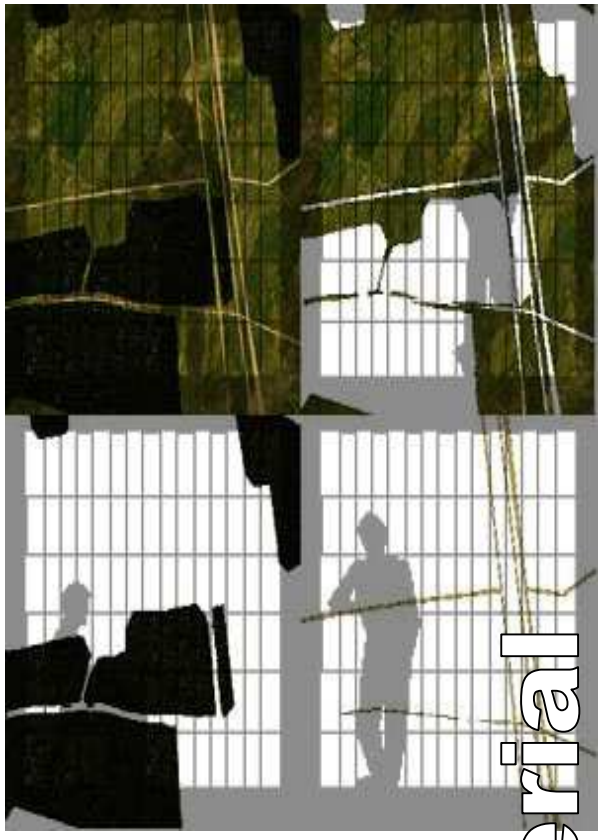
# SE-CLASSIFICATION

## Image

## Physical



## Texture

material CHARACTERISATION

**SEE PHYSICS BEHIND**

# PHYSICAL MODELLING TOOL

SE-CLASSIFICATION features:

Based on Photoshop™ PSD format.

Enables to enhance the contrast and the frequency content of generated images and signals

Provided with a library of materials, thermally and spectrally characterised from visible to far infrared, and physically validated, in the EO version and in the centimetric/ millimetric domain in the EM version

Unlimited number of basic materials can be used in a single texture (use of material layers)

Accurate classification thanks to multi-layers

Validation eased by physical textures display

Import formats: All PhotoShopTM image formats supported

Export formats: SDM materials and textures

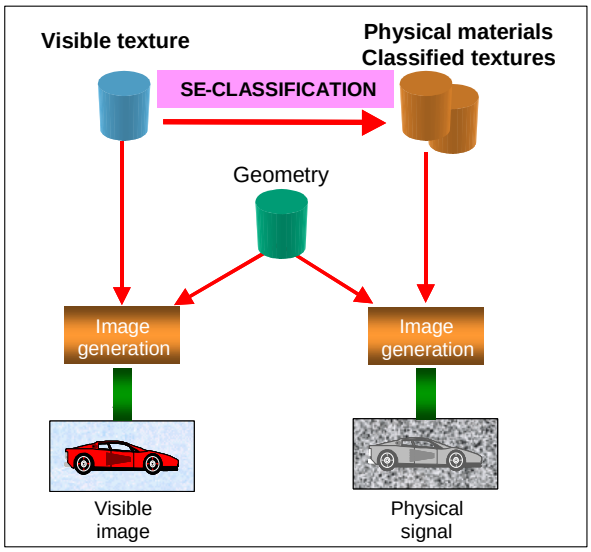
Technology: C++ code development

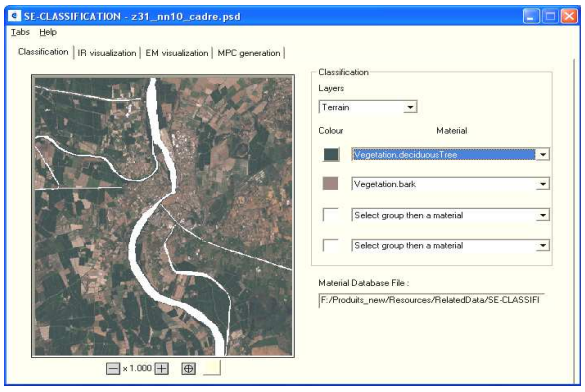
SE-CLASSIFICATION is a tool dedicated to texture classification. This mechanism is used to enhance a visible database, so that it becomes compliant for infrared, acoustic or electromagnetism simulations. From image or picture with three colour channels (red, green, blue), SE-CLASSIFICATION associates physical materials (from the database) to colours of this RGB texture. Thanks to this association colour/material, physical characteristics of texture pixels are fully determined. Finally, SE-CLASSIFICATION generates physical textures and materials.

## Simulation in visible and infrared domains

Synthetic images generation in the visible spectrum (opposed to the infrared spectrum) does not require the knowledge of physical parameters. Thus, a color format like RGB (uniform color or texture) is sufficient to correctly define polygons aspect.

This is not true for infrared images, for two reasons:
**1)** In the visible spectrum, the sun light reflection is the main phenomena (colors are the result of objects reflection coefficients in the different visible wave bands). In infrared, the emission has to be taken into account. The emission characterisation requires the knowledge of object temperature and emissivity.
**2)** Objects colors, which result of spectral reflective coefficients, are empirically known in visible. In infrared, the reflective coefficient of an object is not known a priori, even if its color is well known in the visible spectrum.
Thus, the use of physical information is required for infrared simulations. Physical parameters are gathered in a material database, and used all along by the SE-WORKBENCH.




## Principles

The picture to be classified is decomposed in layers, using Photoshop™. For example, one « glass » layer and one « wall » layer are created for a façade picture. For each layer, a material modulation is computed. For example, for the « wall » layer, red pixels are associated with the brick material, and gray ones with cement.

## Classification panel

- Selection of a color by picking on the image
- Association of a physical material to the color

## Visualisation panel

To check the spectral behavior of materials in use, and the result of the classification, this panel enables the visualisation of emissivity, diffuse and specular reflectivity and transmission planes in the EO domain. A visualisation panel is also available in the RF domain.

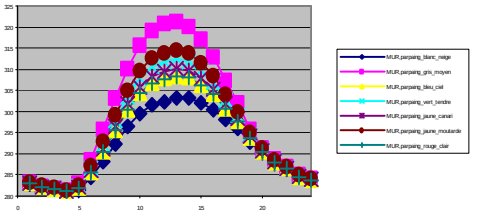
## Generation panel

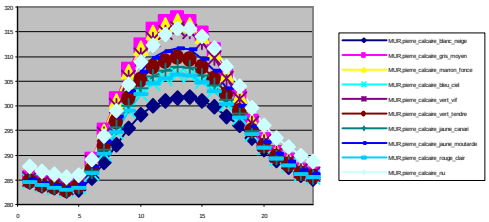
Generation of classified textures for SE-WORKBENCH scene generation tools.

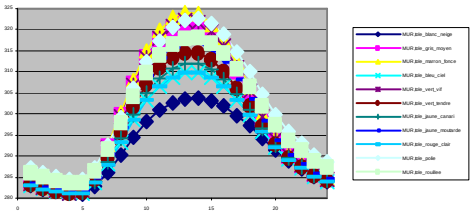
# MATERIAL DATABASE

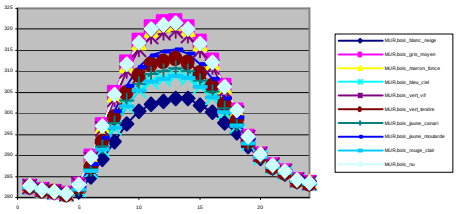
**Benefits:**
Ease of use: Powerful and friendly GUI.

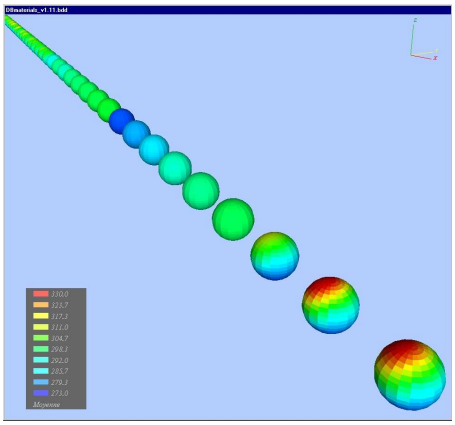
**System requirements :**
Windows NT™ to XP™











For optronic simulations, the required physical characteristics are:
1. Thermal characteristics, to compute objects temperature by using a predictive thermal code. These data allow computing the emissive component of objects radiance.
2. Radiative characteristics, to compute the reflective component of objects total radiance.

This information is stored in the material database, which contains, for a typical generic material, all the physical characteristics required for an infrared simulation.

The material database contains matters and materials. Materials are constituted of several matters ordered in layers (a matter is a single-layer material with arbitrary thickness). The radiative characteristics of the external layer are always used, but its thermal characteristics are used only if it has thickness (materials like painting have no thickness).

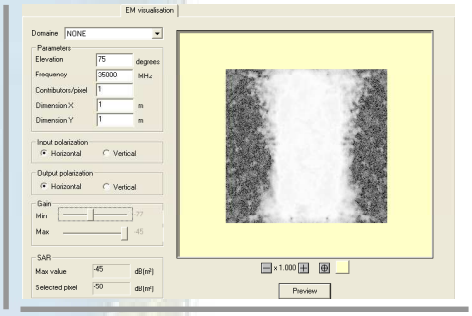
Apart from soils (unique layer of infinite thickness) and vegetation, matters are not representative of the reality, since few objects are made of a unique and homogeneous layer, and also because the thickness defined in the matter description is hardly ever the thickness of the object to be modelled in the scene. Thus, matters are supposed to be used in order to create new materials.

Materials are used with SE-CLASSIFICATION (classification software), and/or SE-THERMAL- and/or SE-THERMAL-SHADOWS (thermal shadows computation software). They are supposed to model the generic elements of a scene: road, wall, roof…

## Associated documentation

A document is delivered with the material database where two kinds of results are presented:
- time profiles, that show the temperature evolution over a typical day, with fine weather, at the beginning of the summer and for a mid-France latitude ;
- 3D spheres, one for each material, for which temperatures have been computed at 2.00 pm. These spheres are designed to be visualised with SE-PHYSICAL-MODELER and the color-scale visualisation functionality.

These results are presented for comparison purposes only. They should be analysed by comparing one material with another, but temperatures should not be compared with the results of a simulation, since the environment conditions change greatly the result of thermal computations.




**We provide software solutions for multi sensors simulations in infrared, electromagnetism, and acoustics.**

## SE-WORKBENCH™

Efficient and professional workshop for synthetic environment data modeling and exploitation in a study or training simulation.

Provides all the simulation services of the perception by a Electro-Optic (EO), Intensification of Light (IL), Radio-Frequency (RF) and Acoustic (AC) sensor immersed in a complex synthetic environment that carries all necessary physical extensions.

## SDM™

SDM/CHORALE is the official format supported by the multi sensors study community in France, Europe and Asia.

## SE-FAST ™

Library allowing one to develop in a simple and fast way three-dimensional visual applications. This C++ library facilitates the construction, the animation and the visualisation of 3D scenes in the visible and infra-red fields.
*OpenSceneGraph based library: available*

## TRAINING

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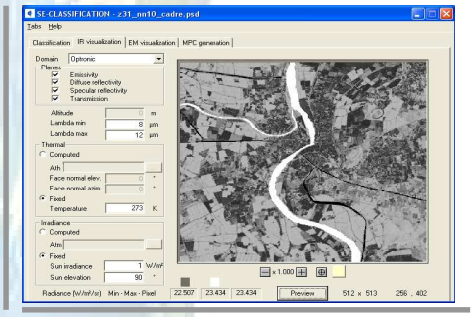
## SERVICES

3D Terrains & Objects catalog
On demand production of 3D virtual mock-ups
Technical support
Software and Hardware integration




See following website for more detailed information:

***www.oktal-se.fr***



OKTAL-SE Synthetic Environment