

NAME

devas-visibility – estimate locations of potential low-vision hazards

SYNOPSIS

devas-visibility *preset-option* [*options*] {*input.hdr* | -}
coordinates xyz.txt dist.txt nor.txt simulated-view.hdr hazards.png

or

devas-visibility [*options*] *acuity contrast* {*input.hdr* | -} *coordinates*
xyz.txt dist.txt nor.txt simulated-view.hdr hazards.png

DESCRIPTION

Extends functionality of **devas-filter** to provide estimates of likely low-vision hazards, defined as geometric structures that may be a mobility hazard but are not co-located with detectable visual contrast. The modeling underlying **devas-visibility** does not address small differences in visibility over the range of normal vision, i.e., from -0.3 to 0.3 logMAR. As a result, specifying and acuity value less than 0.3 logMAR (20/40 Snellen) is not allowed.

Two output images are created. One is the same Radiance HDR format image that would be created by **devas-filter**, given comparable arguments. The other is a color PNG image, with estimated visibility hazards shown in red and other geometric features estimated to be less of a potential visibility hazard shown in green or dark gray. The analysis is based on the image plane distances, quantified in terms of visual angles, between locations corresponding to geometric discontinuities and the closest luminance discontinuity. Regions of this output image that correspond to regions of the input image that are too dark to support reliable visual feature detection are marked in orange or yellow. The yellow coloring indicates the location of a geometric boundary in this too-dark-to-see region. This helps align the hazard visualization with the actual scene structure and encodes geometry that might be invisible due to low luminance.

OPTIONS

All of the **devas-filter** options, plus:

--luminanceboundaries=<filename>.png

Write a grayscale PNG image file indicating the location of detected luminance boundaries. Value of TRUE correspond to boundary elements.

--geometryboundaries=<filename>.png

Write a grayscale PNG image file indicating the location of detected geometry boundaries. Value of TRUE correspond to boundary elements.

--red-green

Larger angular distances (usually associated with estimated visibility hazards) shown in red and other geometric standard boundary elements that are closer (usually associated with elements estimated to be less of a potential visibility hazard) shown in green. Default.

--red-gray

Larger angular distance (usually associated with estimated visibility hazards) shown in red and other geometric standard boundary elements that are closer (usually associated with elements estimated to be less of a potential visibility hazard) shown in dark gray.

--Gaussian=<sigma>

Visualization based on angular distance weighted by an unnormalized Gaussian function with standard deviation <sigma>. Default visualization weighting is **--Gaussian=0.75**.

--reciprocal=<scale>

Visualization based on reciprocal of angular distance, with distance scaled by <scale>.

--linear=<max>

Visualization linearly scaled to a maximum angular distance of <max>.

--ROI=<filename>.png

Read in a region-of-interest file of the same dimensions as *input.hdr*. Only analyze visibility of pixel locations that have a non-zero value in the ROI file.

--quantscore

Annotate the output image with the average Hazard Visibility Score over all of the geometric boundary elements not in low luminance areas. Analysis is limited to pixels in the region of interest, if specified. Only available if compiled with the Cairo library option. If the Cairo library is not available, you can still get access to the Hazard Visibility Score by using the **--printfaverage** option.

--printfaverage

Print to standard output the average Hazard Visibility Score over all of the geometric boundary elements not in low luminance areas. Analysis is limited to pixels in the region of interest, if specified. Does not require the Cairo library.

--printfaveragena

Same as **--printfaverage**, but includes no annotations or a trailing carriage return. This is intended to facilitate capturing data by executing *devas-visibility* from a shell script that intersperses other annotation and formatting information and concatenates the results to a log file.

--lowluminance=<filename>.png

Write a grayscale PNG image file indicating the location of low luminance area in the input image. Such pixels are indicated by a value of *TRUE* in the output file. **--falsepositives=<filename>.png** Write an additional output color PNG image indicating likely potential false positive area in the input image where visual contours do not correspond to actual scene geometry. Uses a gray-cyan colormap.

ARGUMENTS*input.hdr*

Original Radiance image of area in design model to be evaluated for low-vision visibility hazards, as for **devas-filter**.

coordinates

A two line text file. The first line specifies the units for the *xyz.txt* and *dist.txt* files. The second line is the same as the VIEW record in *input.hdr*. See **make-coordinates-file** for information on how to create this file.

xyz.txt

A Radiance ASCII format file specifying the xyz model coordinates for each surface point in the model corresponding to the line of sight associated with each pixel in *input.hdr*.

dist.txt

A Radiance ASCII format file specifying the distance from the viewpoint to each surface point in the model corresponding to the line of sight associated with each pixel in *input.hdr*.

nor.txt

A Radiance ASCII format file specifying the surface normal in model coordinates for each surface point in the model corresponding to the line of sight associated with each pixel in *input.hdr*. Note that the numeric values are unitless since they specify a unit normal.

simulated-view.hdr

A Radiance image simulating the reduced visibility associated with loss of visual acuity and contrast sensitivity.

hazards.png

An output PNG image indicating likely potential visibility hazards.

AUTHOR

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