

Best Fit GUI for Metal Forming in LS-PrePost® 4.5

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INTRODUCTION

Best fit technique is frequently used in sheet metal forming to assess springback accuracy. This has been done for quite a while with LS-DYNA's keyword `*CONTROL_FORMING_BESTFIT_OPTION`. The keyword requires a few entries, for example, target and source node sets, target and source mesh files, etc., which could become quite easily mixed up if done manually. In addition, one has to execute LS-DYNA to get the best fit results.

LS-PrePost Best Fit GUI:

Since the target and source node sets need to be defined in LS-PrePost, it makes sense to output the entire required keyword input from LS-PrePost, and better yet, with a single click of a button in LS-PrePost one should be able to execute the LS-DYNA run in the background and then, when the results are available, directly read into LS-PrePost for analysis, etc. It is possible to include all these functions within a GUI. A Graphical User Interface (GUI) is thus created in LS-PrePost 4.5 to do just that.

In this paper, we only showcase the features in the GUI since the best fit function in LS-DYNA has been QA'ed for quite a while and deemed very robust and reliable.

As shown in Figure 1, the GUI can be invoked by accessing the APPLICATION menu at the top left corner of the menu bar. Once the source and target parts (refer to Keyword Manual I) are imported into LS-PrePost, one can define the target part (PID 100) by selecting it from the main graphics window; similarly source part (PID 2) can be defined, shown in Figure 2. Also, there is an optional check box to output the separation distances between the two parts in vectors (`*CONTROL_FORMING_BESTFIT_VECTOR`), for optional vector display in LS-PrePost. The "Apply" button will write out the LS-DYNA output files required and start executing LS-DYNA for best fit calculation in the background. Once the best fit calculation is finished, one can get the results from LS-DYNA run by clicking on "Load Results" under the "Results" tab (Figure 4). Once the results are loaded, the "Load Results" button will turn green indicating the results are available for viewing. At this point, one can choose either display in fringe color contours the separation distances between the source and target part after the best fit (Figure 5) or display it in vectors (Figure 6). Various plot options also exist both in "Contour" or "Vector", and to turn on/off either target or source part.

There are two convenient buttons for a more detailed analysis of the best fit results. As shown in Figure 4, the "Identify" button takes you directly to *Eletol/Ident menu* so the nodes can be picked on the main screen and their separation distances displayed (Figure 7), which saves a number of

clicks. The “Section Plane” feature (Figure 4) takes you directly to *Model/Section* menu so section plane cuts can be made (Figure 8).

Note although it is transparent to the users, the necessary input files written out for LS-DYNA run are created in the running folder as shown in Figure 9, where `bestfitcontrol.k` is the main input file, which includes `bestfitcontrol_source.k` (source part mesh file in keyword format) and `bestfitcontrol_target.k` (target part mesh file in keyword format) files and `bestfit.out` is LS-DYNA result file after a best fit calculation.

Note also there is a small program (which does not require a license) called `lsdyna_bestfit.exe` must be added in the LS-PrePost4.5 installation folder, typically in `C:\Program Files\LSTC\LS-PrePost 4.5`.

REFERENCE:

LS-DYNA User’s Manual (draft).

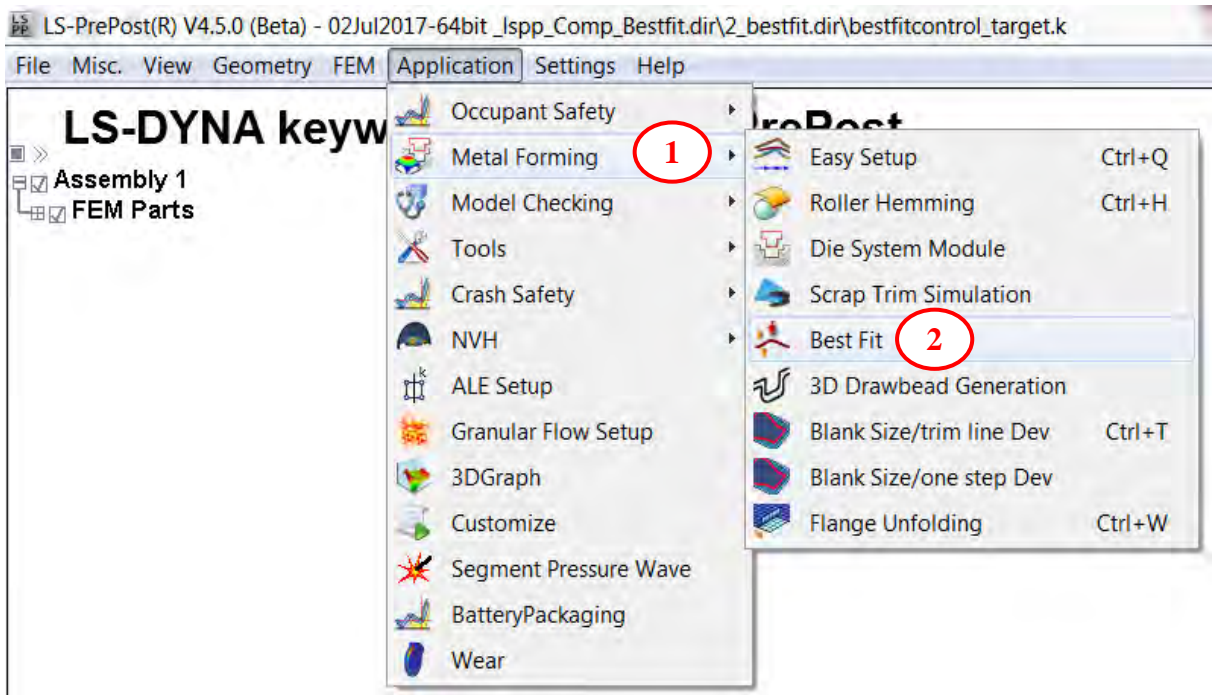


Figure 1. Activating the Best Fit GUI in LS-PrePost 4.5

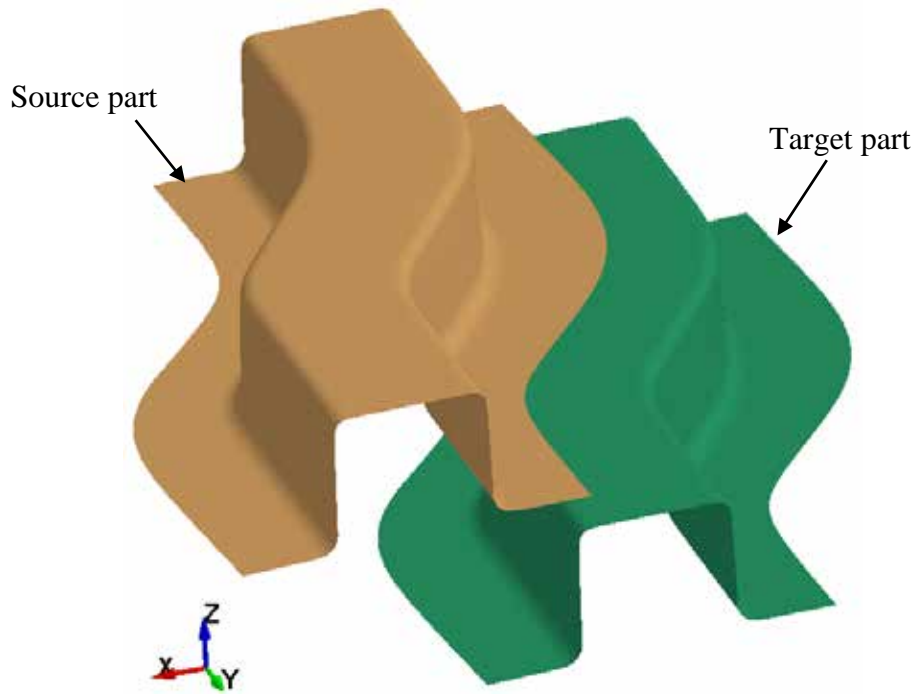


Figure 2. Target and Source Parts.

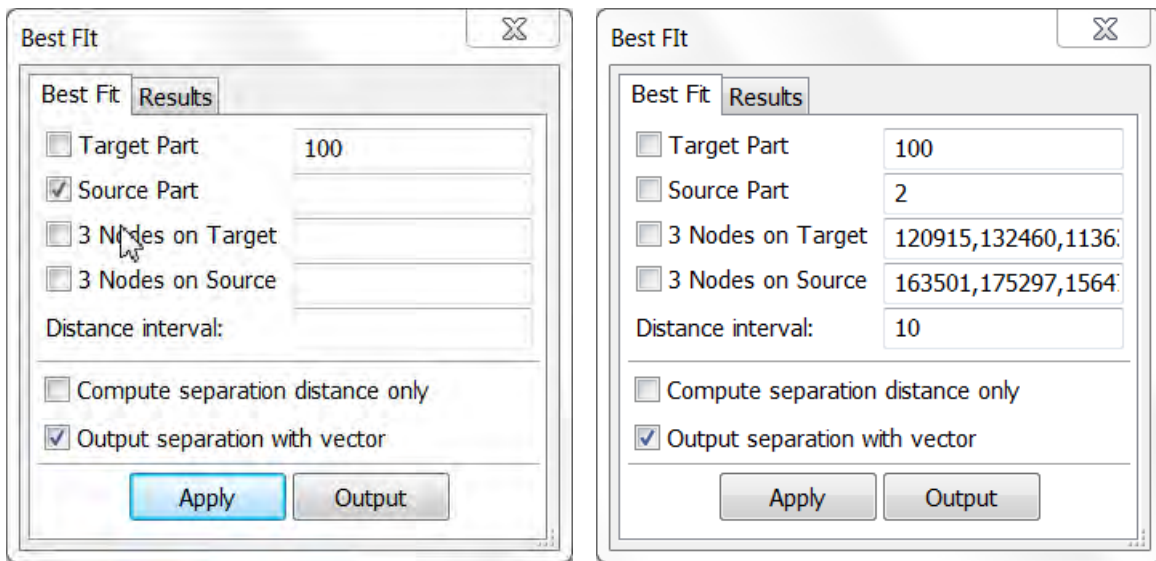


Figure 3. Define target and source parts' PIDs.

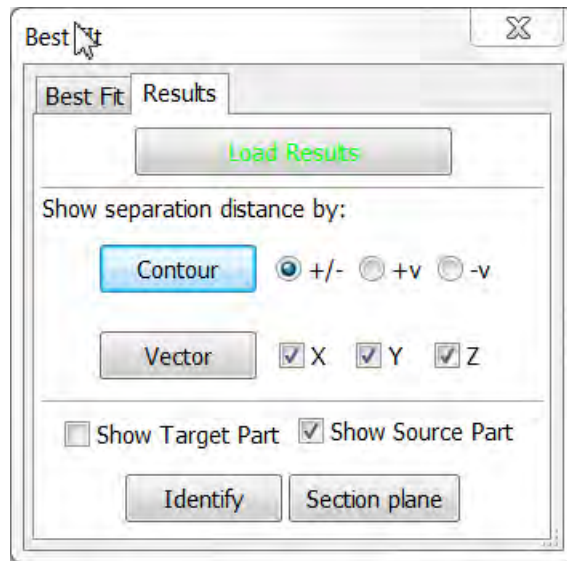


Figure 4. Loading LS-DYNA results into the GUI.

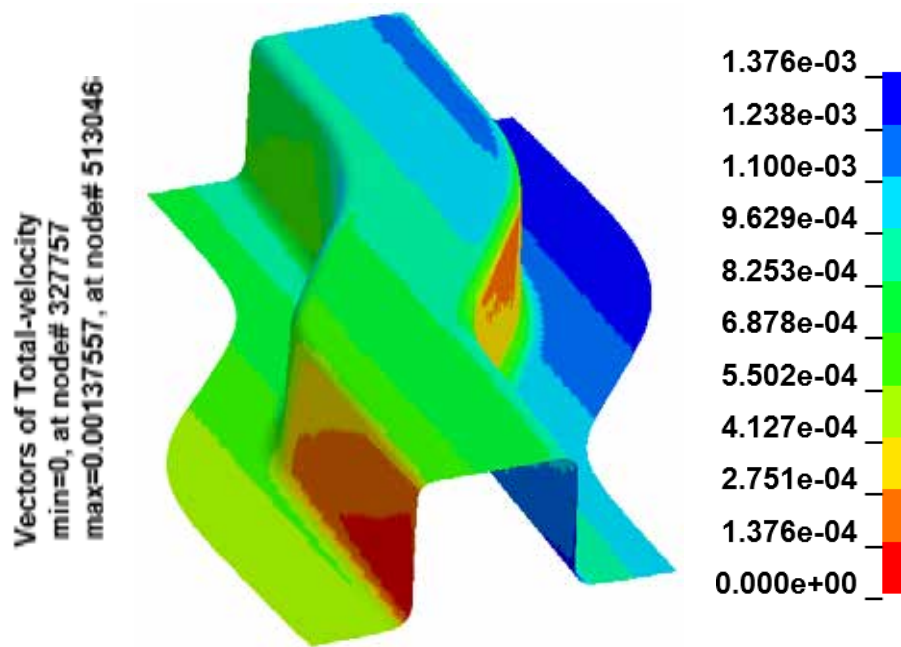


Figure 5. Color contour display of separation distances after best fitting.

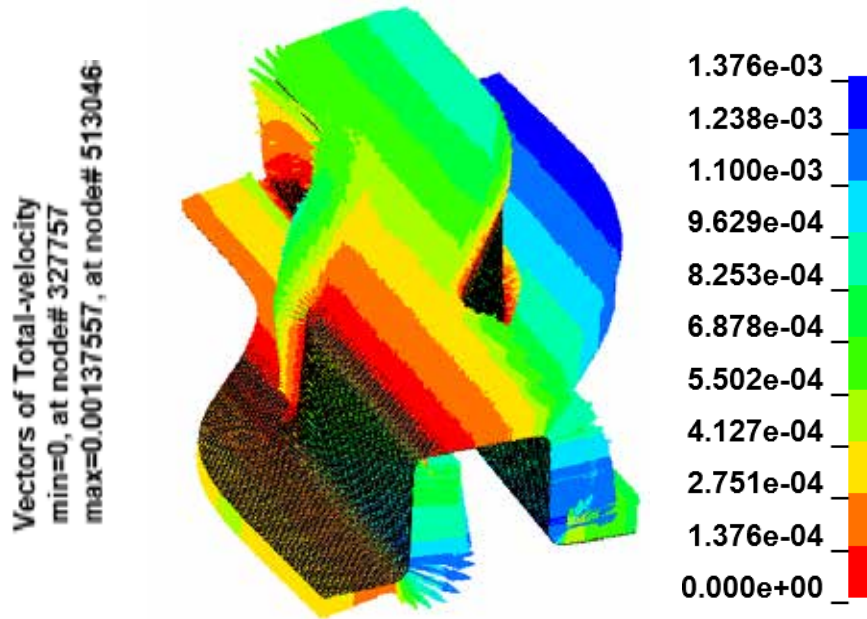


Figure 6. Vector display of separation distances after best fitting.

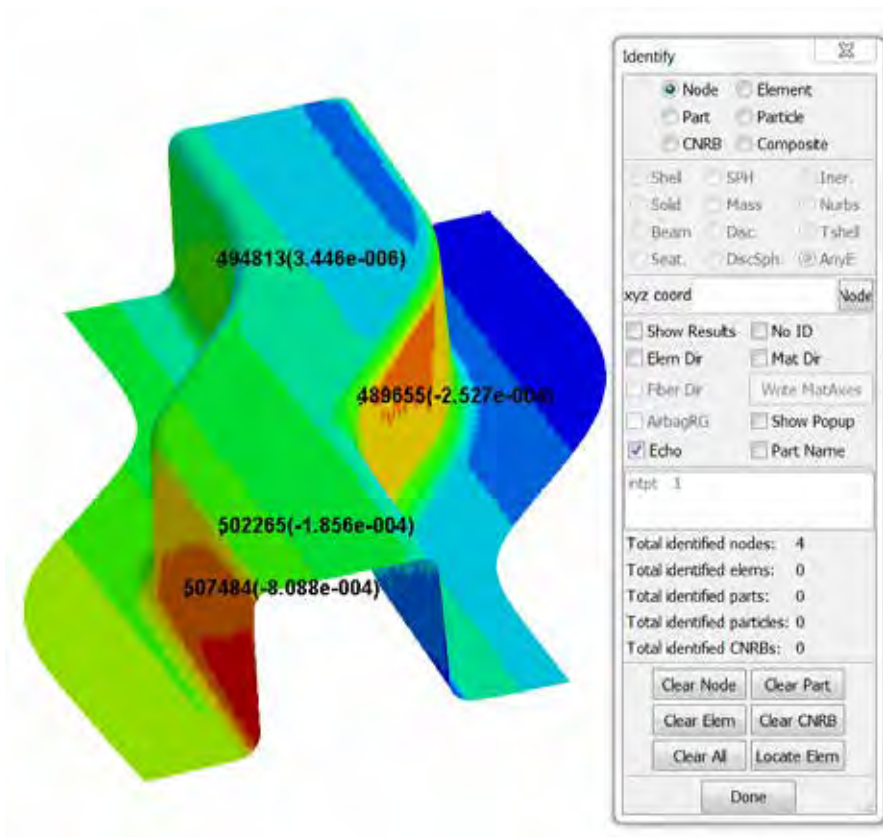


Figure 7. "Identify" separation distances between source and target parts.

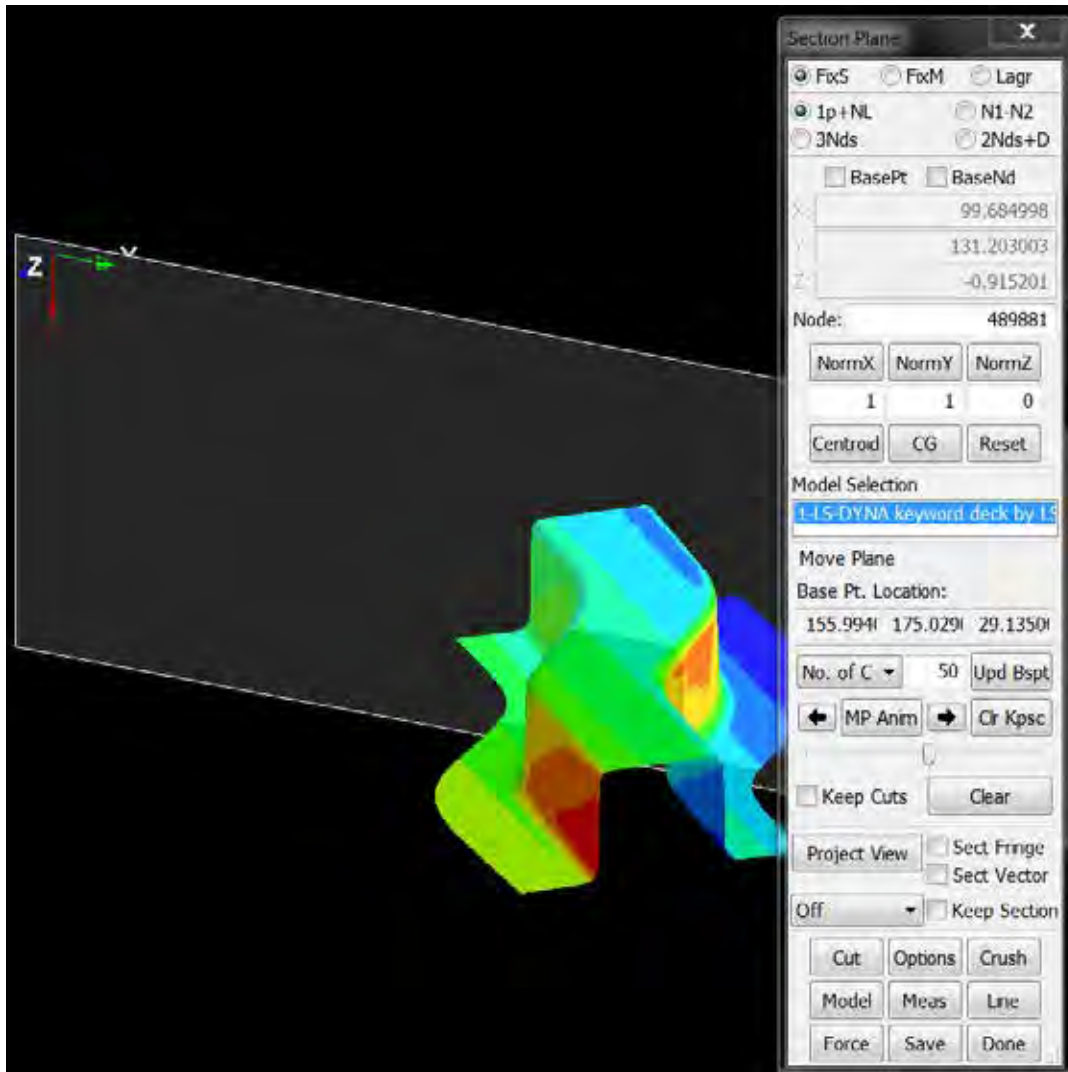


Figure 8. “Section Plane” takes you directly to the menu option for section cuts.

bestfit.out	7/7/2017 5:30 PM	OUT File	9,608 KB
bestfitcontrol.k	7/7/2017 5:29 PM	K File	1 KB
bestfitcontrol_source.k	7/7/2017 5:29 PM	K File	6,376 KB
bestfitcontrol_target.k	7/7/2017 5:29 PM	K File	6,376 KB

Figure 9. Input files generated by LS-PrePost for LS-DYNA best fit execution.