Multiphysics for IronCAD 2017: new technologies, features and updates (April 6, 2017)

New Technology in MPIC 2017

The biggest change in MPIC 2017 version is the adoption of the patented XMD (eXtended Markup language Data processing) technology after more than half a year for development and testing. MPIC 2017 update represents a huge technology leap in the FEA analysis and modeling.

The new XMD model represents a dramatic improvement and flexibility for fast product development, maintenance, and further expansion for more complex multi-physics simulations, and is a revolutionary change in the FEA/CAE industry.

The MPIC XMD model has two-way interchangeability to the AMPS product lines, and to different CAD products adopting XMD technology. We are promoting the XMD technologies to all CAE/FEA vendors in order to achieve further interoperability to speed up CAE adoption in design analysis.

All MPIC models prior to MPIC2017 will be automatically converted into the new XMD model when opened for the first time in 2017 version.

Major Enhancements

- All unit controls are now centralized in the initial system unit controls. Once the desired unit is selected, all dialogs and menus will follow the unit assigned and prompt the user to enter data in the global unit system selected. This is to avoid users accidentally entered the wrong data without noticing different default unit used in different dialogs of the previous versions. If the user changes the global analysis unit, then all entered data will be automatically converted into the new unit system without user intervention.
- New and improved thin layer contact penetration detection algorithm for complete automatic contact impact analysis.
- Result>Options page now includes a 'Save BMP Image' button for saving a .bmp file of the model screen with the currently visible FEA mesh and results.
- User is now able to change the analysis type to investigate different behavior of static/steady-state or transient, modal, buckling, etc using the same setup. This is most useful to help identifying problems in static/steady-state situation where there are unconstrained parts that will be flying away grow in temperature unbounded.
- Newly enhanced Sefea shell based on DSG (discrete shear gap) formulation for faster convergence. Other than triangle meshing, optional quad-dominated meshing is now added as well.
- For shell analysis, the quad SHELL4 Sefea formulation is now activated as it further improves the accuracy and convergence speed. For the 2nd order shell family, the buckling accuracy is also improved.
- Better meshing support for models that may have intended/unintended gaps in assembly.

2017 Product Update Enhancements

- Enhanced meshing and part intersection tolerance to allow for automatic large CAD assembly analysis. The refined discrete meshing algorithm will now accommodate much larger CAD assembly parts intersection tolerance and perform automatic healing/patching in meshing for the intended assembly analysis.
- Animation and bitmap capturing now enabled to work in all graphics mode rather than just in DirectX mode.
- Analysis report will now work with all localized path/filename with HTML direct link for report viewing.

- Faster "lock-free" multithread solver for the faster generation of CPU's. As the CPU gets faster and the memory bus now running at DDR4 speed, we have updated the internal synchronization timing so the multithread performance will run smoother and faster.
- New contact pressure calculation now gives higher accuracy in contact pressure prediction. Previously, the contact analysis Lagrangian Multiplier value along with the contact area estimation were used to compute the contact pressure, and result in much higher contact pressure as the contact tributary area calculation were sensitive to the convergence status. The new formulation now always computes contact pressure based on the final converged state.
- Enhanced stabilization process for tiny, bad or extremely thin/small element due to bad geometry or fast load stepping.

Minor enhancements

- Save AVI works best with the DirectX9 driver, and may not work well with OpenGL and OpenGL2 drivers. A warning message is added to warn user when using OpenGL model trying to produce the AVI video capture file.
- For frequency domain analysis, the non-zero prescribed deformation now will animate with the correct scale, and can also be varied based on the dependent frequency variation.
- Contour legend display has a refined color range for better result examination.
- Refined meshing glue/separate and refinement controls.
- Boundary Condition symbols are redrawn at a fixed size with respect to the view each time the model zoom is changed. If you zoom in, the boundary conditions are drawn smaller with respect to the model.
- The FEA fonts were changed to improve display of foreign characters.
- Support CSV file import/export using semicolon ";" as separator when localized CSV file is using comma "," as decimal point.
- Analysis Report now supports a direct viewing option to ease finding the generated report file.

Changes

- To toggle BC off and on, the user can no longer just enter the toggle times. He must set up a step function and the BCs are off when the step function is zero.
- Users can now select edges for pressure. This should not be used for normal pressure. To convert from the pressure (a force per area) into a force per length, the edge is assumed to have a meter width. So if the pressure is 1 psi, the force per length is 1 psi * meter = 39.38 pounds/inch.
- The default meshing density for shell/2D has been decreased as it is not necessary to use fine mesh for most problems.

Bug fixes

- Fixed an issue when switching simulation models too many times causing memory leaks and conflicts.
- Fixed a bug when in dynamic analysis, the initial velocity setting control was not working.
- Fixed a bug in 32-bit version in which Dir names (X, Y, Z etc.) didn't show up for the fixed position boundary condition.
- Fixed crash if created FEA mesh, deleted IC parts without using FEA sync and tried to redisplay mesh.
- When vector display removed and a contour is being displayed, the contour legend is redrawn to replace the vector legend that is removed.
- Multi-body parts are not supported. A warning has been added when multi-body parts are detected after Load, New FEA or Sync FEA.

- Error causing a crash when a face with a BC is deleted from a model and the Sync button is not used before the model is saved.
- For global acceleration and centrifugal loading, the TIME factor is limited to only piece-wise linear data.
- Fixed an solver freezing issue when more than 32767 material types are used.