Visual-Environment

Integrated Pre and Post Environment for LS_DYNA

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Abstract:
Visual-Environment (VE) is an open collaborative engineering environment framework or platform called as Open VTOS (Virtual Try-Out Space). VE is an integrated suite of solutions, which has different contexts seamlessly linked for Crash and Safety, Durability, NVH and others. The applications of interest for supporting LS-DYNA based processes are: Visual-Crash DYNA (VCD)-a pre processor for LS-DYNA, Visual-SAFE-an advanced pre-processor for safety features, Visual-Mesh a general purpose mesher, Visual-Viewer (VVI)-a general purpose plotting and simulation application, Visual, Visual-Process Executive-an application for CAE process customization and repetitive tasks automation. These are some of the contexts available in VE but focused to support LS-DYNA.

Globalization, new regulations and changes in technologies are influencing the simulation life cycle. These changes are driving the pre and post processing environments for remarkable improvement in productivity, usability and innovative approaches. This paper describes the key features of Visual-Environment 4.0 for LS-DYNA and usefulness of these features in Crash and Safety simulation with productivity examples and process automation.

1   Introduction

Visual-Environment (VE) is integrated environment for all types of simulations. It is a context based environment for different simulation needs such as Visual-Crash Dyna (VCD) for LS-DYNA, Visual-Life Nastran (VLN) for NASTRAN, Visual-Mesh (VME) for meshing and model assembling, Visual-Viewer (VVI) for post processing, Visual-Safe (VSA) for advanced safety applications, Visual-Process (VPR) for CAE process automation and so on. All the contexts are integrated seamlessly to facilitate the user to navigate within one environment with multiple solver accessibility. These contexts features are briefly explained below from the LS-DYNA users point of view.

1.1   Visual-Mesh

Visual-Mesh is the state of the art mesh generation and mesh editing tool for Crash, NVH, Safety, Thermal, Casting, Welding and Stamping applications. Visual-Mesh completely automates the generation of high quality lower order and higher order 1D, 2D and 3D meshes. It provides excellent CAD cleanup features to idealize the CAD for meshing. It also provides batch-meshing utility based on topology meshing with user guidance as well as automatic approach.

1.2   Visual-Crash Dyna

Visual-Crash Dyna (VCD) is the enhanced version of EASi-CRASH DYNA inheriting all standard features of VE that makes VCD to be highly productive tool. It provides users with fast iteration and rapid model revision process, from data input to visualization for crashworthiness simulation and design. This environment provides quick model browsing, advanced mesh editing capabilities and rapid graphical assembly of system models. VCD allows graphical creation, modification and deletion of contacts, materials, constraints, control cards and all crash entities. In VCD, model validation tools helps in correcting kinematic and modelling errors and improve the model before submitting it to a solver, thus saving time and resources.

1.3   Visual-Viewer

Visual-Viewer is the advanced Post-Processing and report generation tool with state-of-the-art Plotting/Viewing features. Viewer is built on the multi page/multi plot environment, which enables the user to group data into pages and plots. Viewer is designed with intuitive and sleek user interface as windows-look-and-feel. Complete plotting session is captured and it can be re-executed as session or templates without losing any data. It is also fully command-driven that enables the user to execute at command-line. The page printing of visual-viewer complies with "What You See Is What You Get"

1.4   Visual-Process

Visual-Process is an advanced CAE environment for process customization and automation. This tool helps to capture, customize and automate corporate best practices and any regulatory CAE procedure such as FMVSS, ECE etc. The Visual-Process Executive comes with many standard templates as defaults such as Frontal Impact, Side Impact, Rear Impact, Interior Head Impact, Pedestrian Impact, Roof Crush, Crash-Stamp Coupling, and Head Impact Report etc.

1.4.1 Following are the benefits of Visual-Process

- Shortens time per design iteration
- Reduces drudgery, inconsistencies and errors
- Streamlines data management
- CAE Experts can add engineering value to the design process
- Provides intuitive environment for new users and non specialists
- Enables resource mobility
- Enables integration and re-usability of enterprise-specific tools
- Establishes high productivity and standardization

2   Productivity Features in Visual-Environment 4.0 for LS-DYNA

Following are some of the features which bring highest productivity for LS-DYNA users.

- Seat Positioning
- Sub-Assembly Replace
- Model Organizations
- Auto Dummy Positioning

- Macros
- Prescribed Structural Motion (PSM) Extraction
- Video Overlay

2.1   Seat Positioning

This tool is a user-friendly graphical interface to define the linkage mechanism for seats by selecting parts and nodes to define links. This has options to position manual seats and power seats. Complete seat mechanism can be built by identifying the joint locations, axis of the rotations, movable seat nodes/parts, defining traverse path, identifying the forward and rearward points, notch points, identifying seat back/head rest parts/nodes. The dummy and seat belt can associated with seat for positioning by auto move. Using this GUI user can move the seat in regulatory standard positions and any other deserved positions by graphical pick.
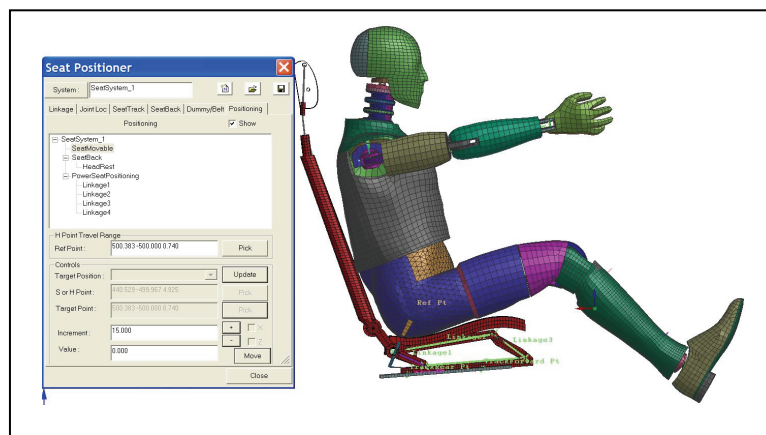
2.2   Sub-Assembly Replace

This is a simple GUI to replace any sub-assembly by another one with options to retain existing transformation or replace with new transformation definition. During this replace process Visual-Crash Dyna automatically resolving connections and referred entities.
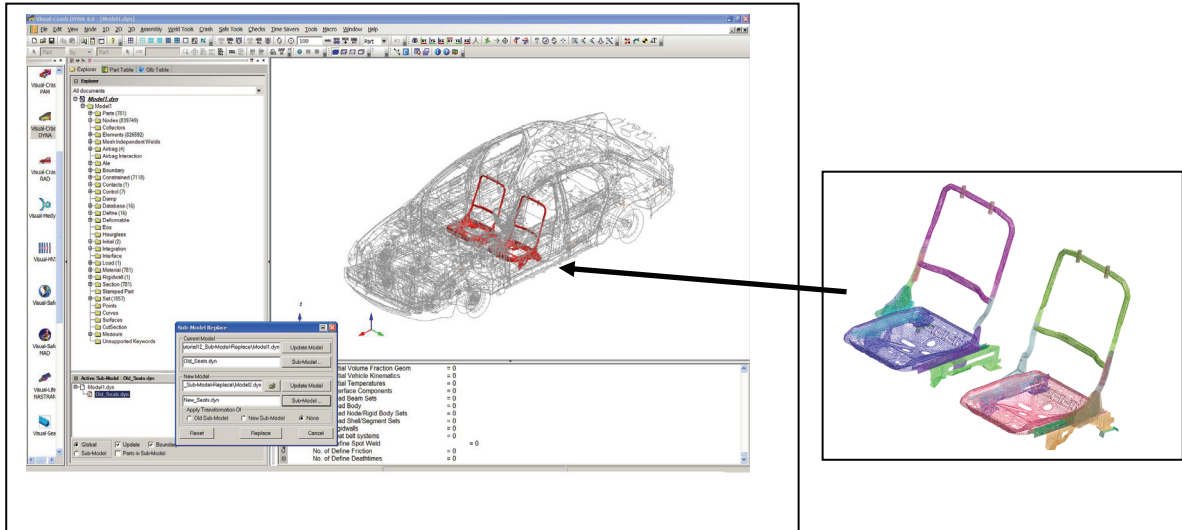

2.3   Model Organizations

Organizing the data easily, quickly and efficiently by
- Retaining include files without merging all data into one single model.
- Creating, modifying, deleting and viewing of include files as sub-models and main model.
- Identification and automatic grouping of connections – both within and between sub-models (include files)
- Ability to locate any entity and identify the appropriate sub-model
- Ability to work with selected sub-model and export only selected sub-models as include files.
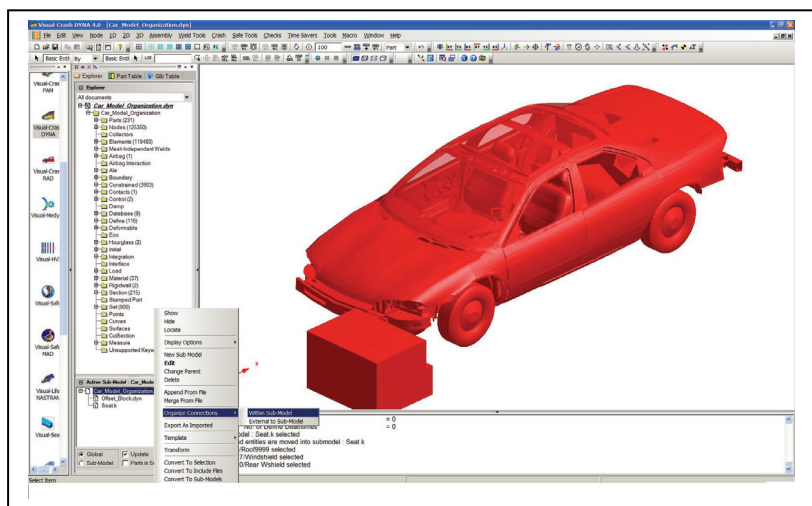
2.4   Auto Dummy Positioning

VCD supports FTSS and LSTC dummy models for auto positioning by defining source and target points. Positioning can be done by Point, Vector or by distance. While positioning dummy there are options to lock the DOF individually or the branch and fix the bodies in global coordinate system. Also users can copy and paste the rotation with branch.
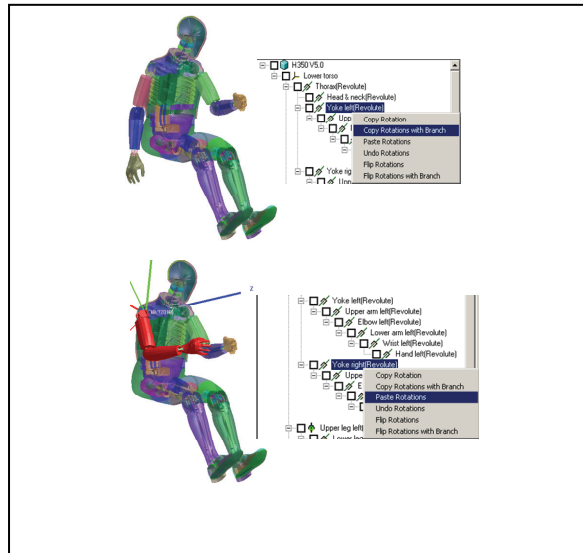

2.5   Macros

Visual-Environment helps to parameterize the repeated simulation tasks by capturing macros. All actions performed with in Visual-Environment can be recorded using this feature. When it records the macro, it will automatically detect all input parameters and allow the users to parameterize them further. It generates the macro code automatically with selected parameter information which can be edited if needed. It allows users change the input parameters and execute the macros.
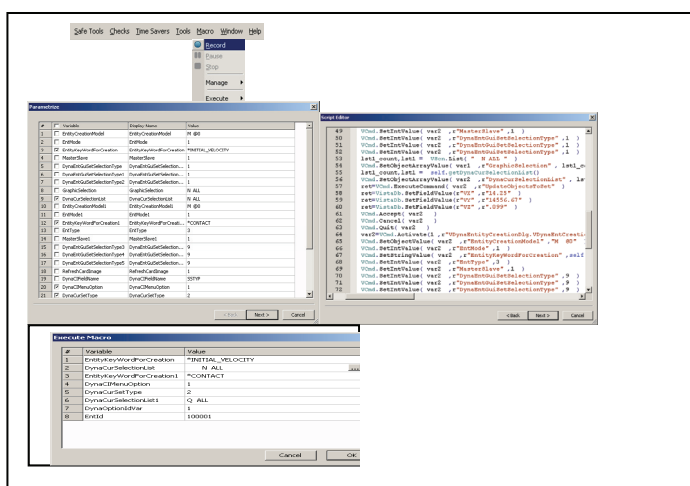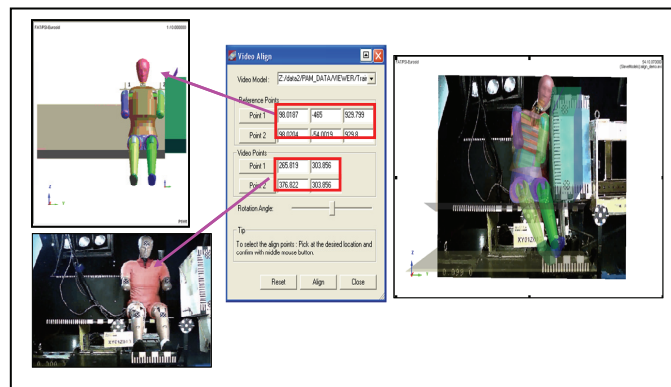
2.6　PSM Extractions

Visual-Viewer's new PSM GUI helps to extract prescribed motion in LS-DYNA, MADYMO and other crash solver format for selected nodes in selected direction. This GUI allows users to extract displacement, velocity, and acceleration. Also it provides option to scale and offset the ID.
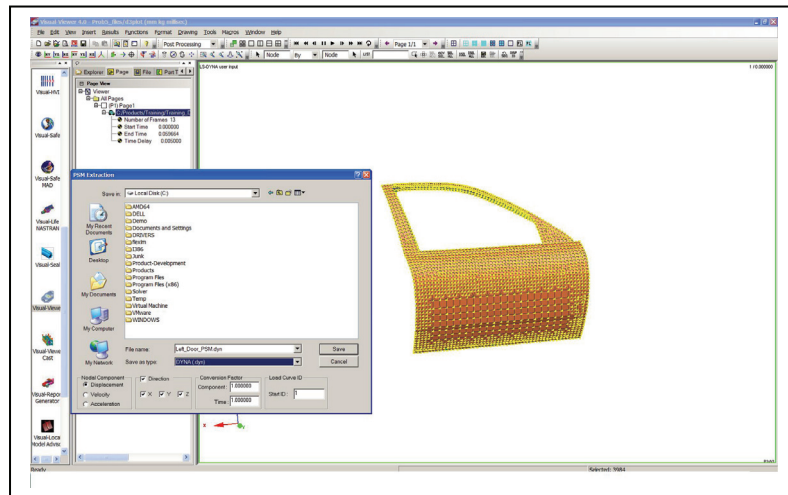
2.7　Video Overlay

Visual-Viewer provides an option to overlay video on Simulation, which helps users to compare the simulation with test. This functionality will help for better and accurate correlations.

2.8   Productivity

Feature	Conventional	VE, VCD
Seat Positioning	40-50 Hrs	< 4 Hrs
Sub-Assembly Replace	8-10 Hrs	< ½ Hrs
Model Organizations	10-20 Hrs	< 3 Hrs
Auto Dummy Position	6 -8 Hrs	< 2 Hrs
Macro		< 5 Mins
PSM Extractions	8-10 Hrs	< 1 Hrs
Video Overlay		**< ½ Hrs**

3   Summary and Conclusions

Visual-Environment is continuously updated to adopt changes in technologies and new regulations. For example dummy positioning based on UMTRI guidelines. This paper describes the few key features of Visual-Environment 4.0 for LS-DYNA and usefulness of these features in simulation in general and crash and safety in specific. But Visual-Environment has plenty of other productivity features, which help users to complete the simulation in shorter duration.

 These benefits can be further improved by using process automation.

4   References

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