NAME

genssky - generates a RADIANCE description of the spectral daylight sources

SYNOPSIS

genssky month day hour [-y year] [-d AOD] [-c cloud_cover] [-l file] [-p dir] [-g grefl] [-L dir_norm_illum dif_hor_illum] [-n nproc] [-r res] [-f outname]

DESCRIPTION

Genssky produces a RADIANCE scene description of spectral sky and ground using the precomputed atmospheric scattering method (Bruneton et al). For a given atmospheric condition, a set of Radiance data files are pre-computed and reused for other solar positions. A "atmos_data" directory will be created in the current working directory to store the precomputed atmospheric data. This directory can be created elsewhere using the *-p* flag. Precomputation can be sped up using multithreading with the *-n* flag. Extraterestrial solar radiation are spectrally resolved from 380-780nm at 20nm interval and constant regardless of location and time. The resulting sky source is in the same spectra range written to stdout. The sky and ground hyperspectral map are written to files {prefix}_sky.hsr, {prefix}_ground.hsr. The default prefix is "out" and can be changed using *-f* flag. The two .hsr files stores the fisheye spectral image of the sky and ground, with a default resolution of 128x128, which can be changed using *-r* flag.

Genssky models the mie scattering differently from the original implementation. Instead of assuming exponential decay uniformly across the spectral range, the mie scattering coefficients, as a functinon of the altitude, are computed into a lookup table using libradtran radiative transfer solver and interpolated directly during precomputation. The default mie scattering profile is OPAC continental average, and can be overridden using the *-l* flag. The overall aerosol profile can also be scaled linearly by applying a broadband aerosol depth value using the *-d* flag.

Rayleigh scattering as a function of altitude is assumed to be exponential decay. The Rayleigh scattering coefficients at sea level are taken from Anderson et al (1986). There are a total of five sets of Rayleigh scattering data: mid-latitude summer, mid-latitude winter, sub-arctic summer, sub-arctic winter, and tropical. Latitudes are divided at 23.5 and 62.5 deg and summer is from month [4-9]. The scale-height of each Rayleigh scattering profile are tuned to fit the corresponding results from a libradtran calculation.

Non-clear conditions are modeled by linearly interpolating between clear sky and CIE overcast sky. The resulting sky is the weighted (cloud cover) average of clear and overcast sky. The overcast sky has a CCT of 6415K, from which the daylight spectra was computed.

genssky can be used with the following input parameters.

-a   Latitude in degree, north positive. Used along with datetime to determine solar angle and Rayleigh scattering profile.

-c   Total cloud cover, value ranging from 0(clear)-1(overcast), default=0.

-d   Broadband aerosol optical depth, default: 0.115. This parameter linearlly scales the overall aerosol scattering, default=0.115.

-f   Output sky map file name prefix, default="out"

-g   Average ground reflectance, default=0.2

-l   **Custom Mie scattering profile file**

-m   **Standard meridian, west positive. For example, UTC-8:00 = 120. Used to calculated solar angle.**

-n   **Number of threads for precomputation, no benefits beyond 16 threads**

-o   **Longitude in degree, west positive. Used to calculated solar angle.**

-p   **Set directory to store the hyperspectral image and precomputed atmopsheric data directory, default=current working directory.**

-r   **Sky hyperspectral image x resolution. default=128. y resolution is half of x resolution.**

-y   **Set year to invoke a more accurate algorithm to calculate solar angles, default=0.**

-L   **Set direct normal and diffuse horizontal illuminance value.**

EXAMPLES

To generate a clear sky for March 2th at 3:15pm standard time at a site latitude of 42 degrees, 108 degrees west longitude, and a 110 degrees standard meridian, using 8 threads:

  genssky 3 2 15.25 -a 42 -o 108 -m 110 -n 8

For the same sky but with 100 percent total cloud cover:

  genssky 3 2 15.25 -a 42 -o 108 -m 110 -n 8 -c 1

For the same sky but with direct normal and diffuse horizontal illuminance of 80000 and 8000 lux:

  genssky 3 2 15.25 -a 42 -o 108 -m 110 -n 8 -L 80000 8000

FILES

/usr/local/lib/ray/mie_ca.dat

AUTHOR

Taoning Wang

SEE ALSO

gensky(1), rcomb(1), rcontrib(1), rpict(1), rtpict(1), rtrace(1), xform(1)