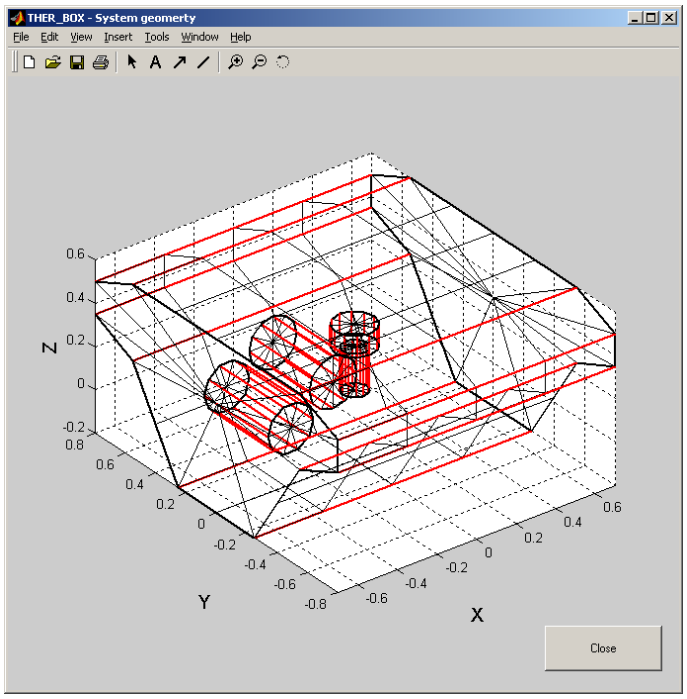
S.A.T.E.

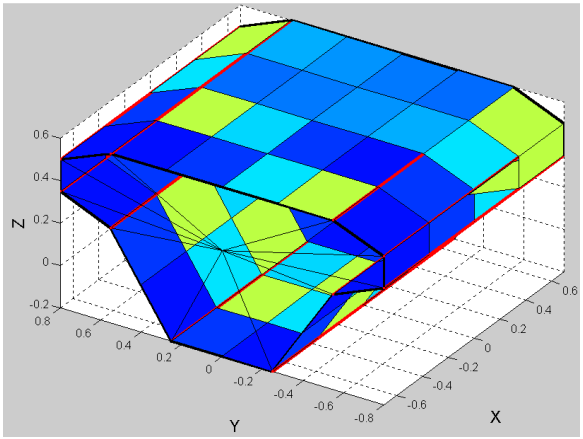
Systems & Advanced Technologies Engineering S.r.l.

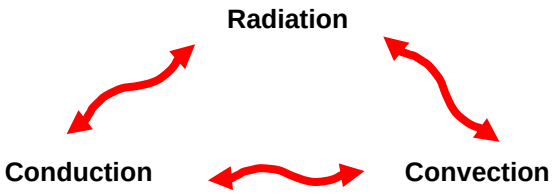
MathWorks Partner

THERBOX

A SIMULATION TOOL FOR HEAT EXCHANGES CALCULATION







OVERVIEW

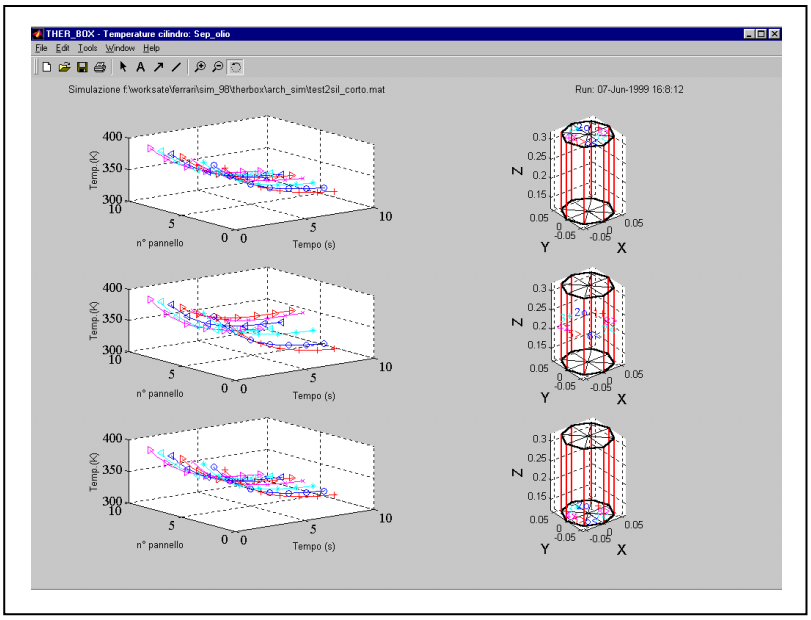
THERBOX is a software application developed in MATLAB/Simulink™ environment, simulating heat exchange between components, ventilation air and radiating sources both inside and outside a car engine bay.
In particular, ***THERBOX*** allows evaluation of the thermal dynamics of a system, associating imposed temperatures from heat sources and air local speed to operative conditions of the engine and of the vehicle speed.
THERBOX is not a CFD programme, but rather assumes that local air temperature and velocity are roughly known to evaluate heat exchange by convection. These functions are given as vectorised input variables.
Non-automotive applications can be however analysed easily too, as the algorithms and objects management are general.

PROGRAM DESCRIPTION

THERBOX runs under The Mathworks' MATLAB/Simulink® environment: a very powerful, qualified mathematical solver and systems simulation tool. The program includes a user-friendly graphic interface based on buttons and menu driven commands, which only require knowledge of basic PC use.
THERBOX performs dynamic simulation of an automotive engine bay, featuring:

- Constant wall temperature elements, used to simulate objects, such as an exhaust manifold, with infinite heat capacity or a defined temperature law, function of exogenous parameters;
- Airflow inside the engine box as a function of vehicle speed.
- Heat exchange between different objects through conduction (between objects in contact with each other) and radiation (between visible objects).
- Internal endogenous heat generation available for every modelled element.

All geometric and physical parameters are assigned in an interactive way by means of graphic windows, generating objects characteristics.



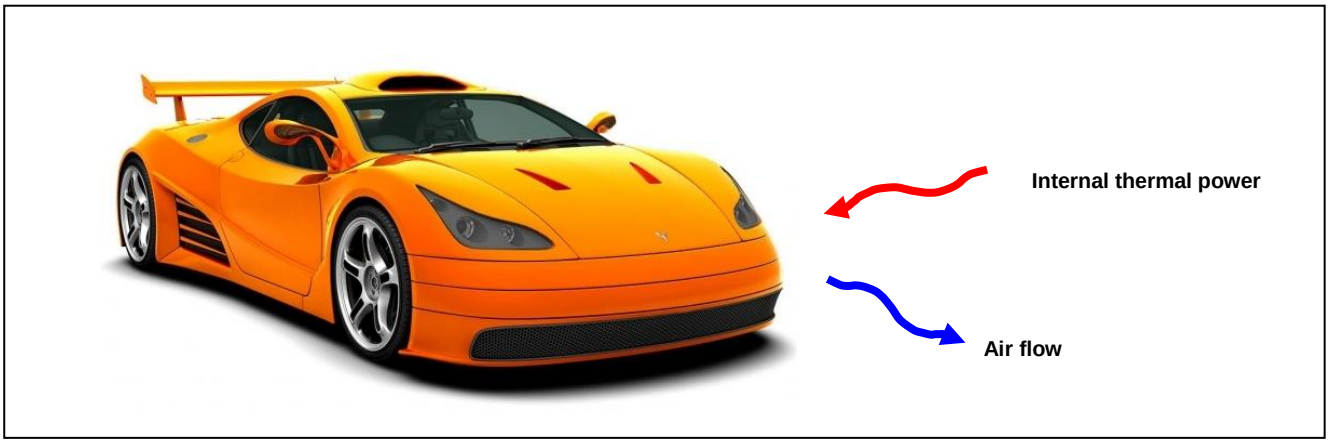
PROCEDURES OUTLINE

The user defines the parameters of the simulation using an easy interactive interface, integrated in the program. Relevant input system data, such as dimensions, heat transfer coefficients and the time evolution of the external conditions, can be stored in files to create a library of configurations that can be recalled for further simulations.

Results of the simulation can be displayed in a variety of output plots that can be printed or exported to other environments. Numerical results can also be written in files compatible and already formatted for easy handling by spreadsheets. The user can view the time histories of the calculated variables for every single face of the modelled objects. ***THERBOX*** could also generate three-dimensional meta colour maps of the surface temperature distribution for each simulated object and for every single time step.

APPLICATIONS

Although ***THERBOX*** has been developed for the simulation of heat balance calculation in the engine bay of motor vehicles, it may easily applied to the thermal analysis of any closed system, i.e. ovens, furnaces, etc.



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