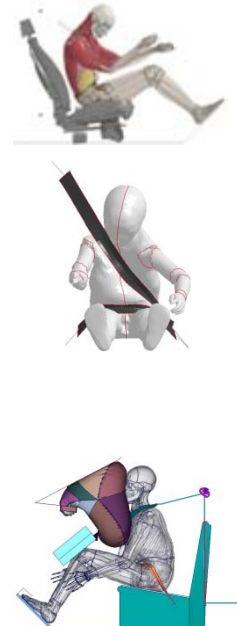
Motivation and Objectives

In passive safety, **advanced Human Body Models (HBM) for injury prediction** based on the Finite Element method have the potential to represent the population variability and to provide more accurate injury predictions than alternatives using global injury criteria. However, these advanced HBM are underutilized in industrial R&D. Reasons include difficulties to position the models – which are typically only available in one posture – in actual vehicle environments, and the limited representation of the population variability (size, weight, etc.).

The main objective of the PIPER project is to **develop “user friendly” tools to position and personalize these advanced HBMs**. By facilitating the generation of population and subject-specific HBMs and their usage in production environments, the tools will enable new applications in industrial R&D for the design of restraint systems as well as in research.

Main steps / Work Packages (WP)

- Definition of the specifications for the personalizing and positioning tools. Improvement of child human models and accident reconstruction environments; evaluation of the tools in actual applications including adult and child biomechanics; definition of guidelines for use of the tools (WP1)
- Development of predictors of posture and shape to help drive the personalisation and positioning tools based on imaging and postural data (WP2).
- Development of a modular framework to position and personalize human body models (WP3)
- Dissemination of results, facilitation of test by potential user (WP4)



Key points and deliverables

The tools will be shared with the community using an Open Source License. It will ensure easy access and allow future evolutions and contributions from the community. The tools aim to be model neutral. The license will allow business services around the tools.

Predictors of posture and shape will be based on statistical databases (e.g. geometrical) that will be released under a similar license. You are welcome to contact us if you think you have data that could be useful for these databases. The needs and priorities of the community are synthesized based on end users requests.

Key figures

4 M€ Budget
3 M€ EC Funding
42 months, from
1st Nov. 2013

Overview of progress during the first year

WP1 Specifications and applications

User acceptance is critical for the success of the tools. Therefore, before starting the development process, their specifications need to be defined based on the needs and priorities of potential users. The first task in work package 1 was to collect and summarize the necessary information from potential users of the PIPER tools required.

A systematic online survey (“survey regarding software tools for positioning and personalizing human body models”, Fig. 1) was developed. It included 60 questions and 32 explanatory graphics (see example in Fig. 2). The survey was successfully carried out and responses from 189 users were received. All questions received a substantial number of answers allowing detailed analyses. One of the interesting results was that more than 50% of the survey participants came from the industry which shows the high interest in the use of HBMs in industry. All results of the poll can be found on the PIPER website (www.piper-project.eu) in an easy to understand graphical presentation (see Fig. 3 and 4).

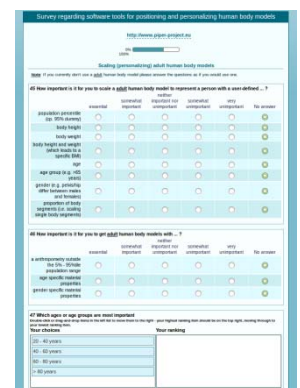


Fig. 1: PIPER online survey

Save the date: PIPER workshop Sept. 8 2015

In Lyon (France) just before the IRCOBI Conference (September 9-11)

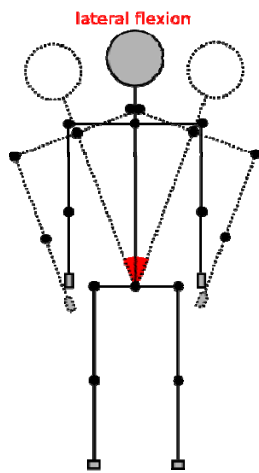


Fig. 2: Explanatory graphics

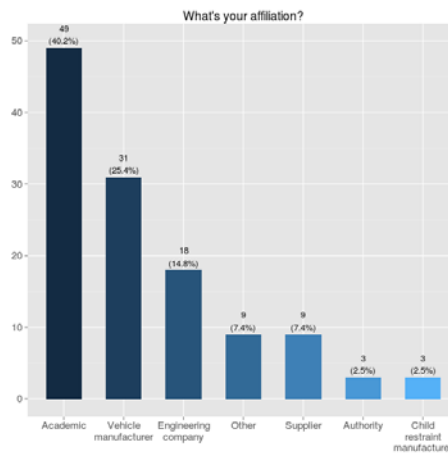


Fig. 3: PIPER survey result

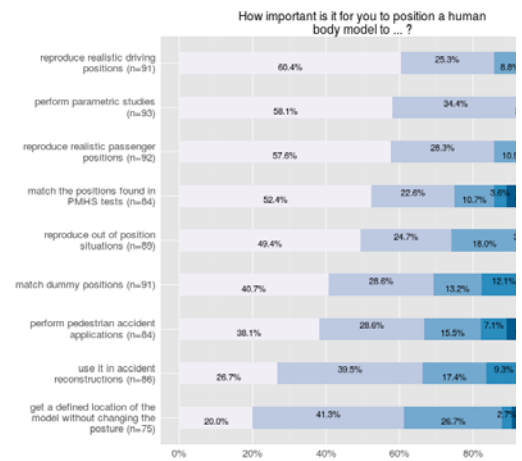
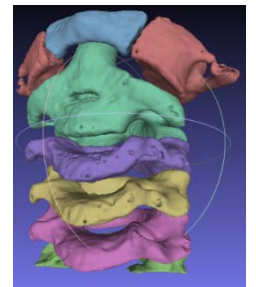


Fig. 4: PIPER survey result

WP2 Predictors of posture and shape

The main objective of this WP is to develop a software tool to describe the human body shape and posture using statistical and optimization approaches. A review was performed on available data, models and methods (a priori knowledge) for describing human body shape including whole body external shape, internal skeleton and organs as well as relationships between them. Data and methods for human body positioning were also reviewed including positioning tools used in automotive ergonomics. A particular attention was paid to spine position.

The future tool will combine literature results, existing datasets, new shape models derived from full body segmentations (ongoing effort, example of the right) and postural predictions to help define more realistic transformation in WP3. Next step will be mainly focused data collection.

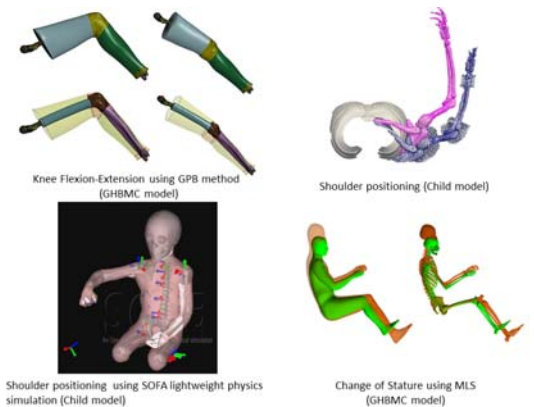


WP3 Positioning and personalization methods and tools

The main objective of this WP is to develop software to personalize and position FE models. It will combine WP2 results with methods developed in this WP. The input will be a FE model in a standard position and the output a customized model in a different position.

To help identify existing capabilities and needs for future developments, an evaluation of some available methods and tools was carried out. The evaluation was limited to geometrical or real time modelling approaches (as opposed to a full simulation).

Results from this evaluation (which will be available on the PIPER website after EC approval), helped define functional specifications. Next stage will focus on the development of the first version of the software, implementing interfaces with existing whole body FE models and first deformation modules.



Project participants



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Foundation for Research and Technology Transfer - Delhi



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