SensorFX

First Experience

JRM Technologies
Real Physics • Real Sensors • Real-time

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SensorFX First Experience

Thank you for deciding to try out VR-Vantage and the SensorFX plug-in. VR-Vantage is MÄK's line of visualization products. It includes VR-Vantage Stealth, a 3D and 2D visualization tool with a focus on information about your virtual battlefield, VR-Vantage IG, which provides realistic 3D scenes of your virtual simulation environment, VR-Vantage PVD, a 2D plan view display, and the VR-Vantage Toolkit, which gives you the power to customize and build VR-Vantage-based applications.

The SensorFX plug-in was created by JRM Technologies. It provides sensor views for infrared (IR) and night vision goggles (NVG). SensorFX requires that terrain and simulation objects be materially classified so that they can be properly represented. Material classifications have been provided for the VR-Village terrain database and all the entities and effects in the VR-Village-CarBombDemo-v3 scenario. (Other scenarios will probably reference entities and effects that have not been material classified, so they may not look correct. The material-classifications are notional only to provide some indication of capability, but not reflect actual vehicle signatures.)

This first experience guide provides a quick guided tour of the SensorFX Basic plug-in. It assumes that you have previously installed VR-Vantage and are already familiar with VR-Vantage Stealth. It also assumes that you are running on Microsoft Windows. If you have not used VR-Vantage Stealth, please read *VR-Vantage Stealth First Experience Guide* before trying this guide.

To get the full experience you will need:

- VR-Vantage 1.5
- SensorFX Basic Plug-in
- MAK Data Logger
- The *VR-Village-CarBombDemo-v3-DIS.lgr* logger file.

1. Install SensorFX

SensorFX is provided as a standard Windows installer. To install it, just run the installer. Be sure to install it into the version of VR-Vantage for which it was compiled, for example, VR-Vantage 1.5, VC 10.

When you install SensorFX, it installs a version of the VR-Village terrain called *VR-Village-SensorFX.mtf*.

2. Start Vantage with SensorFX

1. On the Start menu, choose **All Programs** → **MÄK Technologies** → **VR-Vantage 1.5** → **VR-Vantage with SensorFX Basic**. VR-Vantage Stealth starts up. The Choose a Terrain dialog box opens.
2. In the Load a Local Terrain Database list, select VR-Village-SensorFX.
3. Click OK. The terrain is loaded.

3. Explore the SensorFX Plug-in

SensorFX installs four sensors:

- Visual. The Visual sensor displays objects using the naked-eye visual light spectrum.
- MWIR. The Midwave Infrared (MWIR) sensor displays objects using the intermediate infrared spectrum. In guided missile technology this is the atmospheric window in which the homing heads of passive IR heat seeking missiles are designed to work. It can be white hot or black hot.
- LWIR. The Long Wave Infrared (LWIR) sensor displays objects using the long wave infrared spectrum This is the thermal imaging region, in which sensors can obtain a completely passive picture of the outside world based on thermal emissions only and requiring no external light or thermal source such as the sun, moon or infrared illuminator. It can be white hot or black hot.
- NVG. The NVG sensor simulates night vision goggles, which allow images to be produced in levels of light approaching total darkness.

Sensor settings are observer-specific. The default observers have the following sensors:

- Stealth, Inset, and Out-the-Window: Visual sensor.
- MWIR (Out-the-Window): MWIR white hot.
- LWIR (Out-the-Window): LWIR white hot.
- NVG (Out-the-Window): NVG.

SensorFX starts up with the Stealth observer mode, which uses the Visual sensor (Figure 1). Notice that it is visually richer than the lighting in VR-Vantage without SensorFX.

Figure 1. VR-Village-SensorFX terrain, Stealth observer mode

In the Observer Settings Toolbar, select MWIR (Out-the-Window) observer mode. The scene changes to show IR (white hot) (Figure 2).

Figure 2. VR-Village-SensorFX terrain, MWIR observer mode

In the Observer Settings Toolbar, select LWIR (Out-the-Window) observer mode. See if you can tell the difference from MWIR.

In the Observer Settings Toolbar, select NVG (Out-the-Window) observer mode. The scene changes to be completely white. Why is that? Night vision goggles aren't very useful in the middle of the day. They are completely washed out by all the light. So we have to change the environment to night time.

1. Choose **Settings** → **Scene**. The Scene Settings dialog box opens.
2. Select the Date and Time page (Figure 3).

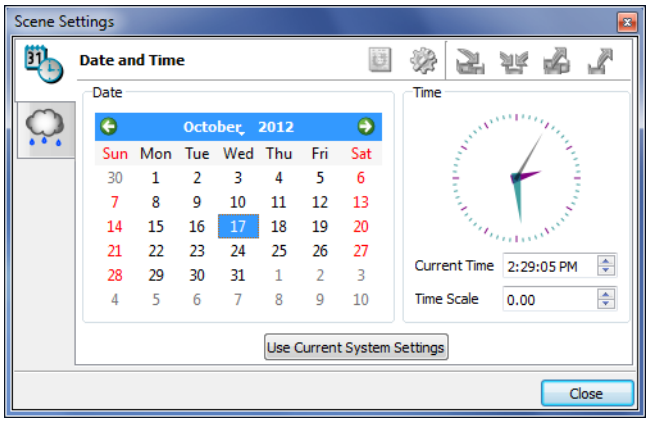

Figure 3. Date and Time page

3. Change the current time to 11:00:00 PM.

Now you can see the village (Figure 4). Switch back to Stealth observer mode to show how the NVG sensor affects visibility at night versus Visual mode. Try the LWIR and MWIR observer modes also.

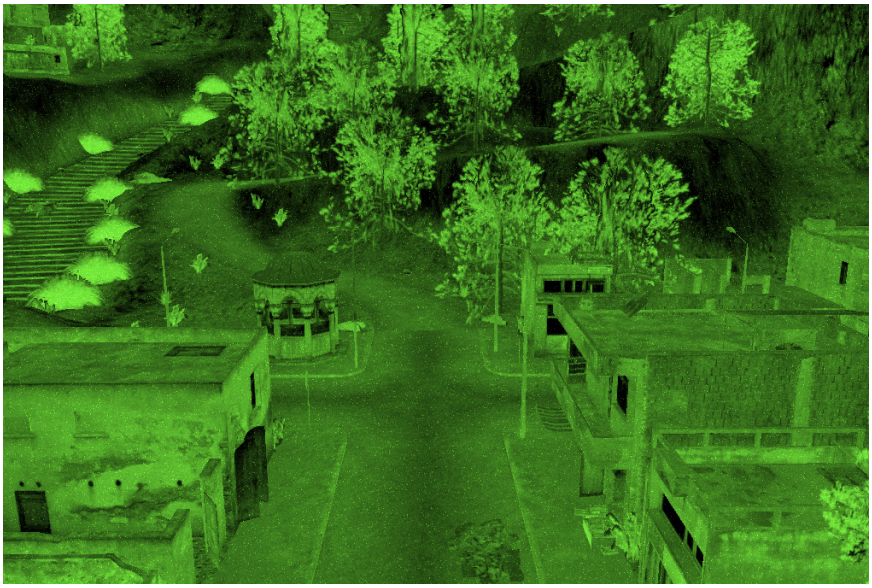

Figure 4. VR-Village-SensorFX terrain, Out-the-Window NVG observer mode

3.1. View a Simulation

Now let's run the MÄK Logger and add some action to the scene. You will have to start the Logger. Then you will have to connect to the network. We will assume that you are using the default port for the Logger and VR-Vantage Steatlh (3000).

1. On the Start Menu, choose **Programs** → **MÄK Technologies** → **Logger X.X** → **Logger DIS**. The Logger starts.
2. Choose **File** → **Open**. The Open File dialog box opens.
3. Select *VR-Village-CarBombDemo-v3-DIS.lgr*. (If you are using Logger 4.3 or earlier, load *VR-Village-CarBombDemoDIS.lgr*.)
4. Click Open.
5. Choose **Play** → **Toggle Loop at End**. This will cause the recording to continuously loop back to the beginning when it reaches the end.
6. Choose **Play** → **Play/Pause**, or click the Play button.

Connect to the Simulation Network

1. Choose **Settings** → **Connection**. The Simulation Connections dialog box opens.
2. Select the DIS Connections page. The default connection is DIS localhost (Figure 5).

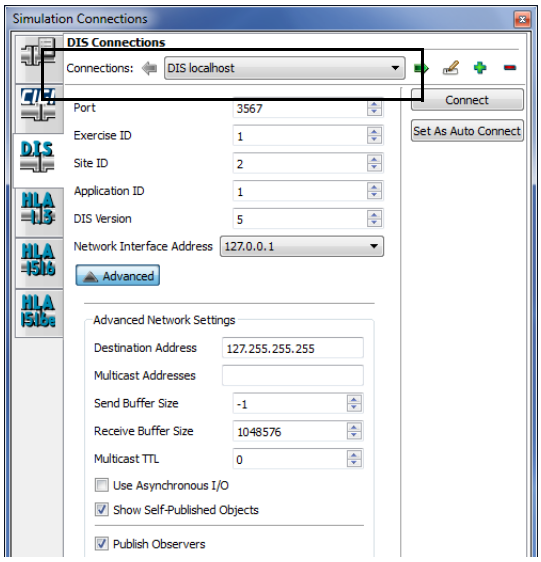

Figure 5. DIS Connection

3. In the Connections drop-down list, select DIS.
4. Click Connect.
5. Click Close.

View the Simulation

VR-Vantage will take a few seconds to load model files. Then it will start to display the action in this simulation. The Logger file sends view control messages to VR-Vantage to control the observer. Turn them off so that we can focus on specific locations.

Disable View Controls

1. Choose **View** → **Observer Control Panel**. The Observer Control Panel gets added to the set of panels on the left side of the window.
2. On the Observer Control Panel, clear Accept View Controls. Now, VR-Vantage will not respond to newly received view controls.
3. If the observer is attached to an entity, press **z**. The observer stops following the entity to which it was attached.

3.2. View Thermal Effects at Different Times of Day

In this exercise, you will change the time so that you can see how thermal effects change based on the time of day.

Two common characteristics of thermal sensor simulations are diurnal cycle effects and thermal cross-over. This can be illustrated by changing the time-of-day from daytime to night-time, and observing the changes in the scene intensities. During the day, vegetation like trees and grass will appear to be cooler than soils, rocks, and man-made construction materials like asphalt, rooftops, and concrete. Deep into the night, vegetation appears warmer than those other materials. Near sunrise and sunset, scene elements will demonstrate a thermal convergence. As a result their apparent temperatures will be about the same, and the scene will appear to wash out. The vehicle hot spots will however, still stand out.

1. Select the LWIR (Out-the-Window) observer mode.
2. Choose **Settings** → **Scene**. The Scene Settings dialog box opens to the Date and Time page.
3. Change the time to different times throughout the day and night. You will see how the “hot spots” stand out at different times of day.

The following illustrations show the same scene captured at 1 PM (Figure 6) and 1 AM (Figure 7). Notice how at 1 PM, the hottest part of the scene (in white) is the pavement. At 1 AM, the hottest parts of the scene are the people and automobile headlights.

Figure 6. LWIR, white hot, 1 PM

Figure 7. LWIR, white hot, 1 AM

3.3. Change Sensor Effects

The IR and NVG sensors let you adjust and turn on and off the following effects:

- Blur. The sharpness of the scene.
- Noise. The graininess of the scene.
- Gain. The contrast in the scene.
- Level. The brightness of the scene.

To change the sensor effects:

1. Choose **Settings** → **Display**. The Display Settings dialog box opens.
2. Select the Sensor Settings page. (Figure 8 shows the settings for the NVG sensor. The settings for LWIR and MWIR are slightly different.)

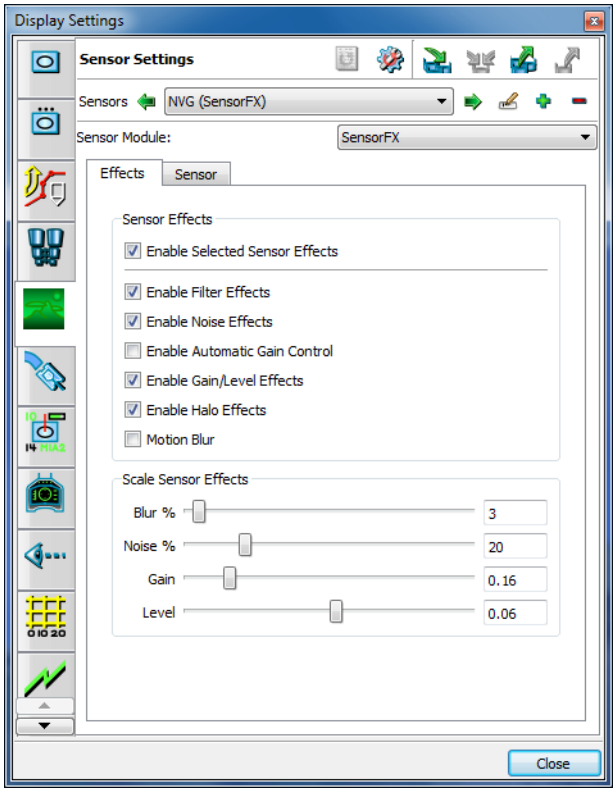

Figure 8. Sensor Settings page, NVG sensor

3. To change a sensor effect, on the Effects tab, in the Scale Sensor Effects group box, move its slider. Observe the changes to the scene.

Figure 9 shows a street scene in Out-the-Window NVG observer mode with different sensor effect settings.

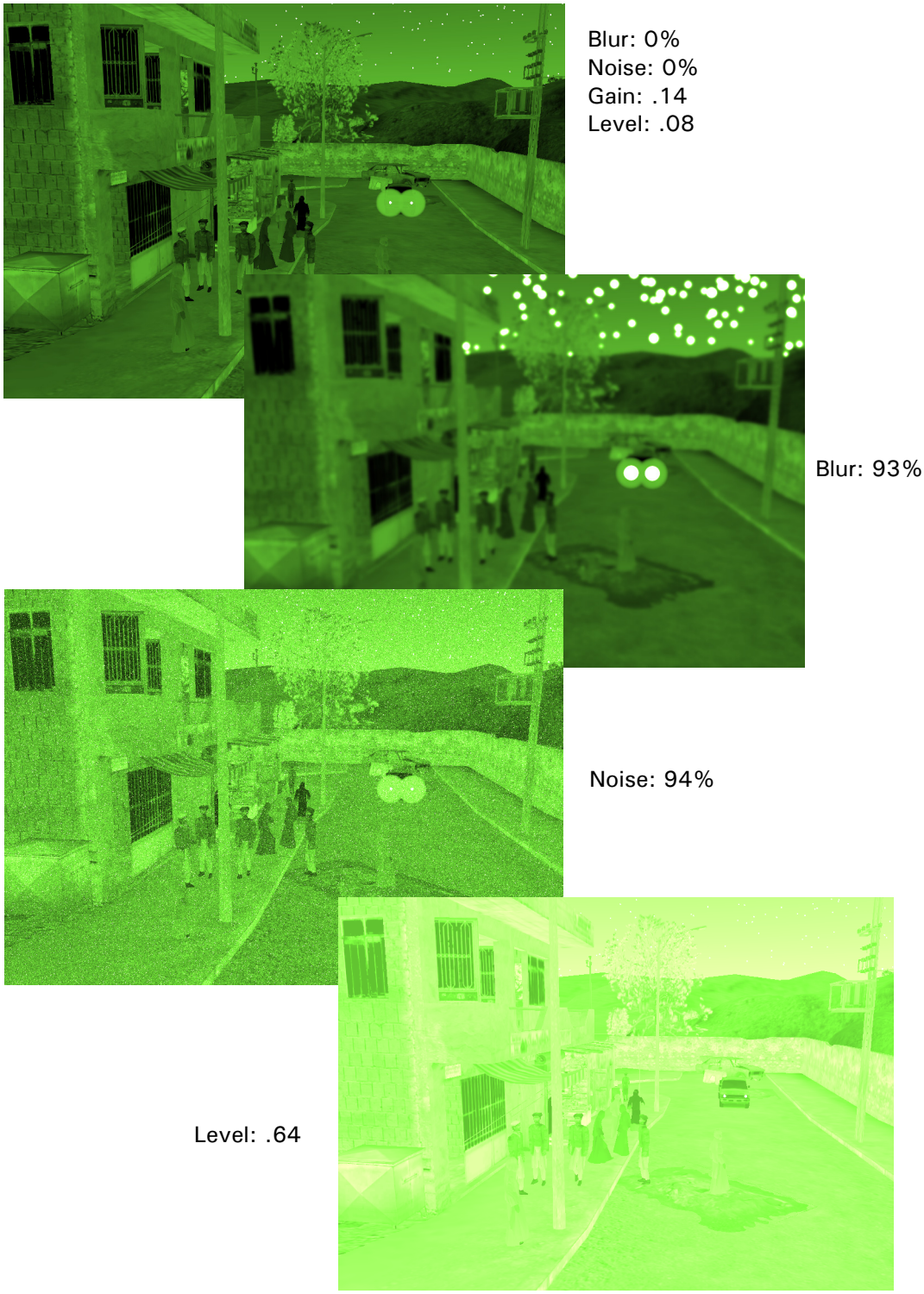

Figure 9. NVG observer mode

White Hot versus Black Hot

So far when we selected an IR observer mode, we have just used the default sensor, which is white hot. Black hot inverts the view and all hot spots are black instead of white. Compare Figure 10 to Figure 6.

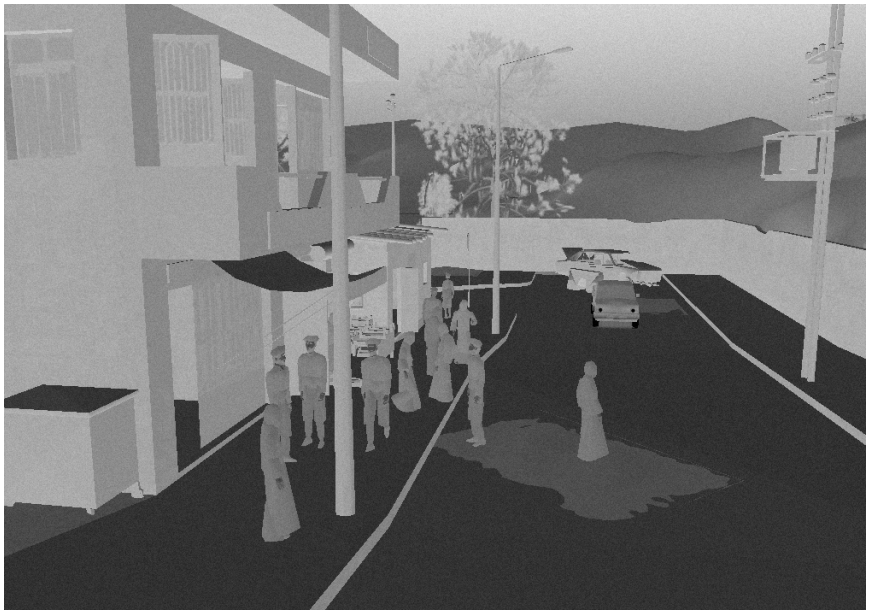

Figure 10. LWIR, black hot, 1 PM

To switch an IR sensor to black hot:

1. Choose **Settings** → **Display**. The Display Settings dialog box opens.
2. Select the Sensor Settings page (Figure 8).
3. In the Sensors list, select the sensor you want to change (LWIR or MWIR).
4. On the Effects tab, in the Sensor Effects group box, select Enable Blackhot.

4. Learn More

For more information about SensorFX, please see *SensorFX Users Guide*. It covers the additional configuration capabilities in SensorFX Pro.