

## ビジュアルコンピューティング

## 演習 (レンダリング)

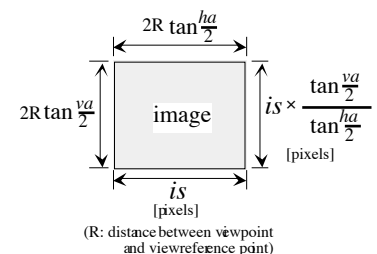
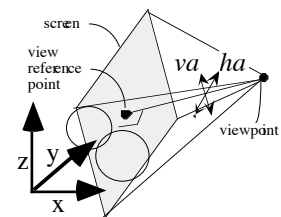
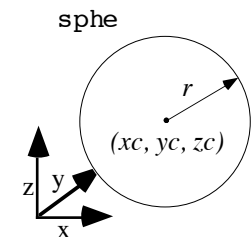
<http://home.hiroshima-u.ac.jp/kin/class/vc/>

## 1. 入力データフォーマット (Input data format)

Sphere:	sphe	$x_c$	$y_c$	$z_c$	$r$				
Material (opaque):	opaq	$dR$	$dG$	$dB$	$ks$	$\beta$		(Level 1)	
Material (mirror):	mirr							(Level 2)	
Material (transparent):	trpa	$kt$	$n$	$ks$	$\beta$			(Level 3)	
Material (mapping):	tmap	<i>(texture)</i>							(Level 4)
Light (directional light):	dlig	$lx$	$ly$	$lz$	$LR$	$LG$	$LB$		
Background:	back	$BR$	$BG$	$BB$					
Ambient light:	elig	$ke$							
Viewpoint:	eyep	$xv$	$yv$	$zv$					
View reference point:	refp	$xf$	$yf$	$zf$					
View angle:	vang	$ha$	$va$						
Image resolution:	size	$is$							
Rendering:	rend	<i>(filename)</i>							
Quit:	quit								

## パラメータ (Parameters in the data format)

$x_c, y_c, z_c, r$ :	center, $(x_c, y_c, z_c)$ , and radius, $r$ , of sphere
$dR, dG, dB$ :	diffuse-reflection coefficient ( $0 \leq dR, dG, dB \leq 1$ )
$ks$ :	specular-reflection coefficient ( $0 \leq ks \leq 1$ )
$\beta$ :	specular-reflection exponent ( $\beta \geq 1$ (integer))
$kt$ :	transmission coefficient ( $0 \leq kt \leq 1$ )
$n$ :	index of refraction ( $n \geq 1$ )
<i>texture</i> :	texture (file name)
$lx, ly, lz$ :	light direction vector
$LR, LG, LB$ :	intensity of light ( $0 \leq LR, LG, LB \leq 255$ )
$BR, BG, BB$ :	background color ( $0 \leq BR, BG, BB \leq 255$ )
$ke$ :	ambient-reflection coefficient ( $0 \leq ke \leq 1$ )
$xv, yv, zv$ :	viewpoint
$xf, yf, zf$ :	view reference point
$ha, va$ :	horizontal and vertical view angles [degree]
<i>filename</i> :	output file name (image file)



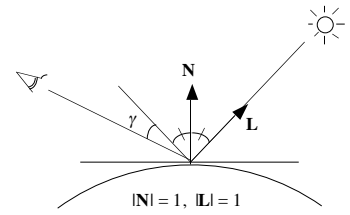
## 2. シェーディング (Shading)

• opaque object: 
$$I_\lambda = \begin{cases} (ke + (1 - ke)(\mathbf{N} \cdot \mathbf{L}))d_\lambda L_\lambda + ksL_\lambda \cos^\beta \gamma & \text{if } (\mathbf{N} \cdot \mathbf{L}) > 0, \cos \gamma > 0 \\ (ke + (1 - ke)(\mathbf{N} \cdot \mathbf{L}))d_\lambda L_\lambda & \text{if } (\mathbf{N} \cdot \mathbf{L}) > 0, \cos \gamma \leq 0 \\ ked_\lambda L_\lambda & \text{otherwise} \end{cases}$$

• transparent object: 
$$I_\lambda = \begin{cases} ksL_\lambda \cos^\beta \gamma + ktT_\lambda & \text{if } (\mathbf{N} \cdot \mathbf{L}) > 0, \cos \gamma > 0 \\ ktT_\lambda & \text{otherwise} \end{cases}$$

• object with mirror reflection: 
$$I_\lambda = R_\lambda$$

( $\lambda = R, G, B$ ), ( $T_\lambda$ : transmitted light,  $R_\lambda$ : reflected light)



## 3. 光線追跡法 (Ray tracing algorithm)

## 4. サンプルデータ(データ 3)と表示結果画像 (Sample data (Data 3) and the output image)

```
##### ex2s3.dat #####
sphe 0. 0. 0. 20.
opaq 1. 1. 0. 0.2 10
sphe 0. 50. 0. 18.
opaq 1. 0.2 0.5 0.4 20
sphe 30. -20. 30. 30.
opaq 0.2 1. 0.8 0.3 30
sphe 20. 20. 25. 12.
mirr
sphe 40. 40. 0. 15.
trpa 0.8 1.5 0.2 10
sphe 0. 50. 40. 10.
trpa 0.8 2.42 0.2 10
sphe 40. 80. 30. 14.
trpa 0.9 1.7 0.1 20
sphe 60. -10. -20. 25.
mirr
back 0. 0. 128.
dlig 0.5 0.5 2. 255. 255. 255.
elig 0.2
eyep 100. 150. 80.
refp 0. 0. 0.
vang 40. 30.5
size 640
rend ex2s3
quit
```

