

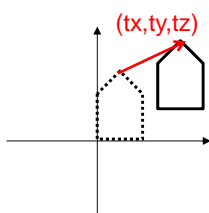
# Exercicis Resolts

## IDI- 2014-2015

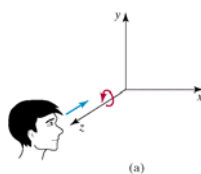
Transformació  
geomètrica



Matriu 4x4  
TG

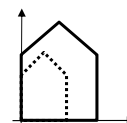


$T(tx, ty, tz)$



(a)

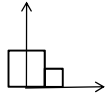
$Gz(\text{angle})$



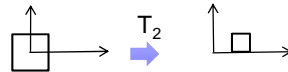
$S(sx, sy, sz)$

## TG i OpenGL: exemple 3 en laboratori

Escena a pintar utilitzant instàncies de pinta\_cub(1)



$$T_1 = \text{Trans}(0, 0.5, 0)$$



$$T_2 = \text{Trans}(0.75, 0.25, 0) * S(0.5, 0.5, 0.5)$$

```
TG=I;
TG=Translatef(0,0.5,0);
pinta_cub (1,TG);
TG=I
TG= TG*Scalef(0.5,0.5,0.5);
pinta_cub(1,TG)
```

per cada cara C

```
v1=TG*v1_c; v2=TG*v2_c;
v3=TG*v3_c; v4=TG*v4_c
glBegin(GL_QUADS);
glVertex3dv(v1);
glVertex3dv(v2);
glVertex3dv(v3);
glVertex3dv(v4);
glEnd();
fper
```

## TG i OpenGL: exemple 3 en laboratori

Escena a pintar utilitzant instàncies de glutWireCube(1) i OpenGL

```
TG=I;
TG=Translatef(0,0.5,0);
pinta_cub (1,TG);
TG=I
TG= TG*Scalef(0.5,0.5,0.5);
pinta_cub(1,TG)
```

```
glMatrixMode(GL_MODELVIEW);
glLoadIdentity();
glTranslatef(0,0.5,0);
glutWireCube(1);
glLoadIdentity();
glTranslatef(0.75, 0.25,0);
glScalef(0.5,0.5,0.5);
glutWireCube(1);
```

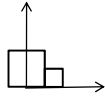
```
glMatrixMode(GL_MODELVIEW);
glLoadIdentity();
glPushMatrix();
glTranslatef(0,0.5,0);
glutWireCube(1);
glPopMatrix();
glPushMatrix();
glTranslatef(0.75, 0.25,0);
glScalef(0.5,0.5,0.5);
glutWireCube(1);
glPopMatrix();
```

$$T_1 = \text{Trans}(0, 0.5, 0)$$

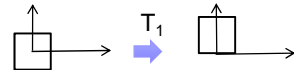
$$T_2 = \text{Trans}(0.75, 0.25, 0) * S(0.5, 0.5, 0.5)$$

Com faríeu per a girar els dos cubs respecte l'eix x?

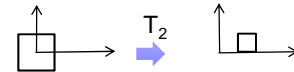
## TG i OpenGL: exemple 3 en laboratori



Escena a pintar utilitzant instàncies de `glutWireCube(1)`



$$T_1 = G_x(\text{alfa}) * \text{Trans}(0, 0.5, 0)$$

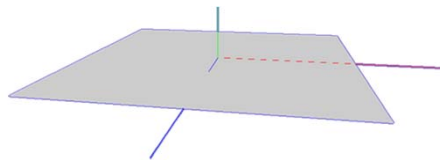


$$T_2 = G_x(\text{alfa}) * \text{Trans}(0.75, 0.25, 0) * S(0.5, 0.5, 0.5)$$

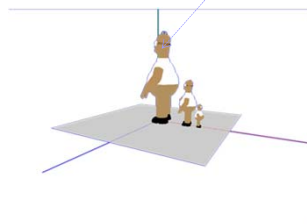
```
glMatrixMode(GL_MODELVIEW);
glLoadIdentity();
glPushMatrix();
glRotatef(alfa, 1, 0, 0);
glPushMatrix();
glTranslatef(0, 0.5, 0);
glutWireCube(1);
glPopMatrix();
glPushMatrix();
glTranslatef(0.75, 0.25, 0);
glScalef(0.5, 0.5, 0.5);
glutWireCube(1);
glPopMatrix();
glPopMatrix();
```

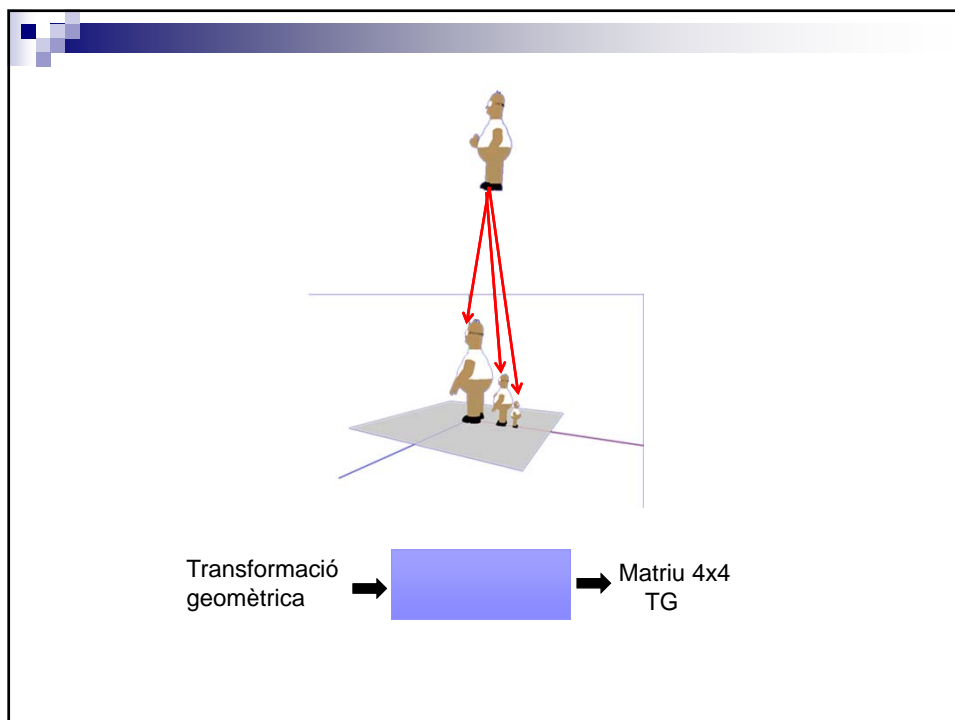
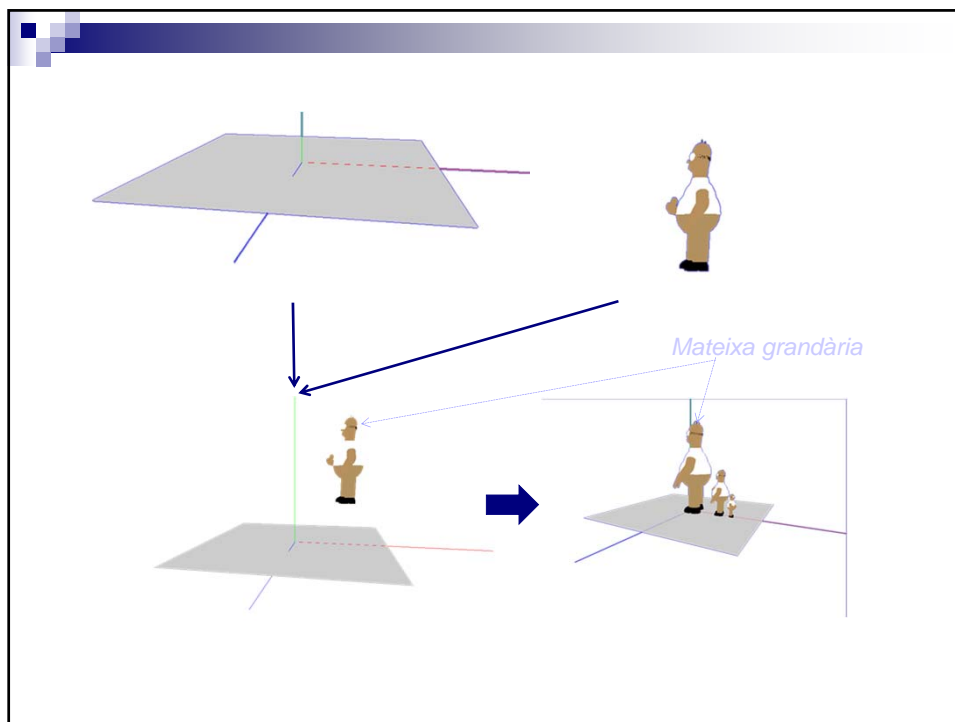
Son necessaris tots els pushes i pops?

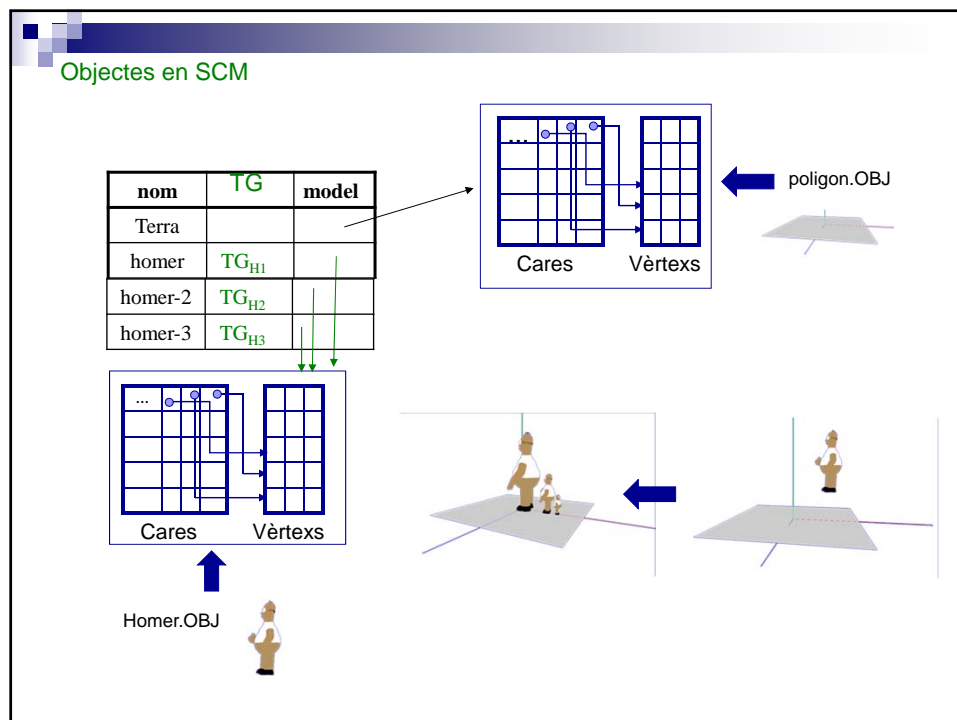
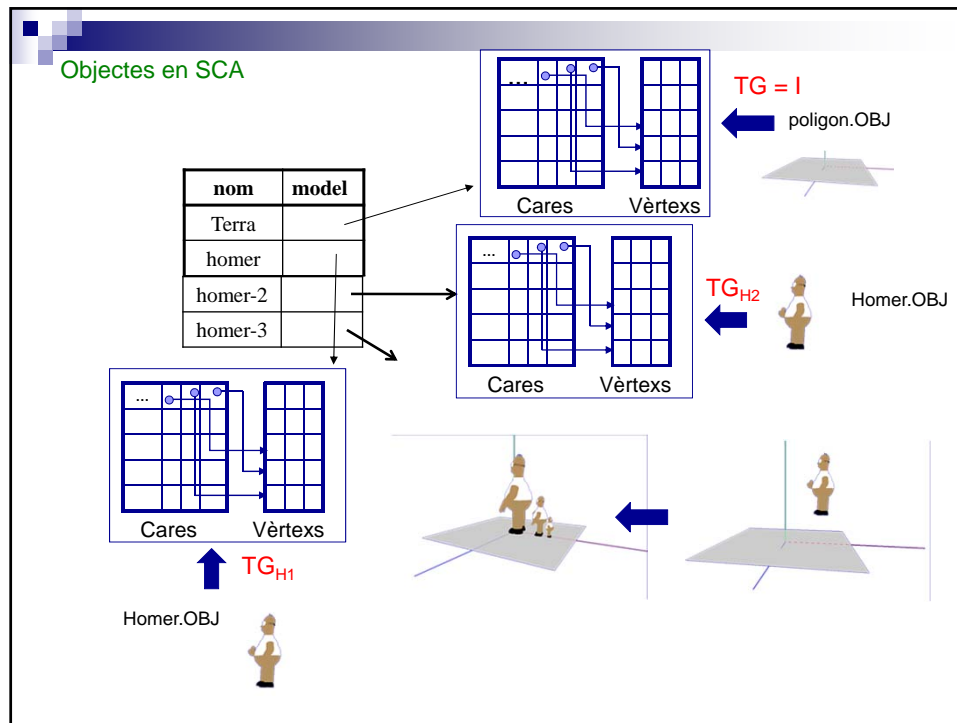
## Exercici

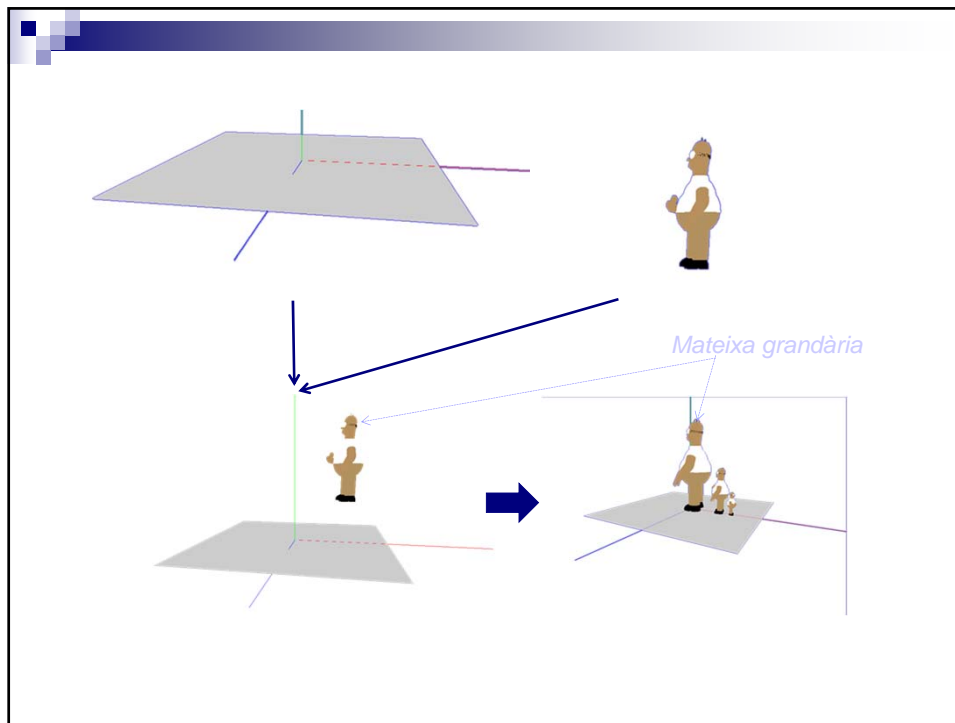



*Mateixa grandària*









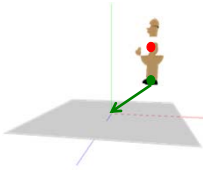


$$\text{CapsaMinCont} = (\text{xmin}, \text{ymin}, \text{zmin}, \text{xmax}, \text{ymax}, \text{zmax})$$

$$\text{Mides} \Rightarrow a = (\text{xmax} - \text{xmin}), h = (\text{ymax} - \text{ymin}), f = (\text{zmax} - \text{zmin})$$

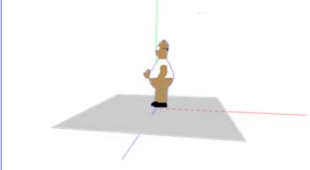
$$\text{CentBaseCapsa} = (\text{cbx}, \text{cby}, \text{cbz}) = (\text{xmin} + \text{xmax})/2, \text{ymin}, (\text{zmin} + \text{zmax})/2$$

Afegir com atributs al model, si cal calcular sovint

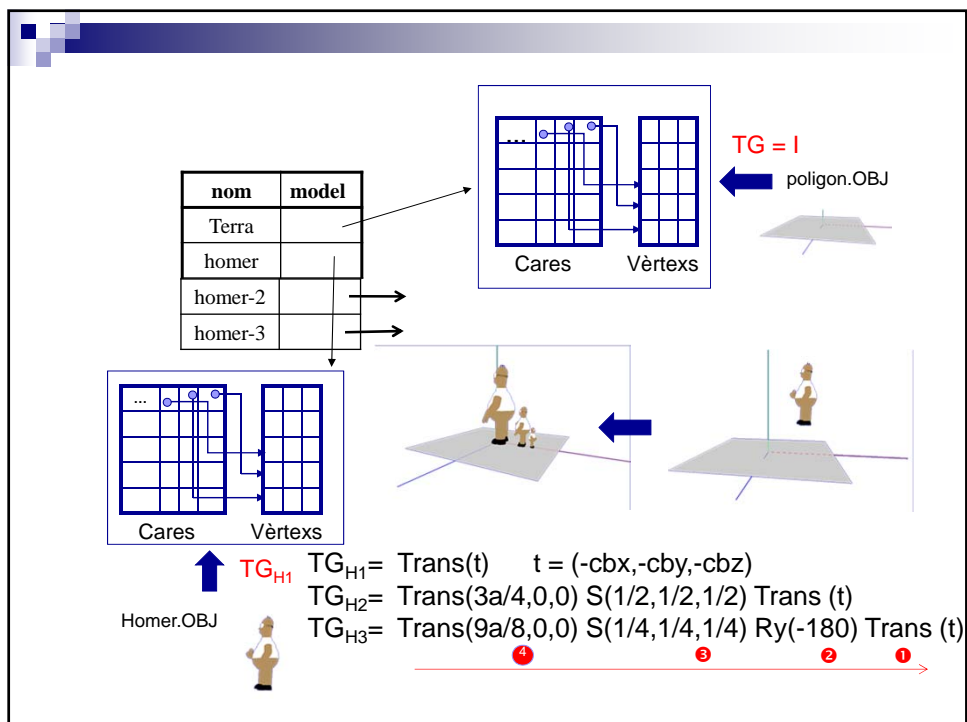
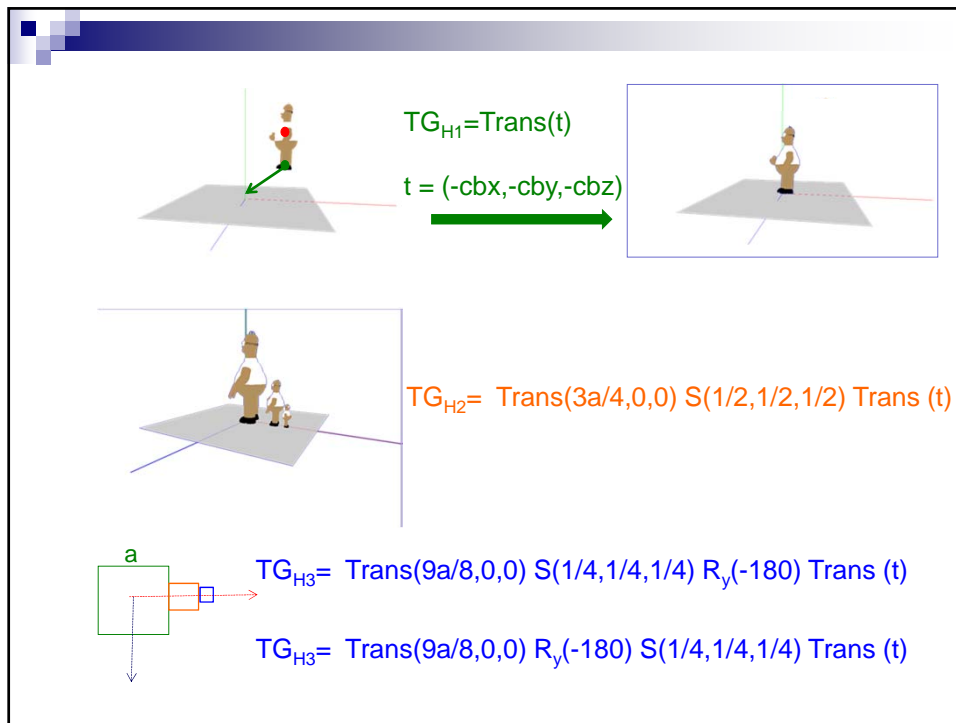


$$\text{TG}_{H1} = \text{Trans}(t)$$

$$t = (-\text{cbx}, -\text{cby}, -\text{cbz})$$



Noteu que la capsa de Homer mogut és diferent de la del seu model; quina és?



## Visualització OpenGL: models en SCA

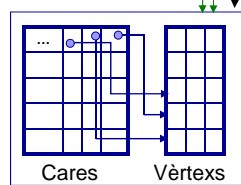
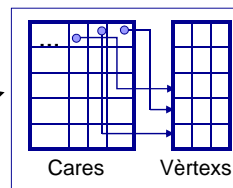
// Recorregut de l'escena

```
per cada objecte o fer
glBegin(GL_TRIANGLES)
  glVertex3dv (v1)
  glVertex3dv (v2)
  glVertex3dv (v3)
glEnd()
fper
fper
```

*Suposem que la càmera i el viewport ja estan definits  
o són els de defecte*

## Models en SCM

nom	TG	model
Terra		
homer	$TG_{H1}$	
homer-2	$TG_{H2}$	
homer-3	$TG_{H3}$	



Homer.OBJ

$TG_{H1} = \text{Trans}(t) \quad t = (-cbx, -cby, -cbz)$

$TG_{H2} = \text{Trans}(3a/4, 0, 0) S(1/2, 1/2, 1/2) \text{Trans}(t)$

$TG_{H3} = \text{Trans}(9a/8, 0, 0) S(1/4, 1/4, 1/4) R_y(-180) \text{Trans}(t)$

i cada objecte una capsa diferent (un cop mogut)



## Visualització OpenGL: models en SCM i tenim TGs (1)

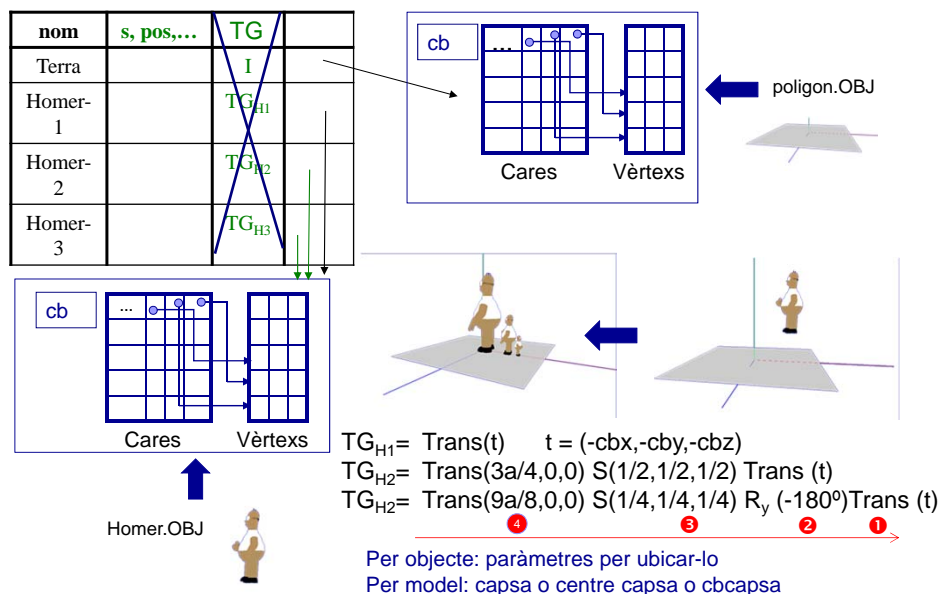
### // 3. Recorregut de l'escena

```

per cada objecte o fer
   $TG_A = o.TG$ 
  per cada triangle t de o
     $v1 = TG_A * t.v1; v2 = TG_A * t.v2, v3 = TG_A * t.v3,$ 
    //v1, v2 i v3 són els punts "moguts"
    glBegin(GL_TRIANGLES)
      glVertex3dv (v1)
      glVertex3dv (v2)
      glVertex3dv (v3)
    glEnd()
  fper
fper

```

## Visualització OpenGL: models en SCM (3)

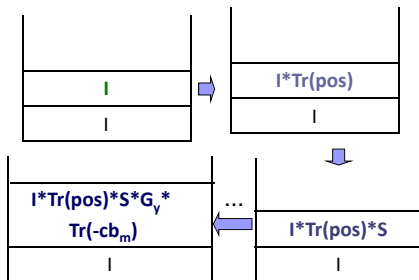


## Visualització OpenGL: models en SCM (3)

per cada objecte o  
 Càlcul TG a partir o.param  
 per cada triangle t de o  
 $v1 = TG * t.v1$ ;  $v2$  ,...  
 $glVertex3dv (v1)$   
 $glVertex3dv (v2)$   
 $glVertex3dv (v3)$   
 fper  
 fper

$TG_{H3} = \text{Trans}(7a/8, 0, 0) S(1/4, 1/4, 1/4) R_y(-180^\circ) \text{Trans}(t)$

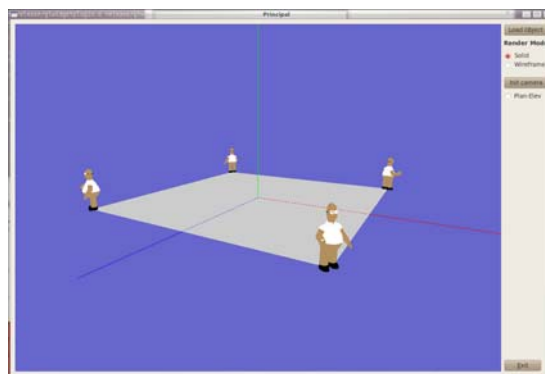
4 3 2 1



```
glMatrixMode (GL_MODELVIEW)
...
//tercer homer
glPushMatrix();
glTranslate (posx, posy, poz)
glScale (s,s,s)
glRotate (-180, 0,1,0)
glTranslate (-cb_m_x,-cb_m_y,-cb_m_z)
per cada triangle t de homer_model
glBegin (GL_TRIANGLES)
  glVertex3dv (t.v1)
  glVertex3dv (t.v2)
  glVertex3dv (t.v3)
glEnd()
fper
glPopMatrix()
```

Pinta\_homer

## Exercicis



Mireu la col·lecció de problemes del racó.  
 Proposta de mínims: 14,18,20, 23,24