GiD LS-DYNA GRAPHICAL INTERFACE

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Abstract. *Graphical interface between GiD and the general purpose finite element code LS-DYNA is presented. GiD can be used in both preprocessing and postprocessing of LS-DYNA simulations. LS-DYNA is developed by LSTC (Livermore Software Technology Corporation) and it is used to analyze the large deformation dynamic response of structures including structures coupled to fluids. GiD-LSDYNA interface is focused on crash test problems and its capabilities are discussed in this paper.*

1 INTRODUCTION

The graphical interface between GiD and LS-DYNA has been developed by CIMNE in collaboration with COMPASS and includes both the transfer of GiD preprocessing data into LS-DYNA and the transfer of simulation results from LS-DYNA into GiD for postprocessing. It has been programmed with a new interface development method based on a XML tree (which makes easier data processing) and takes advantage of both programming languages: TCL/TK for its graphical representation capabilities and C++ in order to work with elements and nodes data.

LS-DYNA is a general purpose finite element code that is developed by LSTC (Livermore Software Technology Corporation). It is used to analyze the large deformation dynamic response of structures including structures coupled to fluids. The main solution methodology is based on explicit time integration. Specialized capabilities for airbags, sensors and seatbelts have tailored LS-DYNA for applications in the automotive industry. The software accurately predicts a car's behavior in a collision and the effects of the collision upon the car's occupants, so it is a powerful tool to analyze vehicle designs.

2 GID LS-DYNA INTERFACE

Even if the interface is loaded from GiD as a classical problemtype, it offers a completely graphical enviroment powered by a *Toolkit for problemtypes creation* developed by Compass

Ingeniería y Sistemas S.A. With this new programming method, problem and groups data is always displayed on the left side of the screen during preprocessing (Figure 1), making its management easier for the user. In the same way, some options are displayed in an aditional data tree during postprocessing to make faster results analisys (Figure 2).

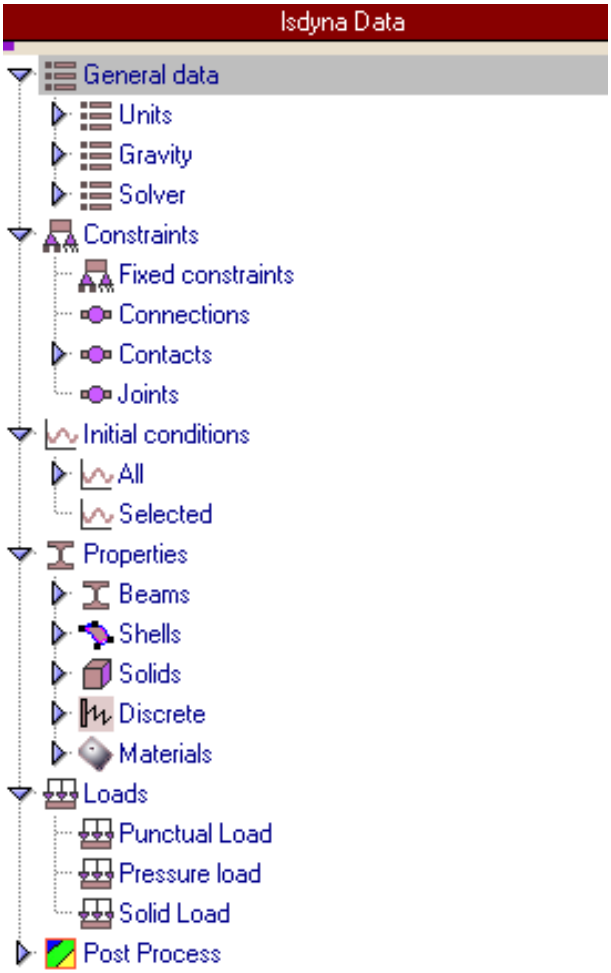

Figure 1: Preprocess options

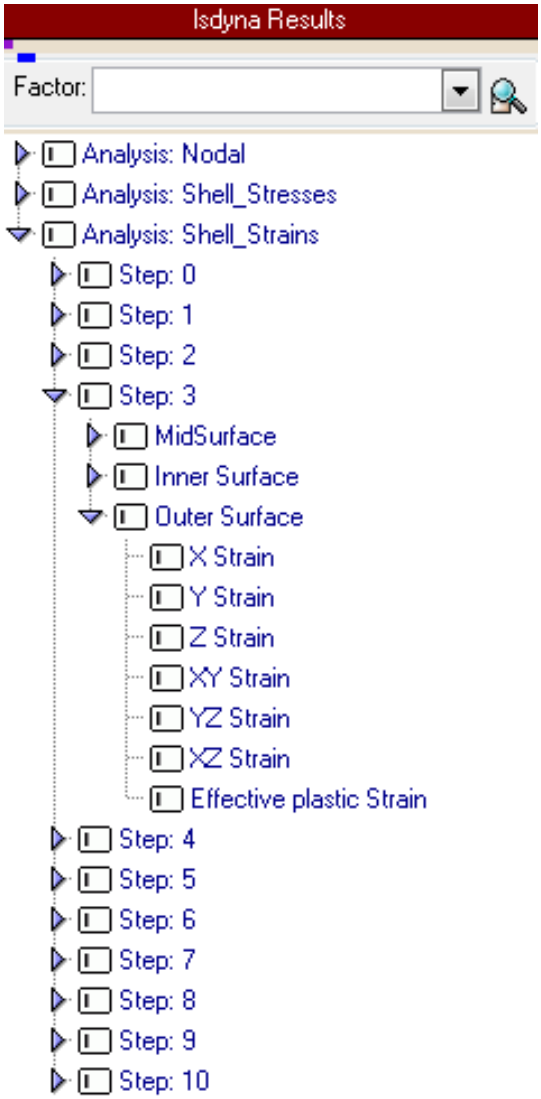

Figure 2: Postprocess options

Groups are defined by their mesh elements or geometry entities, and they can be created and edited in an easy way with the help of a groups edition window (Figure 3).

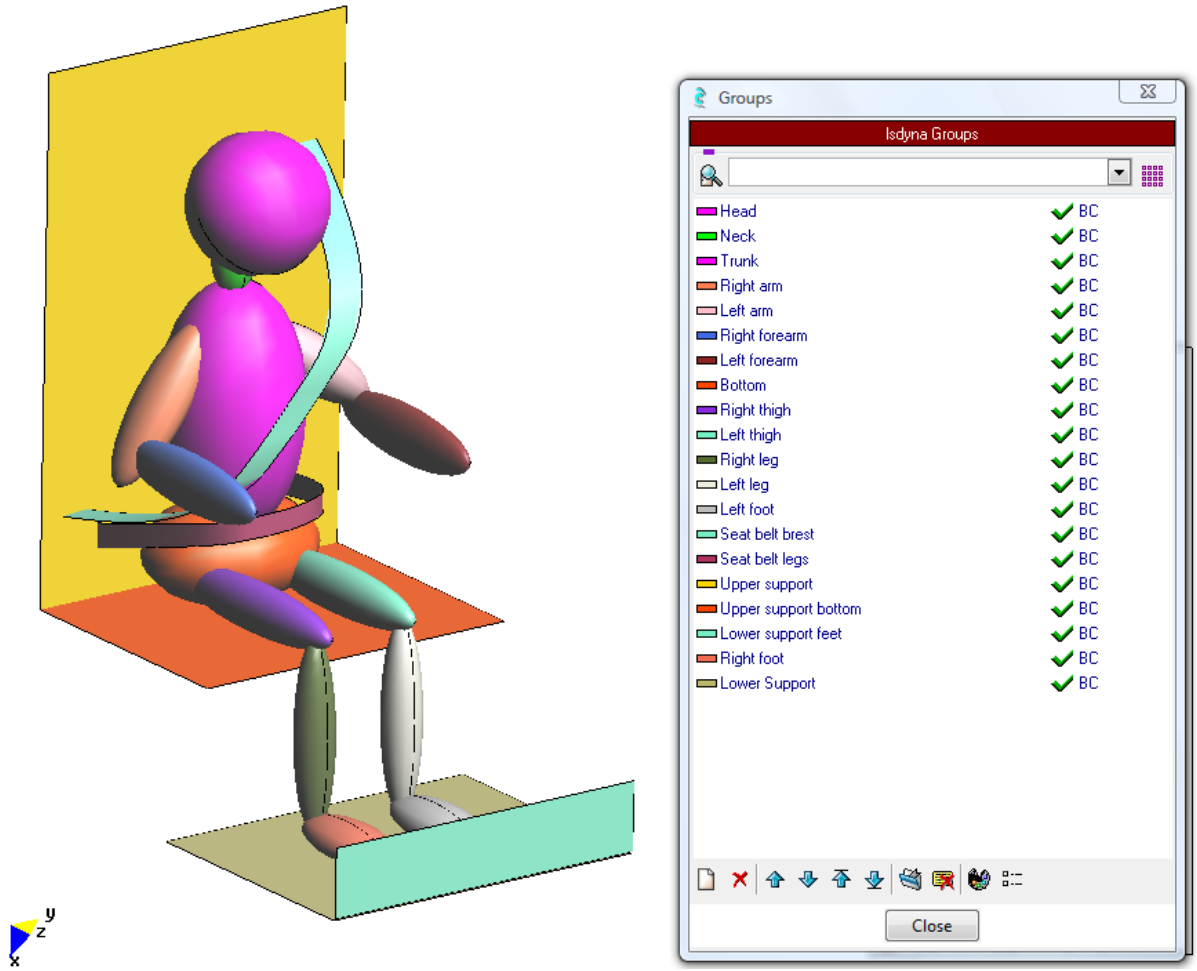

Figure 3: Groups edition window

The aim of the interface is to define crash test problems, which is the main LS-DYNA application as stated earlier. It is able to completely define and to work with several elements (beams, shells, solids, dampers and springs) as well as elastic, plastic and anisotropic materials. Dynamic loads and constraints have been implemented as well. Interface development has been focused in both contacts and joints definition, which are two of the most important problems during crash test problems preprocessing.

Some simple crash tests have already been simulated with GiD-LSDYNA interface, showing up its performances. Next implementation phase will provide the interface with seat belts and airbags definition tools. Therefore, the interface will be a very powerful tool to pre and postprocessing the majority of crash test problems.

2.1 Benefits of GiD-LSDYNA interface

LSTC develops its own pre and postprocessor (named LS-PREPOST), which is always provided for free with LS-DYNA licenses. This software works with every kind of LS-DYNA problems, but it has two important weaknesses. On one hand its 3D elements meshing capabilities (LS-PREPOST is focused on 2D mesh generation) and on the other hand its not

too much user-friendly graphical interface. In order to satisfy these requirements some graphical interfaces with other commercial pre and postprocessors (as Hypermesh or Oasys) have been developed by other societies.

3 CONCLUSIONS

There are many reasons why GiD is an excellent addition to these available softwares. First, the GiD LS-DYNA user-friendly interface allows the user to apply the whole problem conditions and to analyze its results in a completely graphical environment. Moreover, GiD improves LS-PREPOST meshing capabilities and it is also able to import a large number of CAD and mesh formats. Its relative inexpensive cost together with these technical performances make GiD an attractive choice as a pre and postprocessor for LS-DYNA simulations.

In summary, GiD users have with this interface the opportunity to work with one of the most popular commercial solvers for nonlinear dynamics analisys. On the other hand, LS-DYNA experienced users could be attracted by its completely user-friendly environement, which makes easier and faster crash tests definition.

4 ACKNOWLEDGEMENTS

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REFERENCES

[i] LSTC official web page, http://www.lstc.com/
[ii] LSTC, “LS-DYNA theoretical manual” (May 1998)
[iii] LSTC, “LS-DYNA keyword user's manual”, Version 971 (May 2007)
[iv] E.Oñate, “Cálculo de Estructuras por el Método de Elementos Finitos”, *CIMNE* (1992)