Is your analysis tool useful in years to come?

scSTREAM and HeatDesigner have proven track records for incorporating the latest leading edge technology

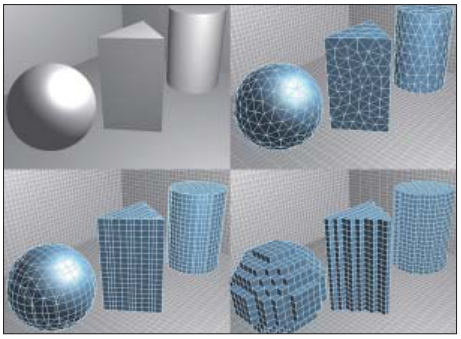
scSTREAM HeatDesigner

scSTREAM thermo-fluid software has serviced the electronics and architectural industries for more than thirty years. The ever-evolving software is characterized by its overwhelmingly user-friendly interfaces and high speed processing. HeatDesigner is based on scSTREAM and is specially developed for thermal design of electronics products. HeatDesigner provides physical functions required only for thermal design with its simple interfaces and powerful computing performance.

*1 Only for scSTREAM

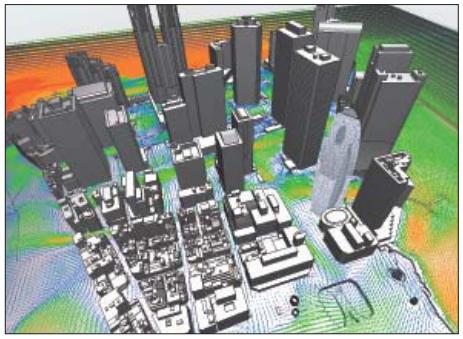
Various methods to represent shapes*1

The shape of a model to be analyzed can be represented by using the following methods: voxel method (slanted faces and curved faces are represented in cuboids), cut-cell method (the shape of a model created with a CAD tool can be represented more accurately), and finite element model method (a model of an arbitrary shape defined with unstructured mesh can be overlapped on a model defined with structured mesh to use the shape created with a CAD tool as is).



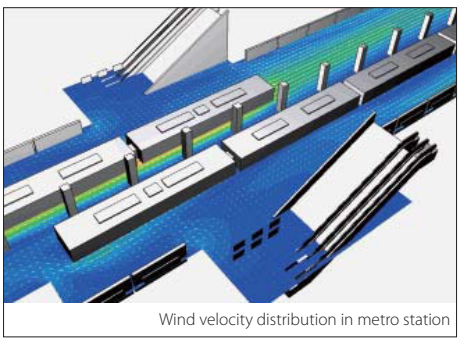
Large-scale calculation

In structured mesh, even a complicated model does not need to be modified almost at all and the shape or the scale of a model does not affect the difficulty of mesh generation. In addition, Solver performs a calculation at a high speed in parallel computing and achieves effective processing as the speed increases depending on the number of subdomains.



Moving objects*1

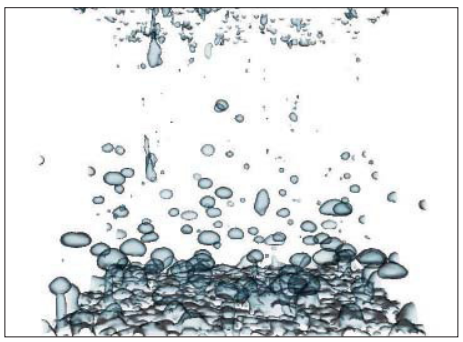
A flow generated by a moving rigid object can be calculated. Conditions including the motions of an object (translation, rotation, and elastic deformation), heat generation/absorption, and air supply/return can be set. The model of a moving object is created on another mesh. In this way, conditions such as the distance that the object moves are limited very little.

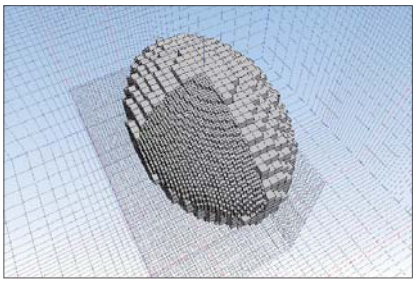


Wind velocity distribution in metro station

Boiling/condensation*1

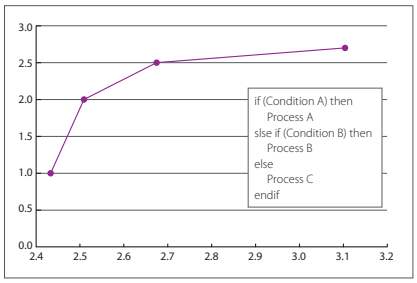
Flow with boiling, which is a gas-liquid two-phase flow due to the temperature difference between liquid and a heating surface, can be analyzed. Flow itself is analyzed by a free surface analysis MARS method, while the phase change of boiling and condensation is modeled by the change in F value (volume fraction of fluid). In addition, latent heat and the change in volume (density difference between gas and liquid) are considered.





Multiblock

Mesh can be refined partially to represent a model shape more accurately and perform a calculation more efficiently.

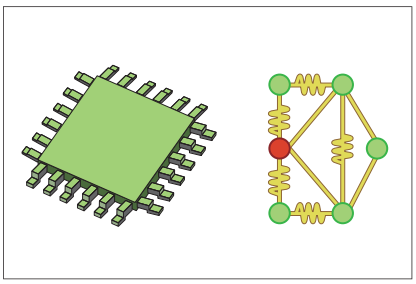


Customizing variables

Complicated conditions including trigonometric functions and conditional branches such as IF statements can be set without compiling.

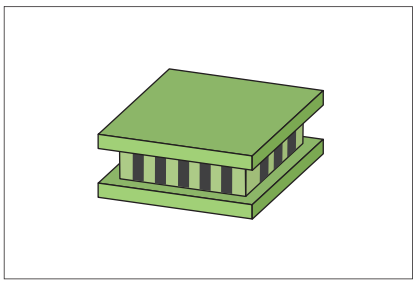
Parts library

The shapes and conditions of frequently used parts can be registered. Conditions include the allocation position, material, and heat generation.



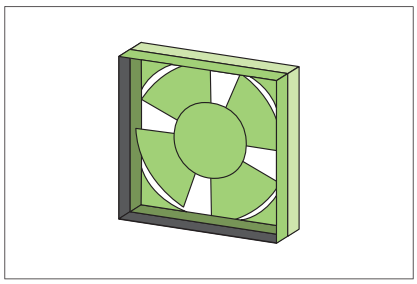
Thermal circuit model

The Delphi model (multiple-resistor model) enables highly accurate calculation.



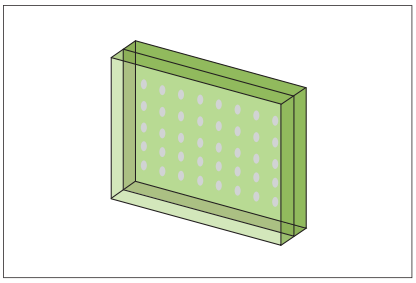
Peltier-device model

The performance characteristics of a Peltier-device model can be considered for calculation.



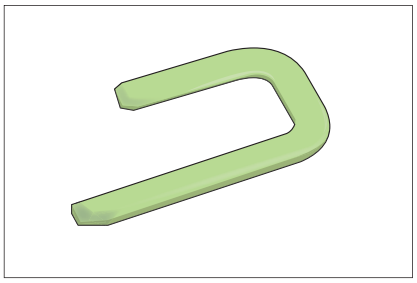
Fan model

P-Q characteristics and swirling components can be considered for calculation without creating the shape of a fan.



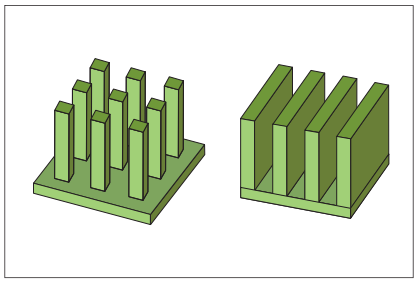
Slit punching model

The pressure loss of a part can be considered for calculation only by setting its opening ratio.



Heat pipe model

Heat transfer from a heat source to a heat-releasing part by using a heat pipe is modeled and the model can be used for calculation.



Heatsink

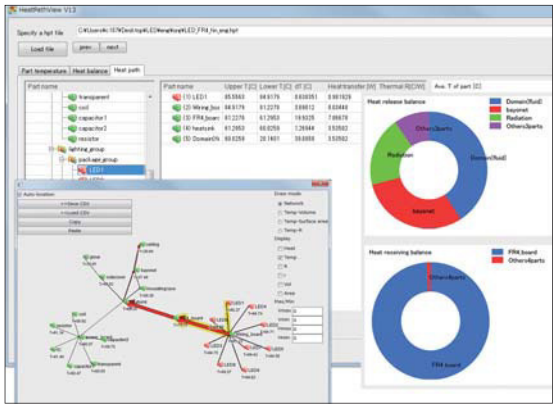
The shapes of pin fins and plate fins can be created easily by specifying parameters.

scSTREAM HeatDesigner

*1 Only for scSTREAM

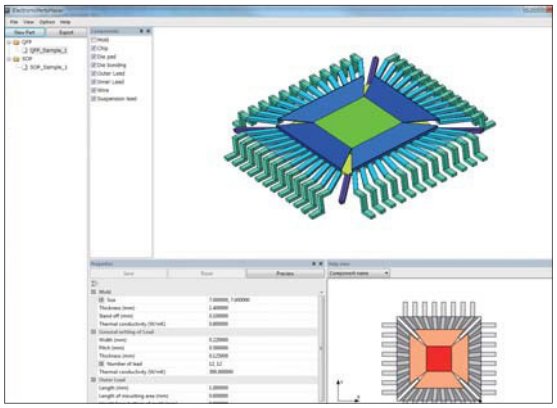
HeatPathView

The information on temperature of each part and a comprehensive amount of heat release obtained in post-processing of a general CFD analysis is not enough to know the heat path. HeatPathView displays heat paths and the amount of heat transfer in the whole computational domain in a diagram, a graph, and a table, allowing you to find the bottleneck of the heat paths easily.



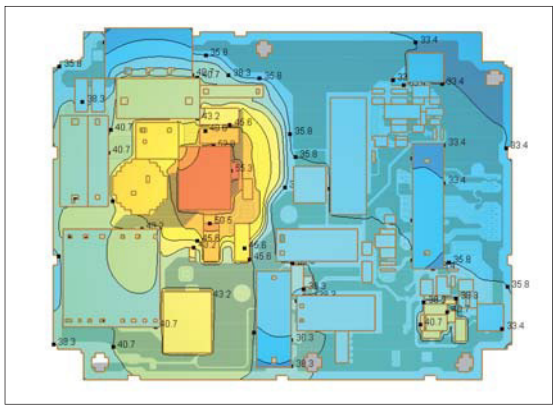
ElectronicPartsMaker

The tool can create detailed models of semiconductor packages including QFP, SOP, and BGA by specifying parameters, and simplified models using thermal resistor models such as Delphi models and two-resistor models. Manufacturers of semiconductor packages can provide the data of semiconductor packages as thermal resistor models without releasing the inside information.



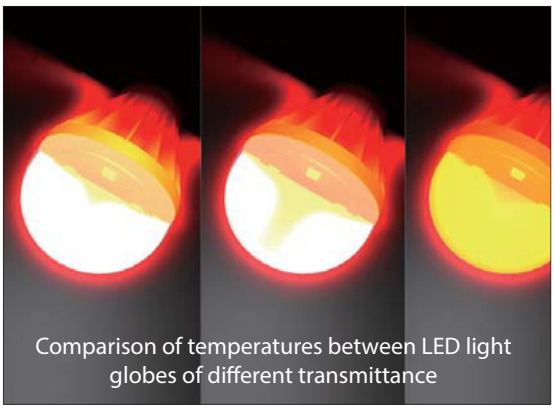
Reading wiring patterns

To calculate heat transfer conditions depending on wiring patterns of a printed circuit board (PCB) in detail, the module can read Gerber data output from an electric CAD tool and import the data as a model for a thermo-fluid analysis. By using Gerber data, a more realistic calculation result can be obtained with the consideration of heat transfer affected by an uneven wiring pattern.



Radiation

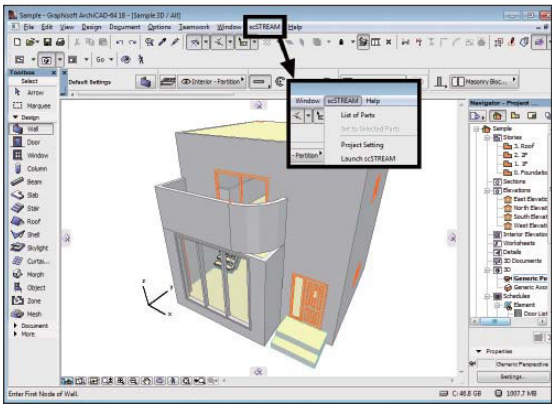
By setting temperature difference and emissivity between objects, heat transfer by radiation of infrared rays, for example, can be considered. VF (view factor) method and FLUX method*1 can be used. Transmission, absorption, diffusion, refraction and reflection of radiant rays can also be considered. The directivity of radiant rays can also be considered in FLUX method.



Comparison of temperatures between LED light globes of different transmittance

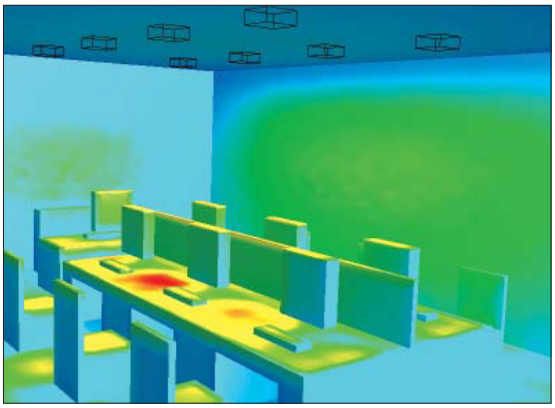
BIM[*1]

The software interface supports BIM 2.0. Autodesk® Revit® and GRAPHISOFT ARCHICAD have a direct interface (optional) through which a target part can be selected and the tree structure can be kept and simplified. In addition, the module can load files in IFC format, which is the BIM-standard format.



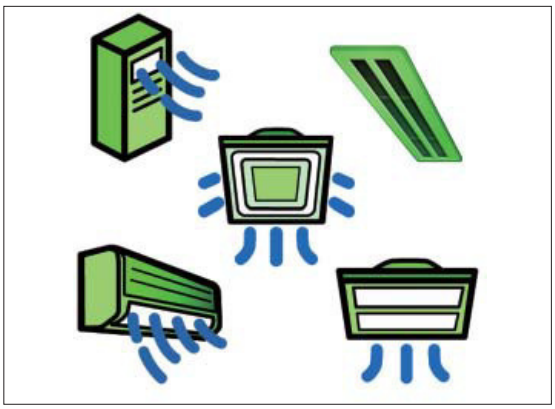
Illuminance analysis[*1]

The software can calculate illuminance of various types of light; for example, daylight through an opening of a building and artificial lighting with consideration of its directivity. Object surfaces such as walls are treated as diffusive reflection surfaces. In general, the larger an opening of a building is, the larger heat loss tends to be. By calculating the illuminance, the balance between heat and light can be examined collectively.



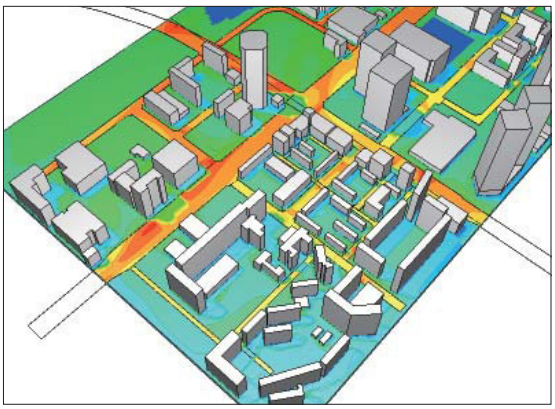
Air-conditioner parts | CFD parts[*1]

The model shapes of parts frequently used for room air-conditioning can be imported. The models include ceiling cassettes, anemostat models, and linear diffusers. The software can import CFD part data, such as air supply characteristics, provided by SHASE[*]. Various parameters can be set to simulate air-conditioning operation in addition to simple air heating and cooling.



Solar radiation | ASHRAE, NEDO[*1]

Climate data published by ASHRAE and NEDO is preset and can be used for condition setting. By entering arbitrary values of longitude, latitude, date, and time, the solar altitude and the azimuth angle of the sun at a specified location and time are calculated automatically. The effect of solar radiation can be examined in detail. Various parameters including absorption and reflectivity of solar radiation and materials which transmit light diffusely, such as frosted glass, can be set.

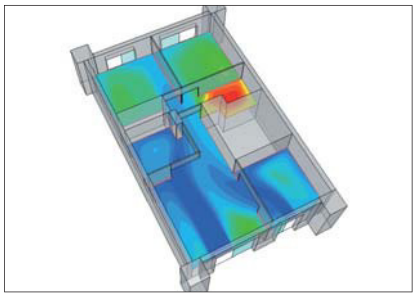


[*] SHASE: Society of Heating, Air-Conditioning and Sanitary Engineers of Japan

*1 Only for scSTREAM

PMV, SET* Ventilation efficiency*1

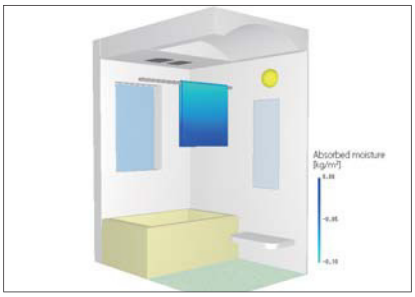
Comfort indices PMV and SET* can be derived from already obtained temperature, humidity, and MRT*, as one of result-processing functions. The scale for ventilation efficiency (SVE), of which some indices can be converted to a real time, can be set by one click, and the range of calculation area can be selected (for example, either one of two rooms).



* MRT: Mean Radiant Temperature

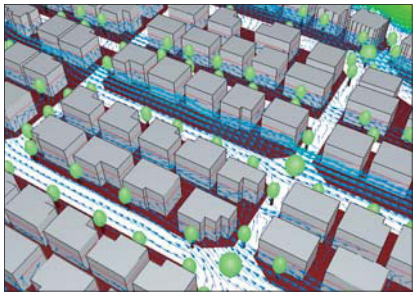
Humidity / dew condensation*1

The software can analyze humidity in the air. Dew condensation and evaporation on a wall surface due to temperature change can be considered and the amount of dew condensation and evaporation per time can be obtained. The software supports the analyses of moisture transfer inside a solid, and the function can be used to analyze a permeable object and dew condensation inside a part.



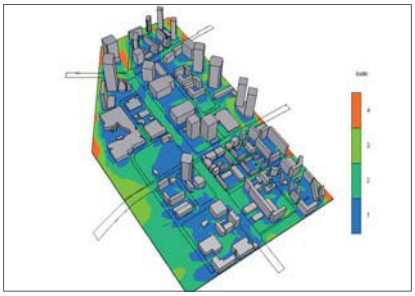
Plant canopy model (flow and heat)*1

Air resistance caused by plant canopy can be considered by setting the coefficient of friction and the leaf area density. For frequently used plants such as oak tree, their parameters are preset as the recommended values. The software also simulates the cooling effect by the latent heat of vaporization on a leaf surface by using the fixed temperature and setting the amount of absorbed heat. The function can be used for analyses of outdoor wind environment and heat island effect.



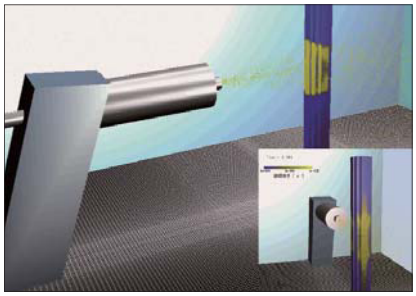
WindTool (outdoor wind environment assessment tool)*1

This tool helps assess outdoor wind environment. The assessment criteria can be selected from the ones proposed by Murakami et al. and by Wind Engineering Institute. By specifying a base shape and parameters required for wind environment evaluation, the parameters for 16 directions are calculated and the wind environment is ranked automatically. Detailed distributions of air current and pressure per direction can be visualized.



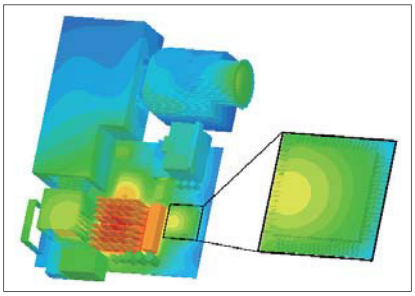
Electrostatic field*1

In addition to fluid force, the effect of an electrostatic field, which applies external force to charged particles, can be considered. By setting electric charge of particles and electric potential of a wall surface, the function can be used for analyses to consider area control of electrostatic coating. Velocity at which charged particles do not adhere on a wall surface can also be examined by using the function.



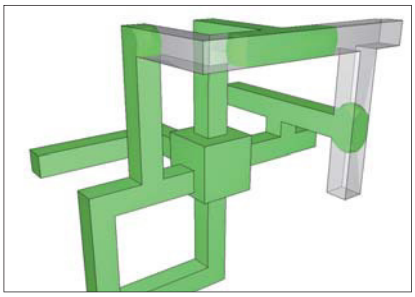
Mapping*1

When a target phenomenon is in a small range and the phenomenon is affected by a wide range of its surrounding area, analysis results of the surrounding area can be used for an analysis of the target phenomenon as boundary conditions to decrease the calculation load. To analyze only the inside of an enclosure for an electronic device highly affected by its outside, the analysis results of the outside can be used as boundary conditions.



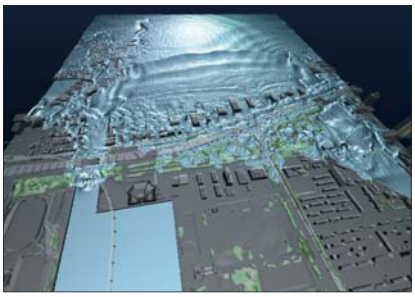
Flow of foaming resin*1

The software calculates the behavior of filling up an object with foaming resin, which is used as a heat insulator for houses and refrigerators. To examine speed and pressure of filling-up and the position for injecting the resin, the software simulates the behavior in 3D. The simulation can provide more pieces of information in shorter time than an actual measurement.



Free surface*1

The software calculates the shape of an interface between a gas and a liquid. Either MARS or VOF method can be used, and the calculation target phase can be selected: both gas and liquid, only gas, or only liquid. The function is useful in a wide range of fields: from an analysis of tsunami in the civil engineering and construction field to an analysis of soldering in the electronic device field.

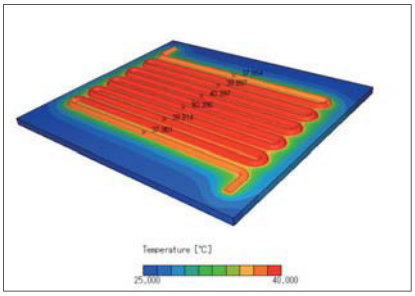


Solidification / melting*1

The phase change between fluid and solid, for example, water to ice and ice to water, can be considered. The following phenomena related to solidification/melting can be considered: change of flow affected by a solidified region, change of melting speed depending on the flow status, and latent heat at melting. A phenomenon that water in an ice maker becomes ice can be simulated using the function.

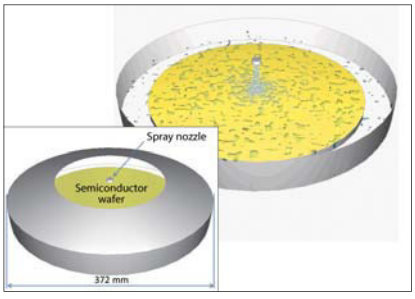
Joule heat*1

Joule heat, which is generated when an electric current travels through an object with an electric resistance, can be considered. By setting a wiring of a conductor and specifying values of electric current and voltage, the wiring works as a heat source automatically.



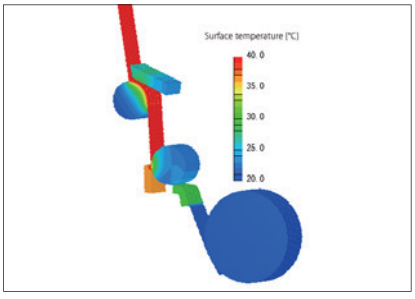
Particle tracking*1

The software simulates the behavior of particles depending on their characteristics (diameter, density, and sedimentation speed) and action/reaction between particles and a fluid. This includes sedimentation due to gravity, inertial force for mass particles, and movement due to electrostatic force, liquefaction at adhering on a wall surface, evaporation and latent heat, the behavior as bubbles in a liquid for charged particles.



Panel (heat conduction / transfer*1/ conveyor*1)

Material properties and motion conditions can be applied to a panel having no thickness in model, which allows for heat conduction to other parts and heat dissipation to air. This enables the simulations of paper feeding and film drying processes, where thin objects move and go under heating repetitively.



Functions (scSTREAM, HeatDesinger)

			scSTREAM	HeatDesigner
Preprocessor	Modeling	CAD data Interface (import)	Parasolid, STEP, STL, IGES, ACIS, CATIA V5, CATIA V4, Creo Elements/Pro (Pro/Engineer), SOLIDWORKS, NX, Solid Edge, Inventor, DXF (2D, 3D-face), VDAFS, XGL, IDF, Autodesk Revit, ARCHICAD, NASTRAN, SHAPE, 3DS, SketchUp, IFC, PRE, MDL, NFB, Gerber (RS-274D, RS-274X)	Parasolid, STEP, STL, IGES, ACIS, CATIA V5, CATIA V4, Creo Elements/Pro (Pro/Engineer), SOLIDWORKS, NX, Solid Edge, Inventor, DXF (2D, 3D-face), VDAFS, XGL, IDF, MDL, NFB, Gerber (RS-274D, RS-274X)
		CAD data interface (export)	Parasolid, STL, MDL, NFB	Parasolid, STL, MDL, NFB
		Primitives	Cuboid, hexagon, cylinder, cone, sphere, revolved rectangle, point, panel (orthogonal, quadrilateral), 2.5D solid part, pipe components, fan (flat, axial, blower), electronics (chassis, thermal circuit model (two-resistor, Delphi, multi-resistor), fin, slits, Peltier device, heat pipes), air-conditioning appliances (4 way cassette, 2 way cassette, wall type, floor type, outdoor unit, anemostat, linear diffuser)	Cuboid, hexagon, cylinder, cone, sphere, point, panel (orthogonal, quadrilateral), 2.5D solid part, pipe components, fan (flat, axial, blower), electronics (chassis, thermal circuit model (two-resistor, Delphi, multi-resistor), fin, slits, Peltier device, heat pipes)
		Geometry modification	Boolean operation (sum, subtract,multiply, divide), shape simplification (deformer, filling hole, projection deletion, R fillet deletion), copy, mirror copy, wrapping	Boolean operation (sum, subtract,multiply, divide), shape simplification (deformer, filling hole, projection deletion, R fillet deletion), copy, mirror copy, wrapping
		Registration of parts library	●	●
	Mesh generation	Tetrahedron	● (finite element model)	
		Hexahedron	● (cylindrical coordinate system)	
		Cuboid	●	●
		Cut-cell	●	
	Conditions	Easy set-up through wizard	●	●
		Preset default conditions	●	●
		Unused dialogs hidden	●	●
		Collective settings to undefined regions	●	●
		Material property library (editable)	●	●
		Laminated materials	●	●
	Operation and control environment	VB Interface	●	●
		Selectable mouse operation modes	●	●
		Mapping	●	
Solver	Mesh	Structured mesh	● (Cartesian or cylindrical coordinate)	● (Cartesian coordinate)
		Unstructured mesh	● (finite element model)	
		Multiblock	●	●
		Cut-cell	●	
		Moving objects	●	
	Numerical scheme	Finite volume method	●	●
		Pressure correction	SIMPLEC, SIMPLE	SIMPLEC
		Convection term accuracy	1st / 3rd (QUICK / WENO) upwind scheme	1st / 3rd (QUICK / WENO) upwind scheme
		Matrix	MICCG, ILUCR, ILUCGS, FMGCG, FMGCGS	MICCG, ILUCR, ILUCGS, FMGCG, FMGCGS
		Steady-state / transient calculation	●	●
	Flow types	Incompressible fluid	●	●
		Compressible fluid	●	
		Non-Newtonian fluid	●	
		Buoyancy (Boussinesq approximation)	●	●
		Multiple fluids	●	
		Gas mixing	●	
		Foaming resin model	●	
	Turbulence models		Standard k-ε model, RNG k-ε model, MP k-ε model, AKN linear low-Reynolds-number model, non-linear low-Reynolds-number model, Improved LK k-ε model, two-equation heat transfer (NK) model (high Reynolds number), two-equation heat transfer (AKN) model (linear low-Reynolds-number), LES (Smagorinsky, Dynamic Smagorinsky, WALE, mixed-time scale)	Standard k-ε model, AKN linear low-Reynolds-number model
	Thermal analysis	Heat conduction (fluid/solid)	●	●
		Convective heat transfer	●	●
		Heat radiation (view factor method)	●	●
		Heat radiation (flux method)	●	
		Heat conduction panel	●	●
		Solar radiation	● (direct / sky solar radiation / reflection)	
		Lamp	●	
		Joule heat	●	
		Mean radiation temperature calculation	●	
	Diffusion analysis	Diffusivity	●	
		Sedimentation rate	●	
		SORET effect	●	
	Index for ventilation efficiency	Age of air, life expectancy of air, inlet contribution rate	●	
	Thermal control model	PMV / SET*	●	
	Illumination analysis	Solar radiation / lamp	●	
	Humidity/dew condensation analysis	Relative humidity / absolute humidity	●	
		Dew condensation	●	
		Humidity transfer in solid	●	
	Reaction analysis	Chemical reaction	●	
		Combustion	● Eddy-dissipation model, PDF (Probability Density Function) method	
	Particle analysis	Marker particles	●	
		Mass particles	●	
		Reactant particles	●	
		Charged particles	●	
		Spray model	●	
		Transforming dew condensation	●	
		Transforming fluid / volume rate	● (MARS method)	
	Multiphase flow analysis	Free surface	● (VOF method, MARS method)	
		Solidification / melting	● (VOF method, MARS method)	
		Evaporation / condensation	● (MARS method)	
	Current analysis	Conductor current	●	
		Conductor potential	●	
		Braking effect of static magnetic field	●	
	Electric field analysis	Electrostatic field	●	
	Thermal circuit model	2-resistor / DELPHI model / multi-resistor	●	●
	Flow conditions	Velocity	●	●
		Power-law velocity	●	
		Volume flow rate	●	●
		Radial volume flow rate	●	
		Pressure (static, total)	●	●
		Natural inflow / outflow	●	●
		Air-conditioner model	●	
		Fan model	●	●
		Wave generation, wave dissipation	● (MARS method)	
	Thermal conditions	Fixed temperature	●	●
		Amount of heat generation	●	●
		Heat transfer coefficient	●	●
		Contact heat transfer coefficient	●	●

Functions (scSTREAM, HeatDesinger)

			scSTREAM	HeatDesigner
Solver	Wall conditions	No-slip (stationary wall)	●	●
		Free-slip (symmetry wall)	●	●
		Log-law condition	●	●
		Power-law condition	●	●
		Surface roughness	●	●
	Pressure conditions	Fixed pressure	●	●
		Pressure loss	●	●
		Porous media	●	
	Source conditions	Volume force / pressure loss	●	●
		Heat source	●	●
		Smoke source (diffusing materials)	●	
		Turbulence generation	●	
		Humidification	●	
		Grass establishment	●	
	User-defined conditions	Variables table / functions	●	●
		Scripts (JavaScript)	●	●
		User-defined function (compilation required)	●	
	Calculation control environment	Job management	●	●
		Monitoring the calculation status	●	●
		E-mail notification of the calculation	●	●
		VB interface	●	●
	Output post files		Software Cradle post files (FLD, iFLD)	Software Cradle post files (FLD, iFLD)
	Output for third party software		Abaqus, NASTRAN, Femtet, ADVENTURECluster, JMAG-Designer, EMSolution, Optimus, Isight, modeFRONTIER Autodesk Revit, ARCHICAD, ThermoRender EnSight, FieldView	Optimus, Isight, modeFRONTIER EnSight, FieldView
Postprocessor	Drawing functions	Mesh, vector, contour plots	●	
		Isosurface, streamline, pathline, volume rendering	●	
		Geometry display	● (STL file, NFB file, Wavefront OBJ file)	
		2D graph	●	
		Mirror / periodical copy	●	
		Vortex center	●	
	Drawing position / orientation	Arbitrary plane, surface, entire volume, cylinder	●	
		Streamlines, isosurface	●	
		Pathlines		
		Arbitrary scaling	●	
		Arbitrary pick	● (scalar / vector value)	
	Special effects	Oil flow	● (on plane / surface)	
		Texture mapping	● (on plane / surface)	
		Lighting, luster, gradation	● (preset, arbitrary)	
		Transparency, water-like expression, shadow	●	
	Animation	Vector animation	●	
		Flow line animation	●	
		Cut-plane sweeping	●	
		Marker particle	● (turbulent diffusion effect)	
		Automatic translation of view point	● (view / focus points can be set)	
		Key-frame animation	●	
		Animation interpolated between cycles	●	
	Analysis results	Variable registration (function registration)	●	
		Integral (surface / volume)	● (scalar / vector integration)	
		Comparison	● (clipping function)	
		Projected area calculation	●	
		Automatic search of the local max / min positions	●	
		Import of CSV data	●	
		Automatic change of colorbar	● (preset, arbitrary)	
	Data image output	Microsoft BMP, JPEG, PNG	● (size, resolution adjustable)	
		CradleViewer®	● (support steady-state / transient animation, attach to Office applications)	
		AVI, WMV	●	
		VRML	●	
	Operation and control environment	Selectable help function	●	
		OpenGL emulation	●	
		VB interface	●	
		Selectable mouse operation modes	●	
		Stereoscopic view (side by side)	●	

System Configuration

Product	Compliant OS*	Recommended environment	Approx. measure of analysis size	Compiler environment (User-defined function)
scSTREAM HeatDesigner	Windows 10 Windows 8.1 Windows 7 Windows Server 2012 R2 Windows Server 2012 Windows Server 2008 R2 RedHat Enterprise Linux 7 *1 RedHat Enterprise Linux 6 *1 RedHat Enterprise Linux 5 *1 *2 SUSE Linux Enterprise Server 11 *1	**[Memory]** 8GB or more **[Hard disk]** 10GB or more free capacity recommended	**[Memory]** 10 million mesh elements / 5.5GB **[Max. number of mesh elements]** 2 billion **[Max. number of parallel processing]** 4096	● Windows version Intel Parallel Studio XE 2015 Composer Edition for Fortran Intel Parallel Studio XE 2016 Composer Edition for Fortran ● Linux version GFortran (GNU Fortran compiler) (Linux standard)

*1 Only compliant with Solver and Monitor. Not compliant with HeatDesigner.

*2 Monitor is not be supported.