

New Features in *Radiance* 2023

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Anywhere Software



Minor Fixes/ Enhancements (1)

- Updated Klems “half” and “quarter” bases to match angles currently used in WINDOW
- Eliminated most aiming failures from triangular light sources with help from David Geisler-Moroder
- Added source obstruction tests to statistics for source visibility in adaptive shadow testing code
 - previous code was over-estimating illumination from untested sources
- Added further testing for coincident planar surfaces, now favoring front sides of non-transparent materials

Minor Fixes/ Enhancements (2)

- Fixed errors in iso2klems script noted by Jacob Jonnson
- Added diffuse components to maximum directional hemispherical reported by **checkBSDF**
- Increased maximum set size to 8191 to reduce set overflow errors
- Increased octree and object array limits to support scenes with billions of primitives
- Updated official copyright and license to wording provided by Jean Haemerle from LBNL IP office

Major Changes/ Additions

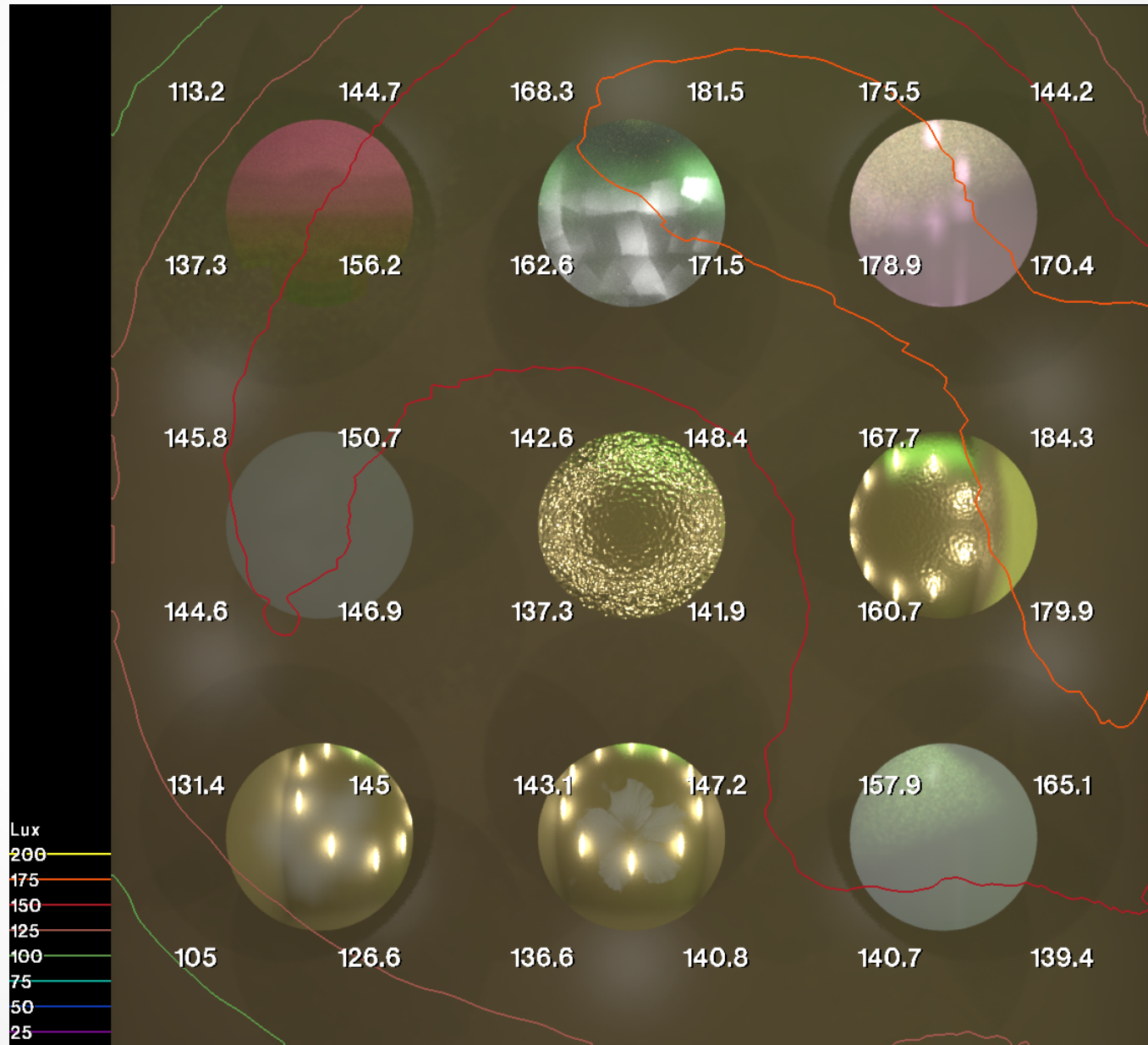
- Added options to **falsecolor** for overlaying matrix of values as requested by Rob Shakespeare
- Added -features options to **rpict**, **rtrace**, and **rcontrib** as suggested by Peter Apian-Bennewitz for fine-grained feature checking
- Added -i* and -o* options to **rhcopy** to enable rays to be read into and out of holodecks, which should enable some annual simulation options



Falsecolor Matrix Overlay

Workplane
illuminance
map

-odim 6 6



New “-features” Option for Renderers

- Designed to enable feature-checking in scripts, etc.
- Basic use:

```
rpict -features feat1 feat2 feat3=optA,optB feat4 ..
```

- If every named feature and subfeature is present, no message is produced and return status is 0
- If any of the features (or subfeatures) is missing, an error message goes to stderr and return status is 1
- If the “-features” option has no arguments, then a comprehensive list of features is sent to stdout

rpict -features

VirtualSources
SecondarySources
SourceSubsampling
SourceVisibility
AmbientModifierSelection
PathTracing
RussianRoulette
LowDiscrepancySeq
SpecularSampling
MaterialMixtures
Antimatter
BackFaceVisibility
ParticipatingMedia=Mist
ScatteringModels=WGMD,Ashikhmin-Shirley
TabulatedBSDFs=DataFile,KlemsXML,TensorTreeXML,+ViewPeakExtraction
Instancing=Octree,TriangleMesh
Aliases
ShadowCache
Persist
ParallelPersist
Recovery

IrradianceCalc
ViewTypes=v,l,a,h,s,c
HessianAmbientCache
AmbientAveraging
AmbientValueSharing
PixelJitter
PixelSampling
PixelMotion
PixelDepthOfField
SmallSourceDrawing
ViewSequence
ProgressReporting
AdaptiveShadowTesting
Outputs=v,l

rtrace -features

VirtualSources
SecondarySources
SourceSubsampling
SourceVisibility
AmbientModifierSelection
PathTracing
RussianRoulette
LowDiscrepancySeq
SpecularSampling
MaterialMixtures
Antimatter
BackFaceVisibility
ParticipatingMedia=Mist
ScatteringModels=WGMD,Ashikhmin-Shirley
TabulatedBSDFs=DataFile,KlemsXML,TensorTreeXML,+ViewPeakExtraction
Instancing=Octree,TriangleMesh
Aliases
ShadowCache
Persist
ParallelPersist
Multiprocessing
IrradianceCalc
ImmediateIrradiance

DistanceLimiting
HessianAmbientCache
AmbientAveraging
AmbientValueSharing
AdaptiveShadowTesting
InputFormats=a,f,d
OutputFormats=a,f,d,c
Outputs=o,d,v,V,w,W,l,L,c,p,n,N,s,m,M,r,x,R,X,~

rcontrib -features

VirtualSources
SecondarySources
SourceSubsampling
SourceVisibility
AmbientModifierSelection
PathTracing
RussianRoulette
LowDiscrepancySeq
SpecularSampling
MaterialMixtures
Antimatter
BackFaceVisibility
ParticipatingMedia=Mist
ScatteringModels=WGMD,Ashikhmin-Shirley
TabulatedBSDFs=DataFile,KlemsXML,TensorTreeXML,+ViewPeakExtraction
Instancing=Octree,TriangleMesh
Aliases
ShadowCache
Multiprocessing
Accumulation
Summation
Recovery
ImmediateIrradiance
ProgressReporting
DistanceLimiting
InputFormats=a,f,d
OutputFormats=a,f,d,c
Outputs=V,W

Example -features

```
$ rcontrib -features SecondarySources Summation      status=0  
$ rpict -features SecondarySources Summation        status=1  
rpict: missing feature - Summation
```

```
$ rtrace -features Outputs                          status=0  
Outputs=o,d,v,V,w,W,l,L,c,p,n,N,s,m,M,r,x,R,X,~  
$ rtrace -features Outputs=L,v                     status=0  
$ rcontrib -features Outputs                       status=0  
Outputs=V,W  
$ rcontrib -features Outputs=L,v                   status=1  
rcontrib: missing feature - Outputs=L,v
```

New rhcopy sample i/o

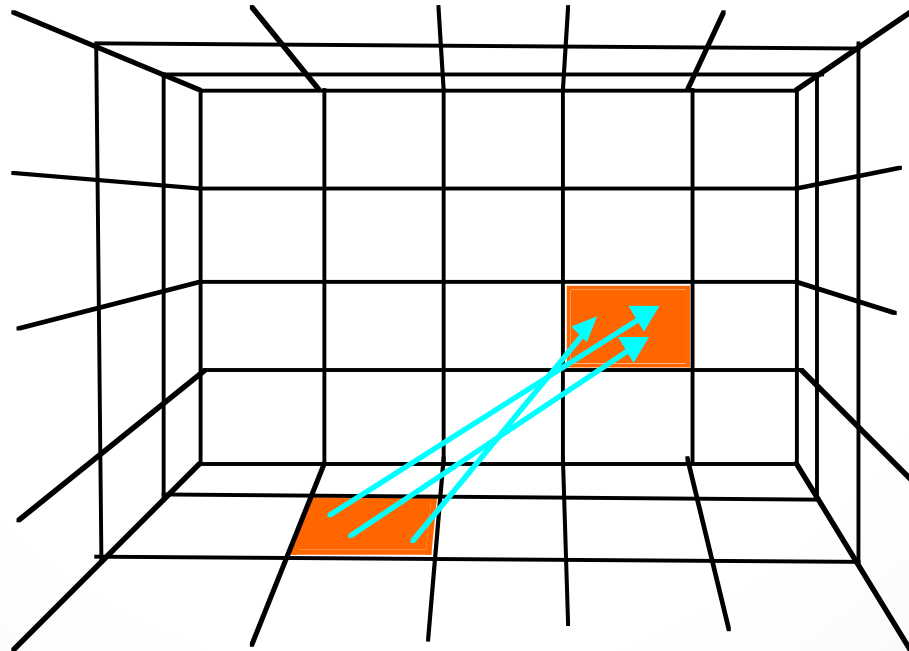
- The **rhcopy** program copies ray samples from pictures and other holodecks into a destination holodeck (which may be initialized but empty)
- New -i* option ingests individual ray samples from stdin and adds them to destination holodeck
- New -o* option reads ray samples from source holodeck and sends requested data to stdout
- Possibly useful for annual simulations and testing

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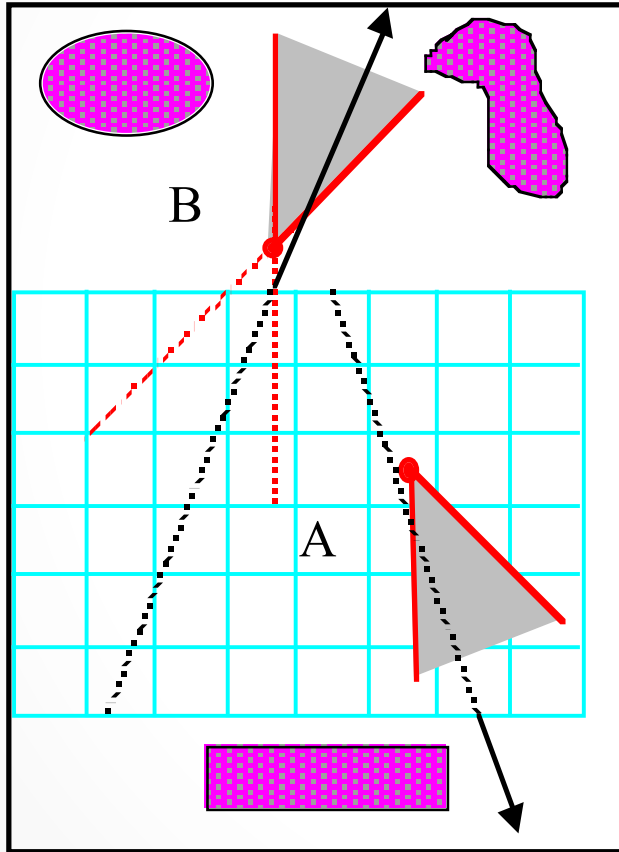
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The Holodeck Ray Cache

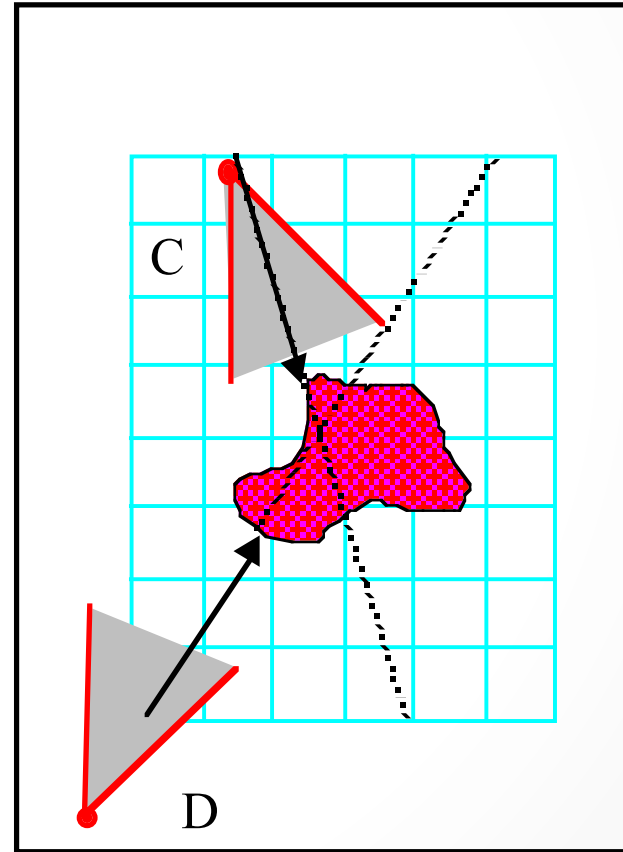
- Rays bundled in *beams* going in one *cell* and out another on a *section wall*



View-Beam Correspondence

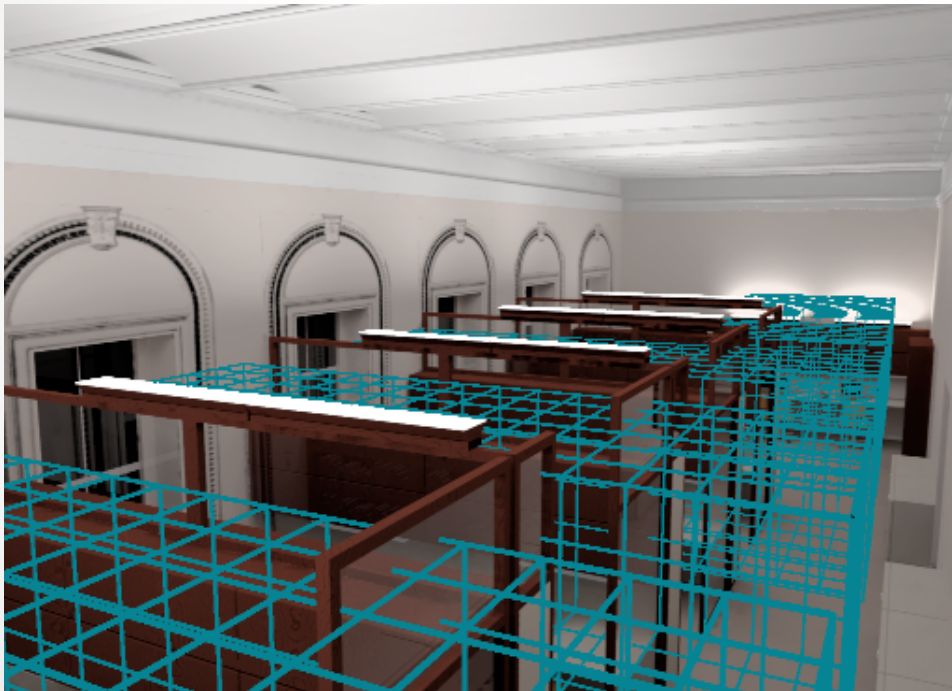


“Internal” Section

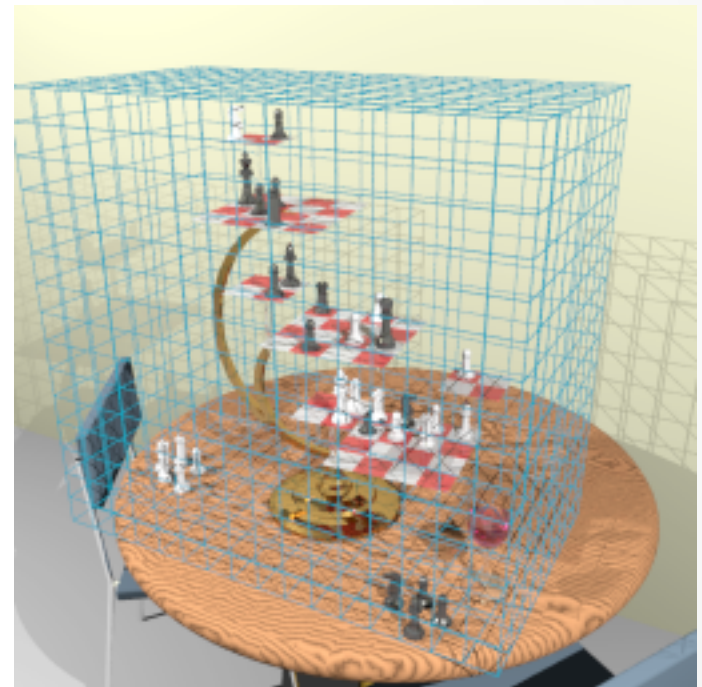


“External” Section

Example Holodecks



Internal Sections
(view from inside)



External Section
(view from outside)

Example Sample Export

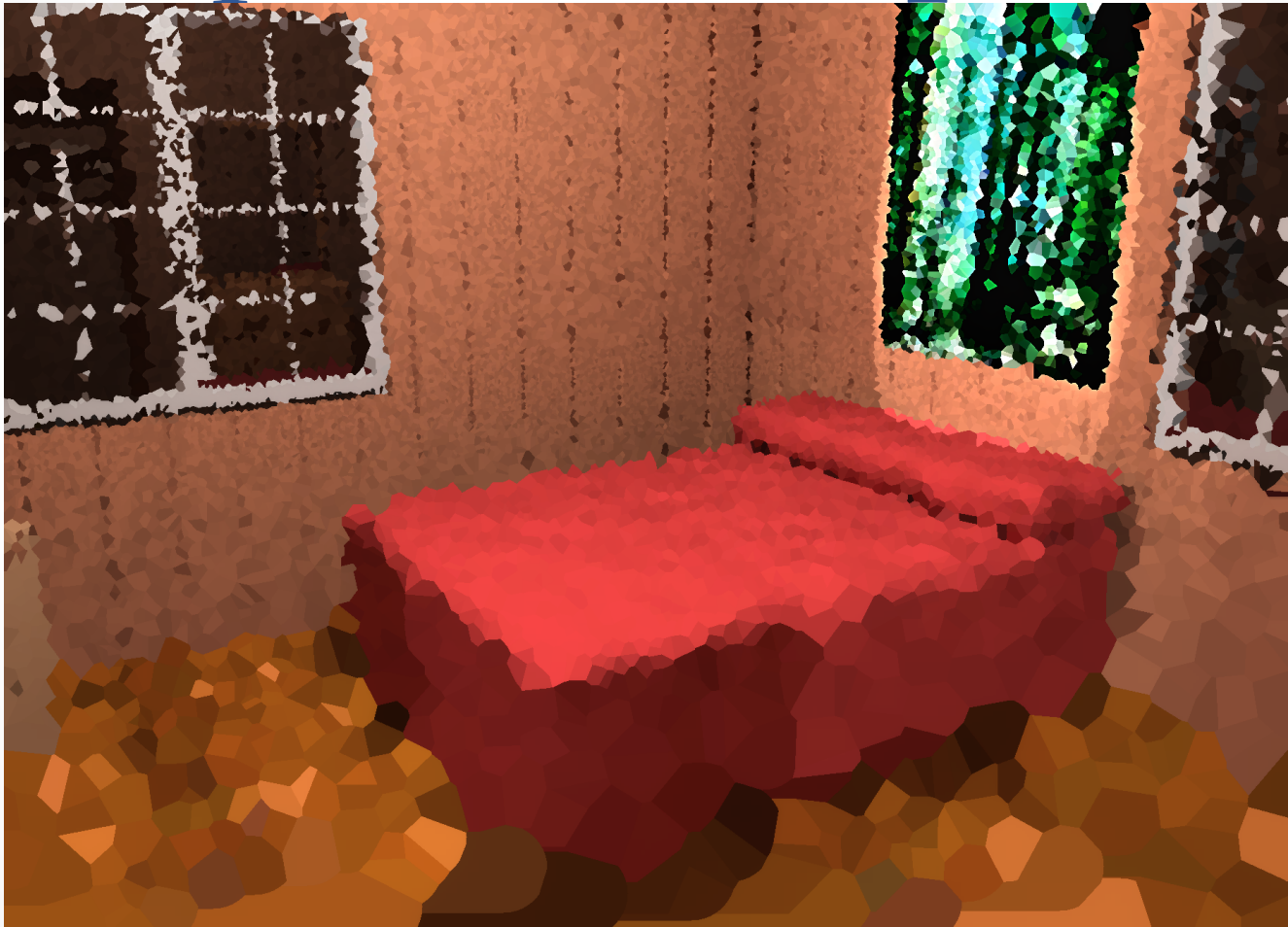
```
rhcopy innight.hdk -ff -opvl \  
| rcalc -if7 -e 'cond=if(1e4-$7,.05-rand(recno),-1)' \  
-o 'void glow g 0 0 4 ${$4} ${$5} ${$6} 0\  
g sphere p${recno} 0 0 4 ${$1} ${$2} ${$3} 0.05' \  
| oconv - > subpoints.oct
```

- **rhcopy** outputs (float) points, values, and distances
- **rcalc** discards infinite points, randomly picks 5% of rest and produces glow spheres for those samples
- **oconv** turns this into an octree for rendering

Rendered from Spheres



Compared to `rhpic -r 0`



Annual Simulation Example

- Take a previously rendered holodeck (point-in-time) and extract sample origins and directions for **rcontrib** or **rfluxmtx**:

```
rhcopy orig.hdk -ff -ood \  
| rfluxmtx -ffc [options] -o daycoef.mtx \  
- tregsky.rad -i scene.oct
```

- Run **dctimestep** for particular sky and put into empty holodeck (coupling origins & hit points):

```
rholo new08-10@14.hdk template.hif  
gensky 8 10 14 [location] | genskyvec -m 1 \  
| dctimestep -of -h daycoef.mtx \  
| rlam -if3 - -if6 "!rhcopy orig.hdk -ff -oop" \  
| rhcopy new08-10@14.hdk -ivop -ff -u -d
```

Questions?

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