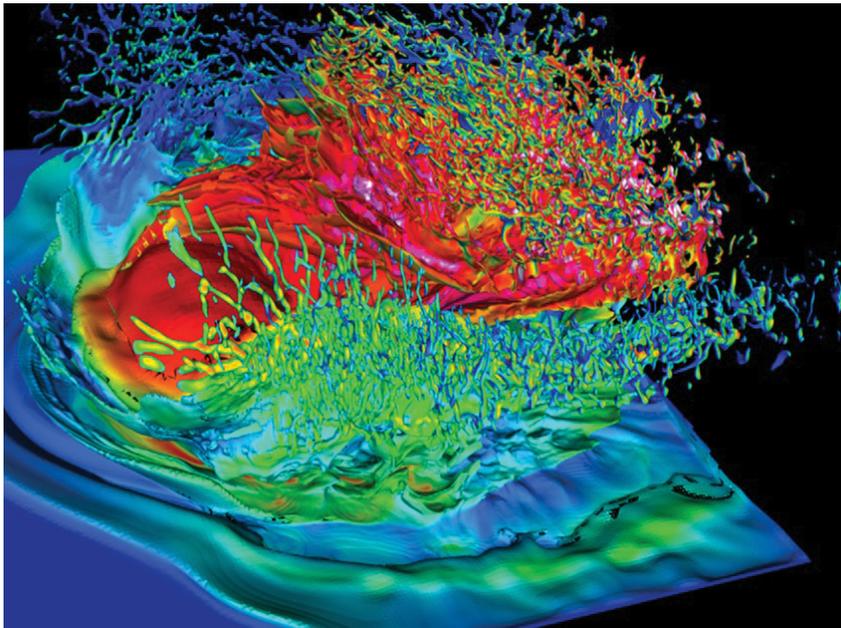# EnSight

EnSight

Analyze, visualize and communicate your simulation data with EnSight. Engineers use this powerful general purpose post-processing tool to gain new design insights and then clearly, effectively sell their recommendations. Flexible EnSight can read and visualize data from most simulation tools - ANSYS and non-ANSYS.

Analyze

EnSight imports simulation results and can create new variables based on these using its variable calculator. Its variable calculator is feature-packed with useful functions. These functions can be queried at feature locations such as clip planes, clip lines and particle traces that can reduce field data into lower dimensions. These features can sweep along a path to collect data into a query for exporting or plotting in EnSight. Furthermore, all EnSight's analysis capability can be extended with Python scripting. Turn to the Variables and Calculator page, the Query and Plotting page, and the Python Scripting page for more information.

Process Even the Largest Datasets with ANSYS EnSight Enterprise

This parallel version of EnSight enables engineers to handle very large models (+100 million cells). ANSYS EnSight Enterprise allows for either spatial or temporally demoposed parallel post processing on a computer cluster.

EnSight handles very large models. Here the meteor impact that led to the extinction of the dinosaurs is simulated with 11 billion cells and 10 TB of data.
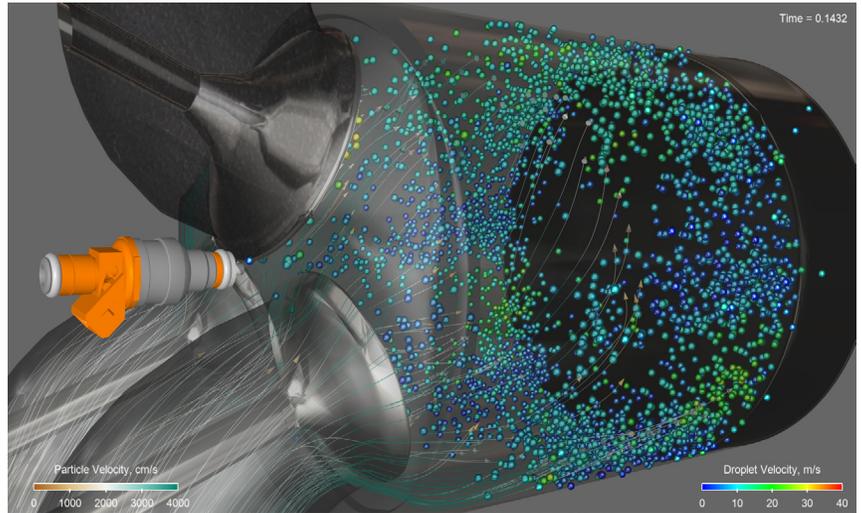
Visualize

Visualizing simulation results is easy with EnSight's rich set of visualization features, the broadest in the market. Besides common tools such as particle traces and clip planes, EnSight has cutting-edge features such as Volume Rendering and Surface Flow, which let you see the entire field and explore the data visually. EnSight goes further by letting you create a composite scene of your design by bringing in experimental data as plots, images or even test movies. You can also apply texture maps and advanced lighting controls to the parts of your simulation models so that your simulations visually match the test results. EnSight lets you visualize data from more than one design simultaneously, even data from different solvers for comparison. Finally EnSight can import results from coupled runs, for example from a CFD solver or an FEA solver for a fluid–structure interaction. Read more about EnSight's visualization capabilities on the Visualize and on the FSI and Multiphysics pages below.

Communicate

After exploring your data you will have new insights to share; EnSight leads the market in providing the best tools to communicate your results. It all begins with the best visual quality provided by EnSight's lighting, materials and texture maps. You can add environmental visuals like backgrounds and skyboxes so your model is immersed in its natural environment. Then it goes deeper with advanced animation capabilities like keyframe animation. With keyframe animation you can take your customer on a guided tour of the results, flying along a designed camera path, zooming in and fading in text or plots to show important details, or fading out housings and outer covers to expose the interior.

When EnSight exports its data animations and images, it can scale them beyond the size of large-format movies and billboards if required, performing antialiasing to make sure lines stay sharp and crisp. In addition, the smart engineer uses 3-D viewers to share results. EnSight's native 3-D viewer, called EnVision, is the best in the market for interacting with the full, rich visual scene you created in EnSight. Other 3-D viewers are also supported.

Post-processing is a very important part of the simulation process. With EnSight you have the leading tool to extract, fuse and communicate your newfound engineering insights.

EnSight can read and visualize data from most popular simulation programs.

FLUIDS, PARTICLES, CFD

ANSYS CFX	OverFlow
ANSYS Fluent	ParticleWorks
ANSYS Icepak	Plot3D
ANSYS Polyflow	PowerFLOW
AcuSolve	RADIOSS-CFD
ADINA-CFD	STAR-CCM+
Barracuda	
CFD-ACE+	
CGNS	
ConvegeCFD	
CRUNCH	
EDEM	
FLOW-3D	
KIVA	
OpenFOAM	

IC ENGINE CFD

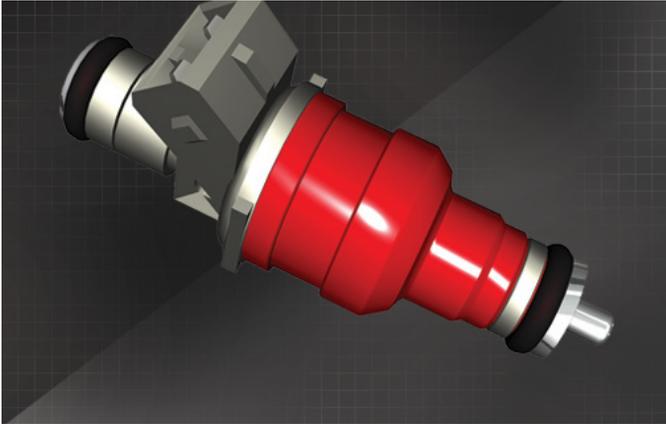ANSYS Forte
Converge
Fire
Kiva
Star-CD
Vectis

CAD
OBJ
STL

CRASH, STRUCTURES

ANSYS Autodyn
ANSYS MECHANICAL
ANSYS LS-DYNA
ABAQUS
ADAMS
ADINA
EXODUS
I-DEAS
Recurdyn
LS-DYNA
MSC.Dytran
MSC.Marc
MSC.Nastran
MSC.Patran
NX Nastran
RADIOSS-CRASH
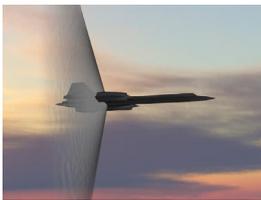
See ANSYS.com for more data interfaces.

Visualize

Materials library
EnSight now comes loaded with several predefined materials, such as plastic and metal. These create realistic-looking parts, giving your presentations a more complete, professional look.
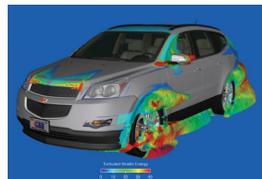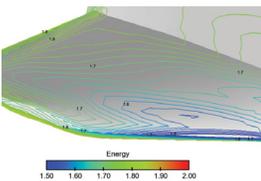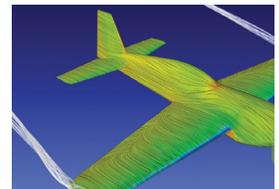

Photo-realistic rendering
Images or animations can now have shadows, reflections and more accurate lighting that brings a new level of realism to your simulations.
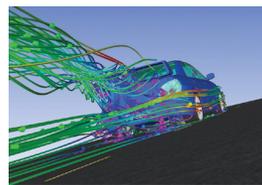

Visualization of a shock wave

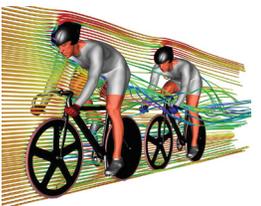Isosurfaces of pressure colored by turbulent kinetic energy.
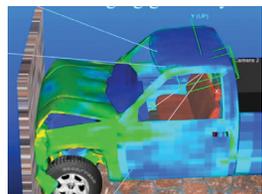

Contour lines of energy.

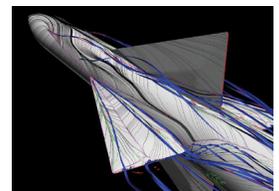Vortex cores used as seeds for the streamlines.

Surface flow or line integral convolution (LIC) shows the direction of surface flow. You can also create a clip plane and see the flow in the plane.
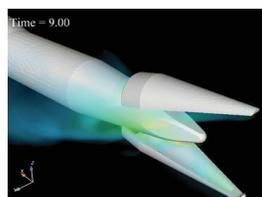

Streamlines of flow around racing bicyclists.

Deformation of parts shown in a car crash simulation.

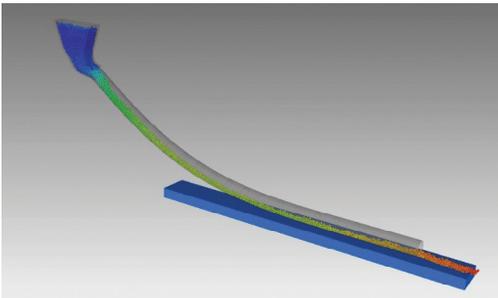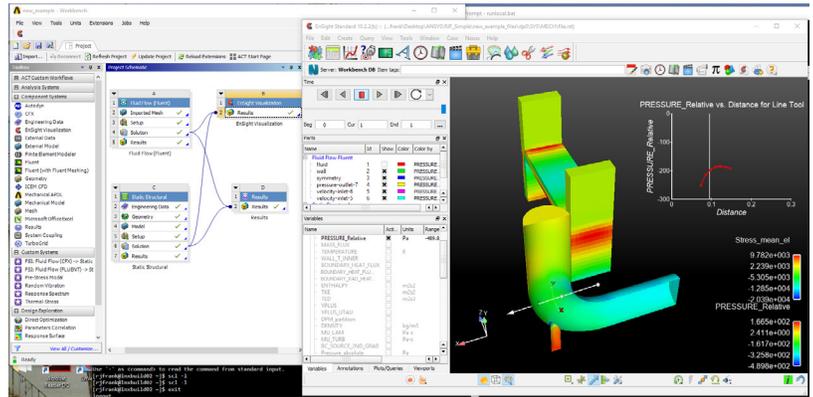Choose from a wide range of customizable color palettes

Volume rendering of a rocket stage separation toexpose the rocket payload.

Flow separation and attachment lines show surface-restricted streamlines created using seeds of separation lines (in blue) and attachment lines (in red).
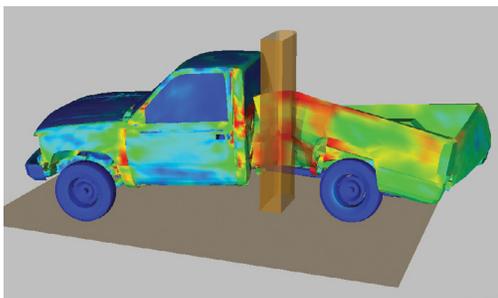
Fluid–Structure Interaction and Multiphysics

Engineers are finding that it is that it is no longer possible to ignore the interactions between fluids and the structures that surround them as they strive to optimize their product's performance. Fluid–structure interaction applications include tire hydroplaning, airbag inflation for automotive occupant safety, sloshing of fuel tanks, and thermal-stress in an exhaust manifold of a car.
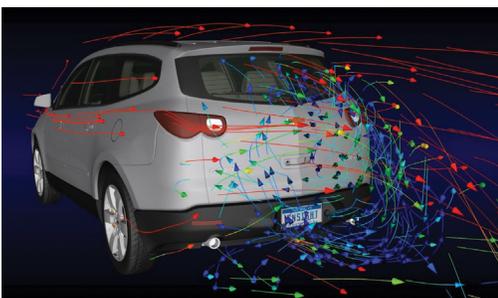
EnSight helps you visualize coupled fluid-structure interaction data to gain the insights you need. EnSight also supports loosely coupled FSI solutions such as an MpCCI server module. For example, Fluent and Abaqus run a coupled simulation by using the MpCCI server module and adding MpCCI plug-ins to their respective programs.

Coupled simulation of discrete element modeling (DEM) and rigid body dynamics (RBD). The two simulations are solved separately but are visualized in one window using EnSight.

A keyframe animation created from a multiphysics simulation from rigid-body dynamics (RBD) and an explicit FEA solver. Both these datasets are read into EnSight and post-processed simultaneously.
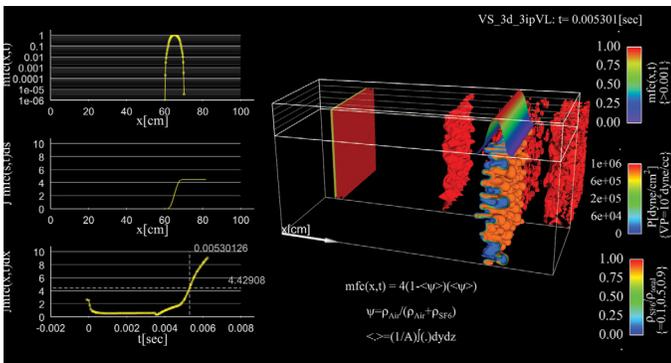

In this example, CFD results are superimposed on the CAD model. The CFD simulation solves for external flow, which does not need any internal parts of the car. Also, the CFD model ignores minor details such as tire treads, logos and gaps. But the CAD model shows all these features in high detail and gives a very realistic feel to the image or video.
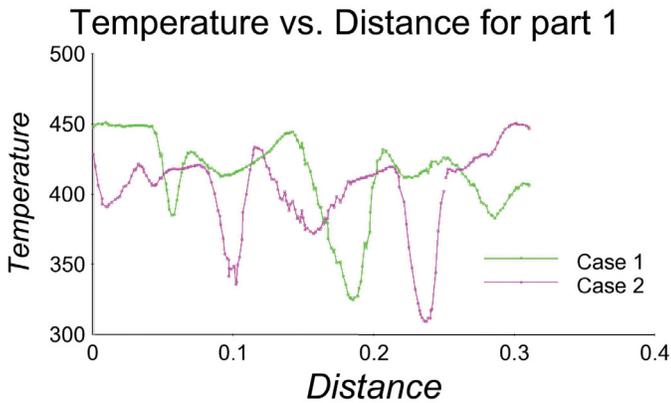
Queries and Plotting

EnSight not only visualizes your existing data, but can also query data and make plots. Many types of queries are available.
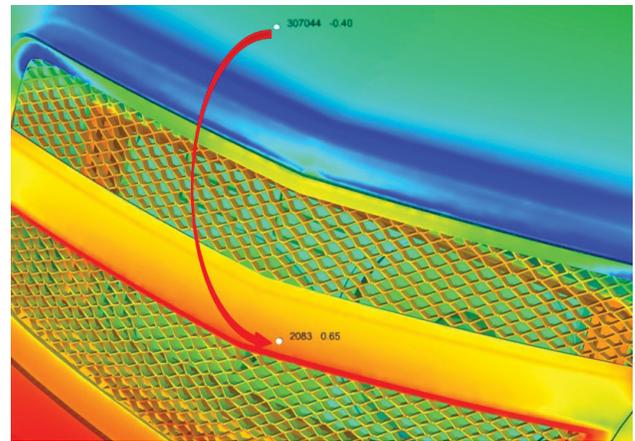
> Over distance queries, distance line tool, 1-D part, and X/Y/Z arc length
> Transient queries: at node, element, XYZ and min & max over time
> Operate on existing queries (integrate, differentiate, etc.)
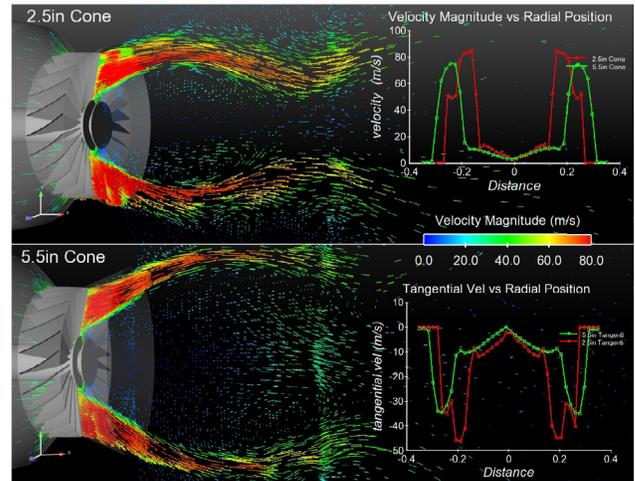> Read data from external files (like experimental data)

Plotters in EnSight can be customized for font type, font size, colors of various attributes, X/Y scales, grid background, etc. Plots in EnSight have an auto layout. When changing the size of the plot, EnSight knows automatically how to rearrange all the attributes. Additionally, when setting a style, it can be copy-pasted onto another plot.

Probe a data set with your cursor and get the value of a particular variable. Move the probe over a surface, or in 3-D, and the variable value automatically updates. In a transient simulation, the probe value updates at each time step.

Compare meshes, solvers, and more by plotting cases together.

Two configurations of a burner nose are compared in the same viewport. Velocity magnitude and tangential velocity are plotted versus radial position. As the time advances, the plots update automatically. If the line was moved, the plots would automatically update for the new location. Courtesy of ASTEC.
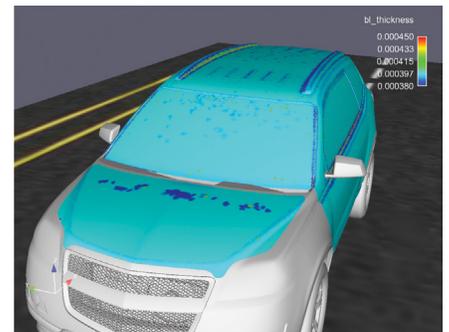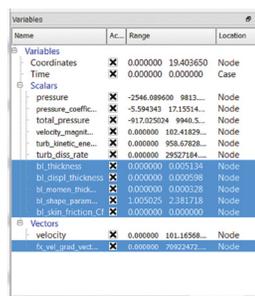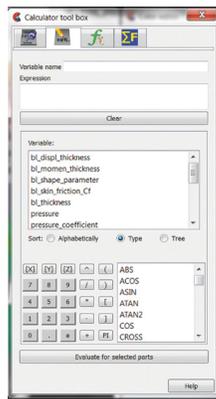
Variables and Calculator

Often an analysis program produces a set of basic results from which other results can be derived. EnSight provides many of these common functions for you, or you can enter the equation(s) and build your own.

The calculator is a powerful tool to derive new variables from existing variables in EnSight. Calculator and variable creation capabilities include:
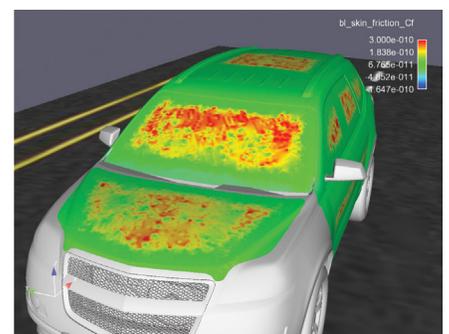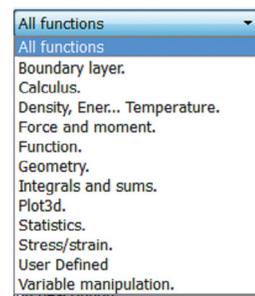
> Compute variables
> Extended CFD variables
> Boundary layer variables

> Integrals and arithmetic operations
> Trigonometric and tensor functions
> Statistic functions

You can build your own new variables by selecting existing variables, math functions, operators and numbers as desired. Example: boundary layer variables calculated within EnSight (highlighted).

SUV body surface colored by boundary layer thickness.

Predefined functions in the calculator: boundary layer variables, calculus functions, force and moment calculations, trig and statistical calculations, and many more.
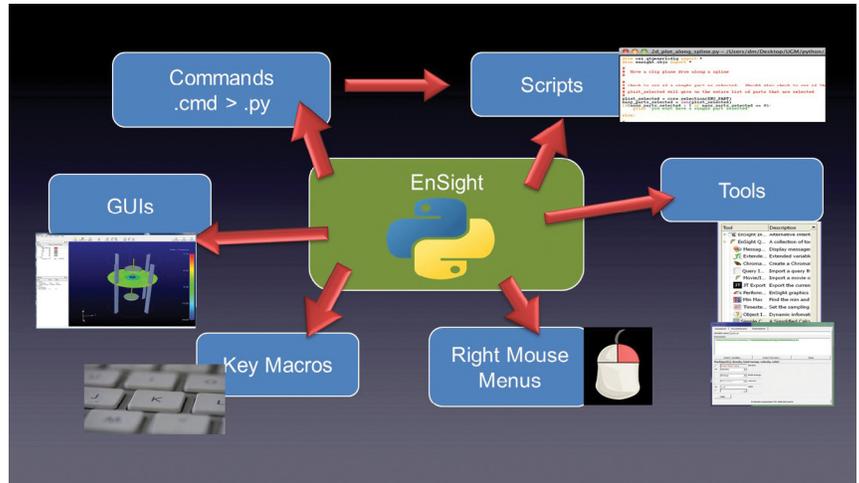

SUV body surface colored by coefficient of skin friction.

You can create additional variables based on existing data. Typical mathematical operations, as well as many special built-in functions, enable you to produce simple or complex equations for new variables. Some built-in functions enable you to use values based on the geometric characteristics of server parts. In general, created variables are available for any process, just like given variables. If you have transient data, a time change will re-compute the created variable values.

Automate your Post-Processing with Python scripting

In addition to its own native journal language, EnSight can understand Python. Python provides a scripting language to drive EnSight, and is also the vehicle by which additional logic, decision making, loop and general augmented capability can be achieved.

> Install Python simply by installing EnSight
> Execute EnSight in batch, with hardware acceleration
> Generate your own scripts and customized GUI using Python
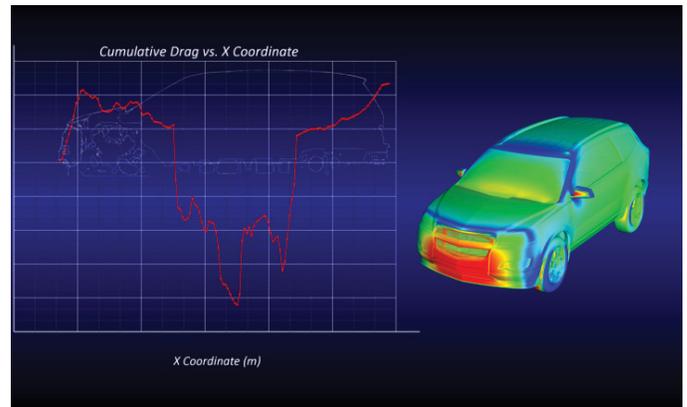> Convert EnSight Command (Journal) language into Python automatically

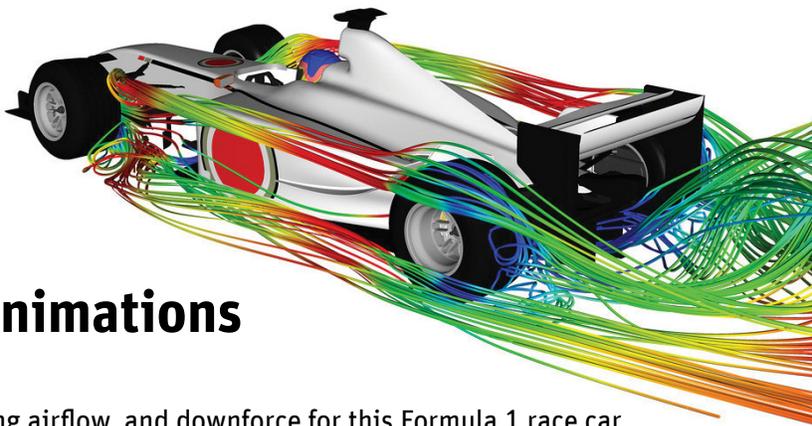## EXAMPLES OF AUTOMATION USING PYTHON

Python Routine in which a sector range in theta is swept around through 360 deg, and some quantity is queried and plotted in a graph.

EnSight graph of average velocity on a moving sector around the circumference. This is an example of a Python routine that takes a sector in the radial-theta-z (RTZ) coordinate system, calculates a spatial mean, and then moves this sector around through 360 degrees, recording the average at each sample.

Accumulated drag is a very useful way to assess the aerodynamic performance and determine the regions of the vehicle which are contributing to the drag. A simple looping Python macro can be used to easily calculate the cumulative drag as a function of length down the vehicle.
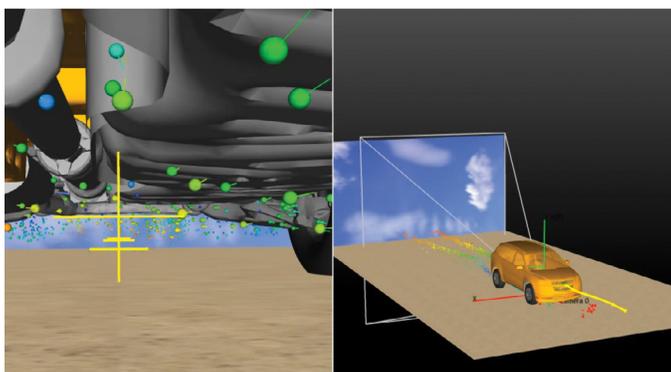
Many top users of EnSight only occasionally open the EnSight GUI. By automating their post-processing using Python and running it in batch, they spend less time interactively post-processing and more time analyzing their results and making better products.
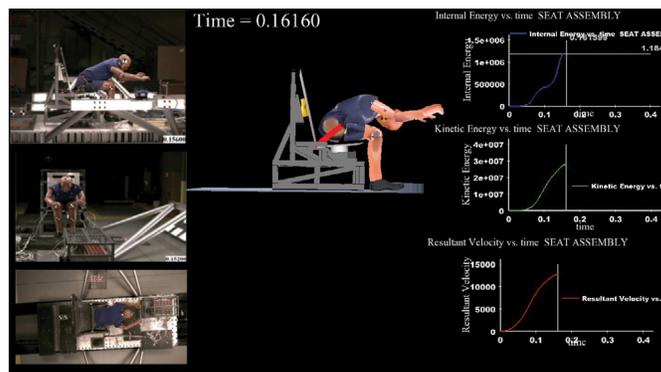
Tell your story with EnSight animations

You are in control with EnSight. Streamlines illustrate cooling airflow and downforce for this Formula 1 race car. You set the speed of the particles, the length of the trace, and the size of the 'tip' (either an arrow or a sphere). Add wheel movement to complete your story.
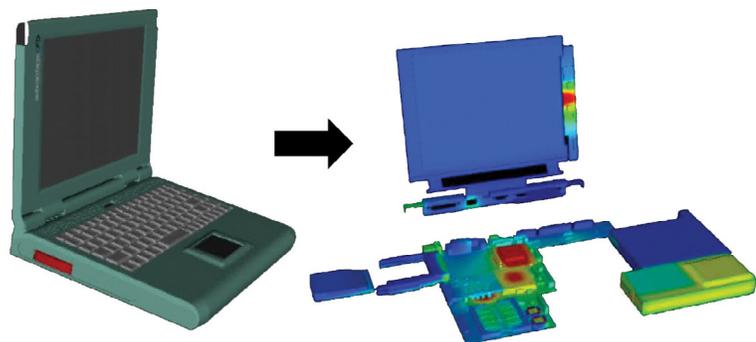
> Particle trace
> Mode shape
> Structural deformation
> Key-frame camera control
> Flipbook

> Exploded view
> Fly-around
> Synchronize with test data plots
> Synchronize with test movies
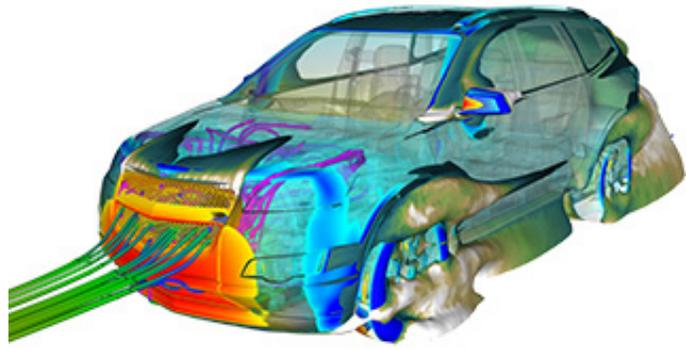> Move the camera along a spline

Virtual cameras in EnSight are used to visualize the flow along a spline or a streamline. This can be extremely useful for internal flows. It can also be used to get multiple perspectives.

EnSight can be used to compare experiment and simulation by playing both simultaneously. In the still to the left, a crash simulation is compared with experimental videos (top/side/front view movies).

This is a still from an animation showing exploded views of a laptop CFD simulation.

EnVision: The Viewer for EnSight

Create a view of your data with EnSight, then present and share it with EnVision. EnVision features high-speed flipbooks, high-quality rendering and support for textures, materials, light sources and created geometry that can help you present your data anywhere in an interesting and informative way.

> EnVision
> Download EnVision
> Pan, rotate, zoom
> Play flipbook animations

> Play keyframe animations
> Write to select image and movie formats
> Free download

EnVision Pro, the Best Way to Review EnSight Data

Are you sure you have all the views you need for that big presentation or project review? With EnVision Pro, you can interact with the data and create new views in real time to answer questions in the meeting room. Use interactive tools such as multivariables access, transient data, auxiliary clipping with the plane tool, annotations and viewports to see your data in new ways, ways you didn't originally prepare in EnSight. With EnVision Pro, you can create photorealistic images using ray tracing, and share your work in more ways than ever. EnVision Pro reads and writes EnVision .evsn files. It also writes to open and licensed image and movie formats, ensuring that your data can be viewed no matter what audience or technology is in play.

> EnVision Pro
> All the features of EnVision
> Output realistic-looking images through ray-tracing
> Multi-variables access
> Transient data (in addition to flipbook animations)
> Auxiliary clipping with the plane tool
> Specify center of transform
> Variable color palette editing
> Picking

> Right-click operations
> Edit the light sources
> Drag and drop
> Create keyframe animations
> Create/edit annotations
> Create/edit viewports
> Query Values
> Included with each ANSYS EnSight license