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Applications of the GHBMC models using the PIPER tools

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Introduction:

While the performance of Human Body Models (HBM) such as the GHBMC family has been improving, positioning them in application environments and personalizing them to match different body dimensions can be a challenge. The PIPER EU project aims to develop methods and tools to facilitate such tasks for leading HBMs including the GHBMC. The objectives are to report on the support of the GHBMC models in the PIPER tools, and to show two examples of applications.

Materials and Methods:

The applications selected for the study two of the GHBMC model families:

- Submarining: the GHBMC M50 v4.4 model was used in simulations of sleds conducted on Post Mortem Human Surrogates (PMHS) and published in Luet et al. (2012). The PIPER tools were used to position the model on the sled and to adjust its anthropometric characteristics to match those of the PMHS (using measurements performed on the CT-scan).
- Pedestrian: the simplified GHBMC M50 model was used in simulations of pedestrian tests conducted with PMHS and simplified vehicle front-ends. The PIPER tools were used to position the model as the PMHS (leg in particular) and also to adjust its characteristics to better represent the specific PMHS

In both cases, metadata were developed to allow the import of the models in the PIPER tools.

Results and Discussion:

Through the applications, the results include an overview of the metadata definition and the software capability. The focus is on the methodology (time needed for the transformation, workflow definition and comparison) rather than specific biomechanical results. Positioning with PIPER will be compared with positioning by simulation, and scaling using anthropometric dimensions will be compared to the absence of scaling.

Conclusions:

While work is still in progress, the tools could significantly help future work with the GHBMC models in a range of applications (e.g. better matching the PMHS characteristics in validation studies, positioning in a vehicle). The PIPER tools (will be → were) released under the Open Source GPL license (v2 or later) end of April 2017.

References:

Luet et al. (2012) Stapp Car Crash J. 2012 56: 411-442

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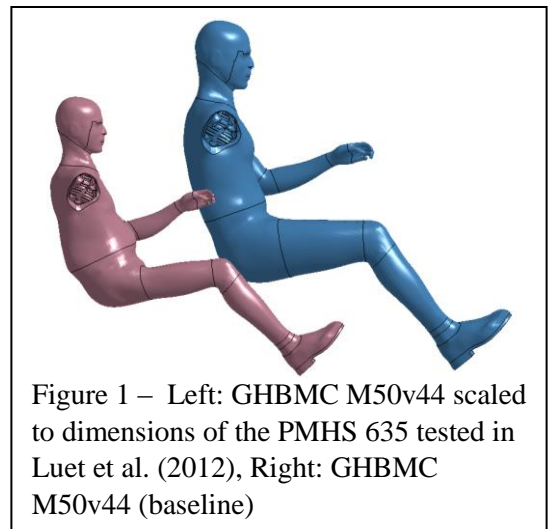


Figure 1 – Left: GHBMC M50v44 scaled to dimensions of the PMHS 635 tested in Luet et al. (2012), Right: GHBMC M50v44 (baseline)

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