

# SE-IR-SENSOR

MTF

SENSOR

Noises

Optronic



Non realtime

ADVANCED SENSOR EFFECTS

# SENSOR MODELING AND INTEGRATION TOOL

## SE-RAY-SENSOR features:

32 bits floating point computation

Spectral optical effects

Modelisation of optical, spatial and electronic Modulation Transfer Functions (Point Spread Functions)

Various types of noises :  
 - Fixed pattern noise  
 - Temporal additive noise

Blooming effects

Non-linear detector model

Persistence effect

Easy sensor parameterisation with C++ API

Integrated into SE-TOOLKIT

SE-IR-SENSOR is a library of first order modelling of generic optronic sensor technology. It eases the way to integrate sensor effects in SE-RAY-IR and SE-FAST-IR image rendering software.

### Synthetic image generator system

The SE-IR-SENSOR libraries applies both to non real-time (SE-RAY-IR) infrared physical computation and to real-time (SE-FAST-IR) graphic board rendering.

### Geometric extent box

The computation of the solid angles is necessary to convert radiances from the SIG into irradiances. Then using detector surface, irradiances are converted into flux (Watts). From a physical point of view, it is better to work in flux because this is more adapted to represent an integral of surface for the consideration of the various PSF (Point Spread Function).

### Modulation Transfer Functions box

To model the various Transfer Functions, from the stream of photons (radiance) in the lens entry of a real sensor towards the electric final signal, we apply several real-valued convolutions to the images. They represent :

- Optical PSF (OPSF)
- Spatial PSF (SPSF)
- Electronic PSF (EPSF)

### Detector Model box

A detector model is necessary to convert irradiances into volts. The spectral non-linear response of the sensor is applied then all the bands are summed.

### Noises box

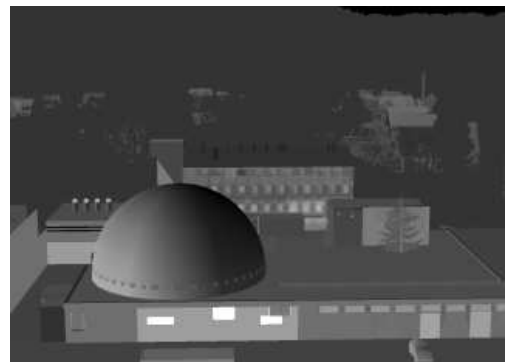
Different types of noises can be applied. These noises are classically based on standard probabilistic distribution laws such as gaussian, poisson,  $\chi^2$ ...

### Display box

If a display (control screen, cathodic, LCD ...) is provided with the camera, it can be interesting to simulate the transfer function such as gamma correction or black hot video mode.

### Other effects

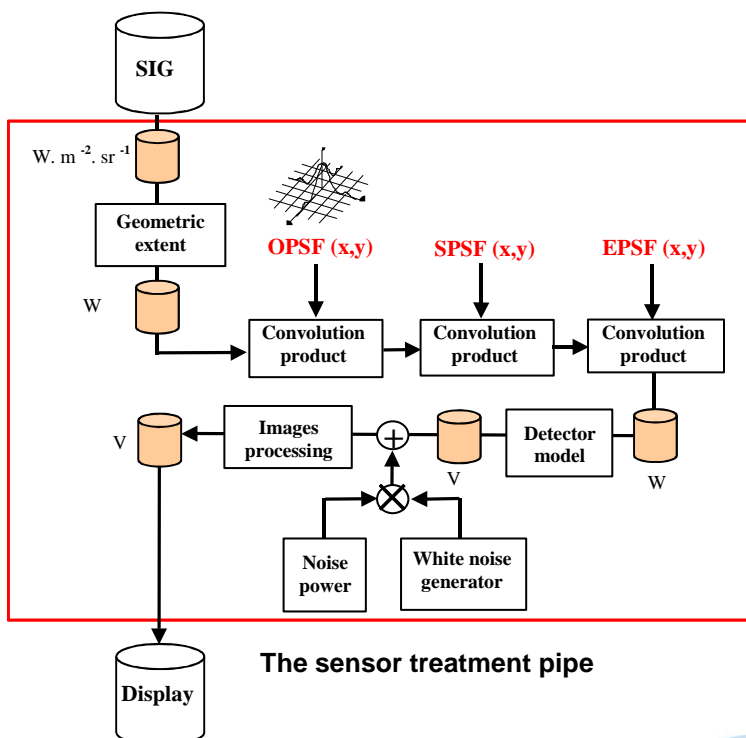
Miscellaneous effects can also be applied : Persistence, Saturation, Vignetting ...



A LWIR image before SENSOR



The same image after SENSOR



The sensor treatment pipe

## Benefits:

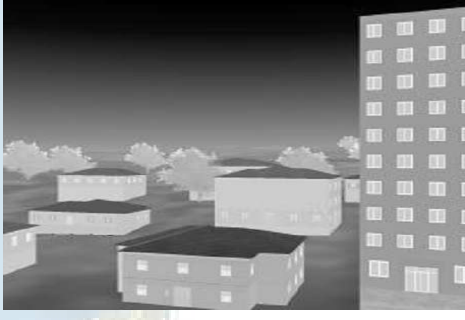
Easy integration through SE-TOOLKIT

Accurate sensor modeling

Numerous sensor effects

System requirements :

Windows™ 98 to XP



**OKTAL-SE provides 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™

Developed by OKTAL-SE, 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 visualization of 3D scenes in the visible and infra-red fields.

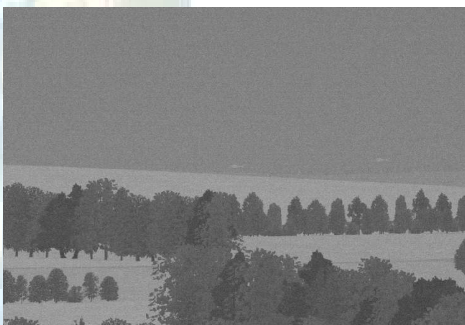
*OpenSceneGraph based library: available*

### TRAINING

See our new training catalog for special session on this product.

### SERVICES

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



Contact OKTAL-SE for more detailed information:

**[www.oktal-se.fr](http://www.oktal-se.fr)**