conecross.r

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#!/usr/bin/r  
  
  
cone3d <- function(base=c(0,0,0),tip=c(0,0,1),rad=1,n=30,draw.base=TRUE,qmesh=FALSE,  
 trans = par3d("userMatrix"), ...) {  
 ax <- tip-base  
 if (missing(trans) && !cur3d()) trans <- diag(4)  
 ### is there a better way?  
 if (ax[1]!=0) {  
 p1 <- c(-ax[2]/ax[1],1,0)  
 p1 <- p1/sqrt(sum(p1^2))  
 if (p1[1]!=0) {  
 p2 <- c(-p1[2]/p1[1],1,0)  
 p2[3] <- -sum(p2\*ax)  
 p2 <- p2/sqrt(sum(p2^2))  
 } else {  
 p2 <- c(0,0,1)  
 }  
 } else if (ax[2]!=0) {  
 p1 <- c(0,-ax[3]/ax[2],1)  
 p1 <- p1/sqrt(sum(p1^2))  
 if (p1[1]!=0) {  
 p2 <- c(0,-p1[3]/p1[2],1)  
 p2[3] <- -sum(p2\*ax)  
 p2 <- p2/sqrt(sum(p2^2))  
 } else {  
 p2 <- c(1,0,0)  
 }  
 } else {  
 p1 <- c(0,1,0); p2 <- c(1,0,0)  
 }  
 degvec <- seq(0,2\*pi,length=n+1)[-1]  
 ecoord2 <- function(theta) {  
 base+rad\*(cos(theta)\*p1+sin(theta)\*p2)  
 }  
 i <- rbind(1:n,c(2:n,1),rep(n+1,n))  
 v <- cbind(sapply(degvec,ecoord2),tip)  
 if (qmesh)   
 ## minor kluge for quads -- draw tip twice  
 i <- rbind(i,rep(n+1,n))  
 if (draw.base) {  
 v <- cbind(v,base)  
 i.x <- rbind(c(2:n,1),1:n,rep(n+2,n))  
 if (qmesh) ## add base twice  
 i.x <- rbind(i.x,rep(n+2,n))  
 i <- cbind(i,i.x)  
 }  
 if (qmesh) v <- rbind(v,rep(1,ncol(v))) ## homogeneous  
 if (!qmesh)  
 triangles3d(v[1,i],v[2,i],v[3,i],...)  
 else  
 return(rotate3d(qmesh3d(v,i,material=list(...)), matrix=trans))  
}   
  
  
ellipsoid3d <- function(rx=1,ry=1,rz=1,n=30,ctr=c(0,0,0),  
 qmesh=FALSE,  
 trans = par3d("userMatrix"),...) {  
 if (missing(trans) && !cur3d()) trans <- diag(4)  
 degvec <- seq(0,pi,length=n)  
 ecoord2 <- function(p)  
 c(rx\*cos(p[1])\*sin(p[2]),ry\*sin(p[1])\*sin(p[2]),rz\*cos(p[2]))  
 v <- apply(expand.grid(2\*degvec,degvec),1,ecoord2)  
 if (qmesh) v <- rbind(v,rep(1,ncol(v))) ## homogeneous  
 e <- expand.grid(1:(n-1),1:n)  
 i1 <- apply(e,1,function(z)z[1]+n\*(z[2]-1))  
 i2 <- i1+1  
 i3 <- (i1+n-1) %% n^2 + 1  
 i4 <- (i2+n-1) %% n^2 + 1  
 i <- rbind(i1,i2,i4,i3)  
 if (!qmesh)  
 quads3d(v[1,i],v[2,i],v[3,i],...)  
 else return(rotate3d(qmesh3d(v,i,material=list(...)),matrix=trans))  
}  
  
############  
  
c(ctr=c(2,2,2),rx=3,ry=2,col="red",alpha=0.4)

## ctr1 ctr2 ctr3 rx ry col alpha   
## "2" "2" "2" "3" "2" "red" "0.4"

c(base=c(-2,-2,-2),rad=0.5,tip=c(-3,0,-4),col="blue",front="lines",back="lines")

## base1 base2 base3 rad tip1 tip2 tip3 col front back   
## "-2" "-2" "-2" "0.5" "-3" "0" "-4" "blue" "lines" "lines"

c(c(base=c(3,-2,3),col="purple"))

## base1 base2 base3 col   
## "3" "-2" "3" "purple"

### now with qmesh()  
  
q1 <- c(qmesh=TRUE,trans=diag(4)) ## the "unit cone";  
## height=1,radius=1, base at (0,0,0)  
c(q1)

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## 1 1 0 0 0 0 1 0 0 0   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## 0 1 0 0 0 0 1

## various transformations and rotations  
c(c(q1,3,0,0),col="green")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "3" "0" "0"   
## col   
## "green"

c(c(c(q1,1,1,2),6,0,0),col="green")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "1" "1" "2"   
## col   
## "6" "0" "0" "green"

c(c(q1,0,3,0),col="green")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "0" "3" "0"   
## col   
## "green"

c(c(c(q1,2,1,1),0,6,0),col="green")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "2" "1" "1"   
## col   
## "0" "6" "0" "green"

c(c(q1,0,0,3),col="red")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "0" "0" "3"   
## col   
## "red"

c(c(c(c(q1,1,1,2),pi/4,0,1,0),0,0,6),col="red")

## qmesh trans1 trans2 trans3   
## "1" "1" "0" "0"   
## trans4 trans5 trans6 trans7   
## "0" "0" "1" "0"   
## trans8 trans9 trans10 trans11   
## "0" "0" "0" "1"   
## trans12 trans13 trans14 trans15   
## "0" "0" "0" "0"   
## trans16   
## "1" "1" "1" "2"   
##   
## "0.785398163397448" "0" "1" "0"   
## col   
## "0" "0" "6" "red"

s1 <- c(qmesh=TRUE,trans=diag(4)) ## the "unit sphere";  
## radius=1, ctr at (0,0,0)  
c(s1)

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## 1 1 0 0 0 0 1 0 0 0   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## 0 1 0 0 0 0 1

## various transformations and rotations  
c(c(s1,3,0,0),col="green")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "3" "0" "0"   
## col   
## "green"

c(c(c(s1,1,1,2),6,0,0),col="green")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "1" "1" "2"   
## col   
## "6" "0" "0" "green"

c(c(s1,0,3,0),col="green")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "0" "3" "0"   
## col   
## "green"

c(c(c(s1,2,1,1),0,6,0),col="green")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "2" "1" "1"   
## col   
## "0" "6" "0" "green"

c(c(s1,0,0,3),col="red")

## qmesh trans1 trans2 trans3 trans4 trans5 trans6 trans7 trans8 trans9   
## "1" "1" "0" "0" "0" "0" "1" "0" "0" "0"   
## trans10 trans11 trans12 trans13 trans14 trans15 trans16   
## "0" "1" "0" "0" "0" "0" "1" "0" "0" "3"   
## col   
## "red"

c(c(c(c(s1,1,1,2),pi/4,0,1,0),0,0,6),col="red")

## qmesh trans1 trans2 trans3   
## "1" "1" "0" "0"   
## trans4 trans5 trans6 trans7   
## "0" "0" "1" "0"   
## trans8 trans9 trans10 trans11   
## "0" "0" "0" "1"   
## trans12 trans13 trans14 trans15   
## "0" "0" "0" "0"   
## trans16   
## "1" "1" "1" "2"   
##   
## "0.785398163397448" "0" "1" "0"   
## col   
## "0" "0" "6" "red"