

SPEED 3.1.2 Release Notes (11 - January - 2018)

Finite Element Solver

- Friction option added to contact.

Multi-material Euler Solver

- A general speed-up between 10% and 60 % could be achieved. On average the gain is around 25%.
- 3D initialization accelerated (mesh filling uses multi-threading).
- “Repair cell” option has been enhanced to avoid wrapup caused by overemptied cells.
- “A “flow out” boundary condition is available for 2D and 3D Euler solvers. It is expected that it gives for many problems more realistic flows than the “transmissive” boundary.

Material Library

- The Tillotson EOS has been implemented. Several examples in the library use it together with the Johnson-Cook strength model.

GUI

- Polygon point picking can be used for 2D FE geometries and regions.
- 2D FE parts can be copied and pasted (geometry and mesh definitions)
- In the “Tools” menu an option to create time histories from power spectral densities has been added. This can be used to specify random loads.
- Movies can be recorded with camera motion following a specified gauge.

Bug Fixes

- Large Euler models (say close to 100 Mio. Cells) suffered occasionally from unintentional write access to cell memory.
 - Function definitions for boundary conditions used occasionally wrong units.
 - Initial positions and node masses are saved in the 2D FE state file. This allows plotting velocities and strains correctly.
 - Density gradient due to gravity option was not initialized in version 3.1.1
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SPEED 3.1.1 Release Notes (11 - November - 2017)

Finite Element Solver

A 2D finite element solver has been added.

- Quadrilateral and triangular solid elements
- Plane strain and axial symmetry
- Quad mesher for arbitrary geometries
- Interface to integrated FreeCAD
- Import of LS-DYNA k-files and AD structured grids

- Access to all existing material models
- Contact and erosion options

CAD Module

FreeCAD has been integrated into SPEED.

- Import of CAD data
- Macros for 3D to 2D axial symmetry conversion
- Setup of 2D geometry for Euler parts and FE meshes

Euler Solver

- For the CJ shock burn higher robustness and essentially improved isotropy have been achieved by abandoning the existing geometry based implementation in favour of a level set algorithm.
- Energy partition in mixed cells has been improved and leads to more realistic temperature output.

Material Library

- Pmin values have been revised for all materials.

GUI

- On the post tab the logfile can be opened.
- The “heat” colormap has been added to the contourplot options.

Documentation

- A “Tutorial Manual” has been added.

Bug Fixes

- Initial time step was sometimes incorrect for the Euler solvers when rigid parts were present.
- Material boundaries in contour plots were frequently not visible.
- Parameters of Steinberg EOS were incorrect in Restarts from a state file.

SPEED 2.3.3 Release Notes (12 - December - 2016)

Geometry Import

- Parts (geometries) in STEP format can be imported from CAD applications into 3D models.
- Multiple selection of geometries / parts / assemblies for import from k-files and STEP-files is now possible.

State Export in ASCII Format

- 2D and 3D multi-material simulation states can be exported in a structured ASCII format. The exported file contains all state variables for all cells.

Material Models

- A “Universal” Hugoniot for Liquids (Universal liquid EoS) has been added.
- A new “P-alpha Spall Model” has been added. This (optional) model is available for the Johnson-Cook, Zerilli-Armstrong and Steinberg models.

Material Database

- Added Universal Liquid Materials: Benzene, Carbon Tetrachloride, Ethanol, Gasoline, Glycerol, Heavy Mineral Oil, Water

Postprocessing, Time Histories, Gauge Data

- New state variables Max. Overpressure and Max. Overimpulse for e.g. safety area determination have been added to 2D and 3D multi-material simulations.
- An option to multiply the ordinate values of time-history data has been added.
- An option to generate a new curve by concatenating data sets has been implemented.
- An option to plot the maxima or minima of different time-histories (e.g. peak pressures in different gauges) has been added.
- An option to display diagrams / curves with two different y-axes for displaying different scale / different units curves in a single diagram has been implemented.
- A feature to export all time-history data for one or more gauges into a text file has been added.

Graphics

- Volume rendering has been added for IGS models.
- Zoom by Shift + Left Mouse Button implemented for 3D models.
- A function to fit the current view of 3D models into the Graphics Pane has been added.
- 3D parts can now be masked / unmasked during the model setup.

Model Setup

- The location of gauge is now checked upon initialization of the simulation. The user is warned if gauges are located inside rigid parts or outside of the mesh.

Cell Selection / Output

- Specific cells in the simulation can now be selected for evaluation in the Text Pane output. Selection can be made with respect to i-j-k index, smallest time step, min. value in contour and max. value in contour.

Bug Fixes

- Changes of the material definitions were not considered when an existing state was re-started.
 - A possible display error when plotting curves with logarithmic scale has been removed.
 - An error in the bulking calculation of JH2 materials has been corrected.
 - A possible crash when deleting a parts from the setup has been removed.
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SPEED 2.3.2 Release Notes (23 - March - 2016)

Bug Fix

- Import geometry from k-file has been corrected. Affected version: 2.3.1
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SPEED 2.3.1 Release Notes (25 - January - 2016)

Multithreading

Multithreading uses a user specified number of (virtual) processor cores which work in parallel on rectangular subregions of the Euler mesh. The speedup depends on computer resources and problem details. Multithreading also interferes with licensing: each thread requires one license.

Job Queue

A job queue can be defined to run successively several problems.

SPEED-Pre-Post

SPEED users can install a pre-post-version for free. SPEED-Pre-Post can be used for pre- and postprocessing purposes without consuming a licence.

Compressed State Files

An option was added, which permits to save state files (*.sta) in a compressed format. This may save disk space.

Logfile

For each run a logfile is written to disk. It contains time and time step data on a per cycle basis.

Remap

- Materials to be mapped can be selected by the user
- A rectangular region in the source file can be specified for remap
- Limitations: Cannot read older version state files. Work around: Open state file with latest SPEED version, save the state, and do the remap.

Material Models

- The P-alpha model has been revised.
- The Steinberg model considers strain rate now.

Material Database

- Added Johnson-Cook Materials: Aermet 100, 1080 Steel
- Added JH2 Materials: Granite

Postprocessing, Time Histories, Gauges

- Additional history variables of a cell can be plotted

Bug Fixes

- Errors in 2d geometry “Parabola” had to be fixed by a new definition of “Parabola”. Backward compatibility could not be maintained.
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SPEED 2.2.4 Release Notes (11 - May - 2015)

Bug Fixes

- Using together “Gravity” and “Rigid” options in 3d resulted in incorrect mesh filling.
 - Parts imported via k-Files could be incorrectly filled along axis-parallel and diagonal planes.
 - “continuous rezone” in x-direction crashed the program in 2d plane strain and 3d problems.
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SPEED 2.2.3 Release Notes (27 - November - 2014)

Bug Fix

- The receiver mesh of a remap could contain empty cells. Affected version: 2.2.2
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SPEED 2.2.2 Release Notes (14 - October - 2014)

Geometry Modeling

- Copy and paste for parts has been implemented.
- 3d parts can be transformed as a whole.

Remap

A cell in the receiver mesh becomes “rigid” if the cell itself had been rigid before, or when it overlaps with a rigid cell in the source mesh.

Graphics

- 2d models can be displayed rotated by a multiple of 90°.
- 3d models can be displayed in a “Wireframe” or “CSG” mode.
- 2d and 3d models show optionally a material key (legend).
- Materials can be selected or deselected for a 2d contour plot.

Bug Fixes

- A source of instability arising from mixed cells when using one of the ignition models has been removed.
 - A bug that could cause a crash when removing items from the object list has been fixed.
 - Using “Gravity” in 3d is now possible.
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SPEED 2.2.1 Release Notes (14 - August - 2014)

Ideal Gas Solver

The “3d ideal gas solver” is a third processor type now available in addition to 2d and 3d multi-material Euler solvers.

State files from the 2d and 3d multi-material solvers can be mapped into IGS meshes.

JH-2 Ceramics Model

The Johnson-Holmquist material model for brittle materials (glass and ceramics) has been implemented. The material database includes B₄C, Al₂O₃, SiC, AlN, and float glass.

- ***Geometry Modeling***

- Geometry definitions can be copied to any part in any open SPEED application.

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- ***Geometry Import***

Geometry from k-Files can be imported into 3d multi-material models. The k-File must include solid elements.

K-Files are the format of LS-Dyna input. They can be created e.g. by LS-Pre-Post (a freely available modelling tool).

Export of an unstructured 3d Lagrange mesh from AUTODYN to a k-file is possible with a “ad_usersub.exe” which is included in the SPEED setup package.

Bug Fixes

- In 3d visualization boundaries normal to the y-axis were incorrectly displayed.
 - In 3d visualization rigid bodies were incorrectly displayed after geometry changes.
 - The remap from 2d axi-symmetric to 3d is now independent from the ordering of the materials.
 - Restart handles used and unused materials correctly.
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SPEED 2.1.3 Release Notes (10 - April - 2014)

Bug Fix

- When gravity was activated, SPEED crashed during initialization. Affected versions: 2.1.1 and 2.1.2.
 - Remap could lead to empty cells followed by a crash. Affected versions: 2.1.1 and 2.1.2.
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SPEED 2.1.2 Release Notes (24 - February - 2014)

Bug Fix

- Graphic pane was not updated if the application was displayed on monitors set left or above of the primary monitor.
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SPEED 2.1.1 Release Notes (13 - January - 2014)

64bit Version

- Version 2.1.1 comes with a 64bit executable. Unlimited memory allocation allows for larger problem sizes.

GUI

- Filling particles in parts considers mesh extension.

Mixed Cells

- Option “average pressure” has been improved to avoid instabilities

Remap

- Speed of remaps has been enhanced
- New remap option: 2D plane strain → 2D plane strain
- A constant velocity can be added to the imported mesh

Bug Fixes

- Meshing: jumps in mesh size have been eliminated
 - Inaccuracy in rezone with fixed fraction could lead to material diffusion
 - Combustion option: Sequence of material is now arbitrary
 - 3D post-processing: selecting cells in planes works correctly
 - Restart with detonation and combustion options works now.
 - Display of 2d geometry figure “Arc” has been corrected.
 - Crashes during movie creation have been fixed.
 - Temperature output of gauges is working.
 - 3d contours “div(v)” and “vorticity” corrected.
 - Crashes after failed memory allocation fixed.
 - State dumps are done at correct times when using negative start time.
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SPEED 2.0.18 Release Notes (02 - September - 2013)

GUI

- Options dialog for movie creation added.

Initialization

- The 3D initialization routines were enhanced to increase speed of element filling.

Bug Fixes

- EoS in Steinberg model could deliver too high sound speed.
 - Material Property page for Lee-Traver model was partly not accessible.
 - “Hexahedron” edge points had a numbering error.
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SPEED 2.0.17 Release Notes (06 - May - 2013)

Material Models

- Ignition and Growth (Lee-Tarver) has been implemented. In the material library the example materials can be found under "Ignition".
- The TD-JWL assumes $\lambda = 1$, when "Anaerobic Combustion" is off.

GUI

- Material data read from a state file are available for editing at restart.
- Multiple detonation points can be generated using the "Duplicate" button on the "Detonation" page.
- "Hexahedron" was added as new 3D-Geometry.

Material Database

- Several examples for "Ignition and Growth" initiation model have been added.
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SPEED 2.0.16 Release Notes (25 - January - 2013)

GUI

- The Movie-function has been altered. After making the movie, it restores the current state instead of the last dump state.

Material Database

- Mortar and Adobe have been added to the HJC concrete model.
 - Comp A and PBXN-109 have been added to the Ignition model (HVRB).
 - Diesel fuel has been added to the "Shock EOS" model.
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SPEED 2.0.15 Release Notes (07 - January - 2013)

Initiation Model in the 2d Multi-Material Solver

- The HVRB (History Variable Reactive Burn) model has been implemented. It can be applied to model high explosive initiation and detonation propagation phenomena like projectile impact and corner turning. Two sections in the Theory manual have been added as well as example files. The material library contains two examples (Comp B and PBXN-110) under the new type "Ignition".

Additional Features

- The "Tools" menu has been introduced.
- "Tools/Elastic Constants..." calculates elastic constants and wave speeds from any two (or more) inputs specified by the user.
- "Tools/Steel Hardness..." converts tensile strength into Brinell/Vickers/Rockwell hardness and vice versa.

GUI

- During creation of a movie refreshing the window is suppressed. Single states are not displayed when loaded.
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SPEED 2.0.14 Release Notes (07 - December - 2012)

Increased Memory

- SPEED can handle larger models on 64bit Windows OS due to potentially larger memory allocation (now about 2 GB, formerly about 1.2 GB).

GUI

- On the "Control" page runtime and termination information is given in the "Info" pane at the right hand side.
- A progress dialog appears during initialization (mesh filling).
- The default for combining geometries to parts has been changed from "intersect" to "add".

Bug Fixes

- Contour and profile plots in 3d could crash SPEED.
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SPEED 2.0.13 Release Notes (19 - November - 2012)

Bug Fixes

- CJ Shock Burn did not work correctly in 3d.
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SPEED 2.0.12 Release Notes (02 - November - 2012)

Bug Fixes

- Broken 3d functionality in 2.0.11 (advection)
 - 3d example added (2-room-example, reduced resolution, modified geometry compared to manual)
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SPEED 2.0.11 Release Notes (18 - October - 2012)

Demo Version

- The 3d option is enabled in the demo version.

GUI

- New geometry in 2d added: Arc.
- Counter for number of cells added.

Bug Fixes

- Mesh creation could fail for intervals with only a few cells.
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SPEED 2.0.10 Release Notes (09 - October - 2012)

Unicode Support

- Version 2.0.10 and higher are supporting the Unicode character set.

GUI

- 3d states can be displayed "single plane" mode.

Multi-Material Cells

- The multi-material solver has been enhanced resulting in an improved stability.

Bug Fixes

- Gauge array definition with 3 base vectors works now correctly.
 - 2d Ogive geometry is now correctly displayed.
 - z-Position in time history plots was corrected.
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SPEED 2.0.9 Release Notes (09 - August - 2012)

EOS

- Implementation of the HJC concrete model has been improved.

User Manual

- Two chapters have been added:
 1. Mesh Adaptivity
 2. 3D Internal Detonation Example

GUI

- The creation of the time history and material summary files is delayed until the Start or Restart Button is pushed. The user must confirm deletion of existing files.
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SPEED 2.0.8 Release Notes (28 - July - 2012)

EOS

- The EOS of solids has been improved for highly expanded states.
- Modifications of material parameters after "Initialize" become effective.

Adaptivity

Mesh adaptivity is now available.

SPEED 2.0.7 Release Notes (22 - July - 2012)

3D Multi-Material Solver

- The "Remap" has been enhanced for 3D axis-aligned cases.

Bug Fixes

- The 3d Remap neglected history variables.
 - Using 2D Ogive geometry caused a crash when reading the model file.
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SPEED 2.0.6 Release Notes (20 - July - 2012)

3D Multi-Material Solver

- The "Remap" function is now activated.
- Contour Plot Options and Profile Plot Options are extended.
- A cell can be selected on a plane for inspection of its state in the text output window.

General Solver Improvements

A new option "Adaptive Mixed Cell Treatment" is now available. It is considered to be the most stable of the alternatives offered, and is therefore the new default option.

Material Models

The "Steinberg" model was revised. The spallation model has been corrected and tested for mesh independency.

Bug Fixes

- Boundary conditions were not displayed after loading a state file.
- Co-ordinates of mouse pointer displayed in the status pane had incorrect units.

- The dM/dv plots of the jet summary have now correct units "mass/velocity".
 - The text output window scales now with window size.
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SPEED 2.0.5 Release Notes (22 - June - 2012)

3D Multi-Material Solver

- The 3D multi-material solver option has been activated.
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SPEED 2.0.4 Release Notes (15 - June - 2012)

Bug Fixes

- Program crashed when used with "gravity".
- Refresh of contour plots did not work.
- Warnings are now raised when materials for aerobic combustion are missing.

Material Data Base

- FOXIT has been added.

Visualization

- Names for contour plot variables changed (beta, lamda)
- Material color/name legend now displayed