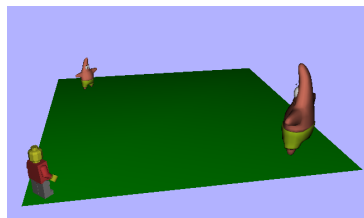
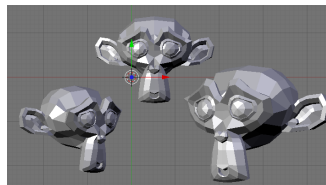
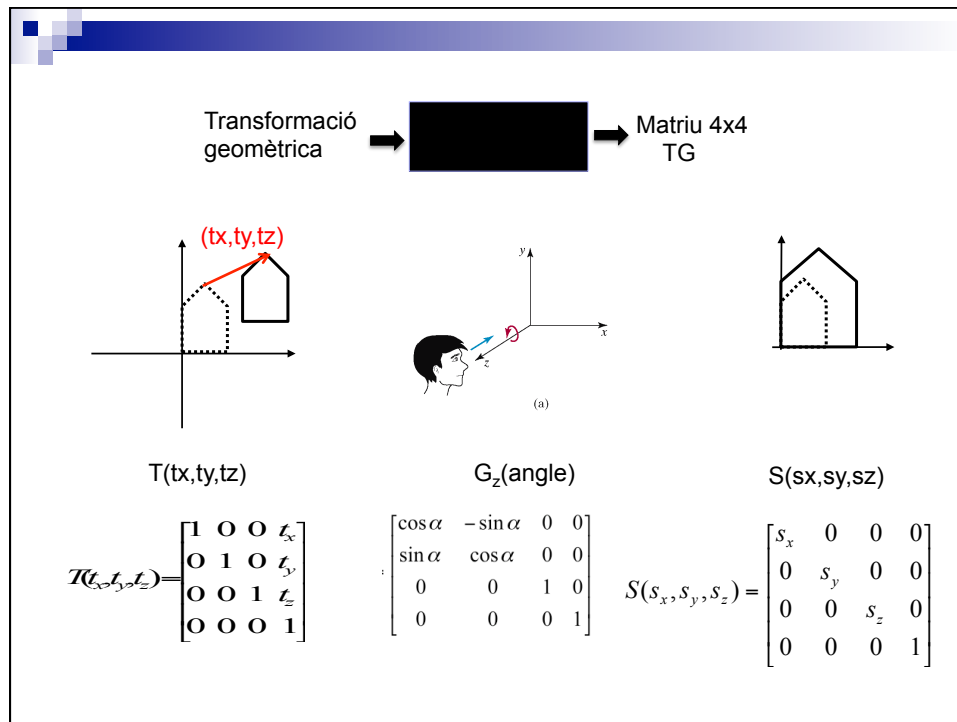


# Exercicis TG

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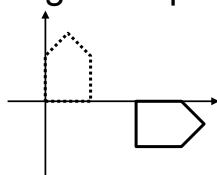
## MOTIVACIÓ: càlcul de la TG a aplicar a models





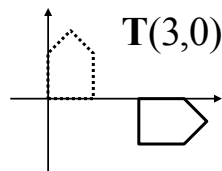
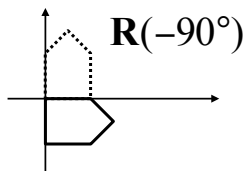
## Composició de Transformacions

- Imaginem que volem



No es pot fer amb cap de les matrius anteriors

- Cal compondre/efectuar dues transformacions



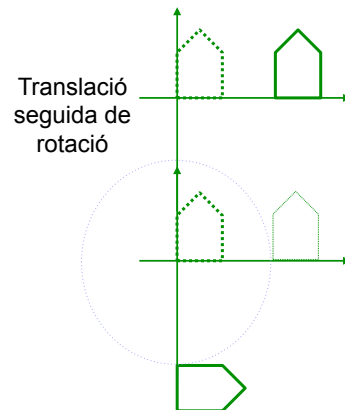
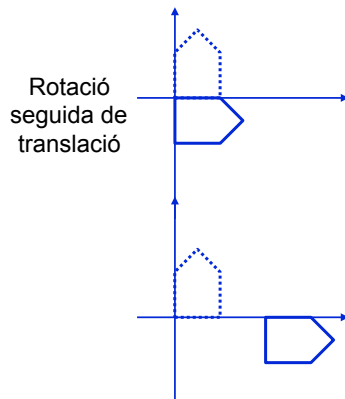
$$M = T(3,0) \cdot R(-90^\circ)$$

$$P' = T(3,0) \cdot (R(-90^\circ) P) = \underline{(T(3,0) \cdot R(-90^\circ))} P = M \cdot P$$

## Composició de Transformacions

$$\underset{\textcircled{2}}{T(3,0)} \cdot \underset{\textcircled{1}}{R(-90^\circ)} \neq \underset{\textcircled{2}}{R(-90^\circ)} \cdot \underset{\textcircled{1}}{T(3,0)}$$

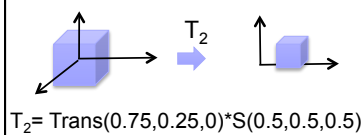
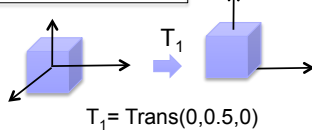
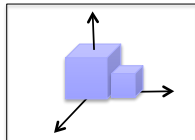
### ■ Multiplicació de matrius no és commutativa



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## Exemple simple de TG (1)

Escena a pintar utilitzant pinta\_cub()



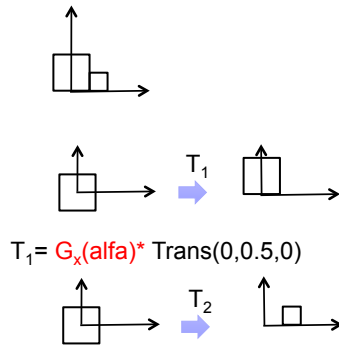
Pseudo-codi

```
TG= Translate(0,0.5,0);
modelMatrix(TG); pinta_cub ();
TG= Translate(0.75,0.25,0);
TG= TG*Scale(0.5,0.5,0.5);
modelMatrix (TG); pinta_cub();
```

```
glm::mat4 TG;
TG= glm::translate (glm::mat4(1.f),glm::vec3(0,0.5,0));
modelMatrix(TG); pinta_cub ();
TG= glm::translate (glm::mat4(1.f), glm::vec3(0.75,0.25,0));
TG= glm::scale(TG, glm::vec3(0.5,0.5,0.5));
modelMatrix(TG); pinta_cub();
```

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

## Exemple simple (2)

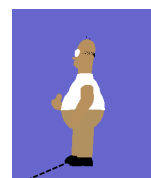
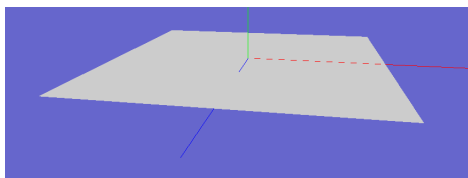


$$T_1 = G_x(\text{alfa}) * \text{Trans}(0, 0.5, 0)$$

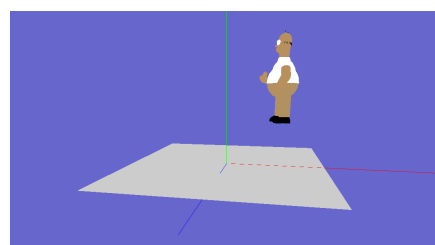
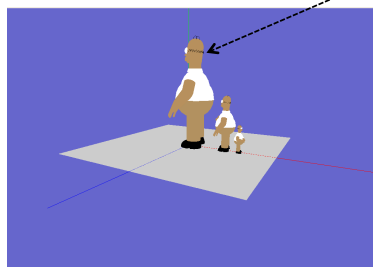
$$T_2 = G_x(\text{alfa}) * \text{Trans}(0.75, 0.25, 0) * S(0.5, 0.5, 0.5)$$

```
glm::mat4 TG, AUX;
AUX=glm::rotate(glm::mat4(1.f), alfa, vec3(1,0,0));
TG= glm::translate(AUX, glm::vec3(0,0.5,0));
modelMatrix(TG); pinta_cub();
TG= glm::translate(AUX, glm::vec3(0.75,0.25,0));
TG= glm::scale(TG, glm::vec3(0.5,0.5,0.5));
modelMatrix(TG); pinta_cub();
```

## Exercici 1



*Mateixa grandària*



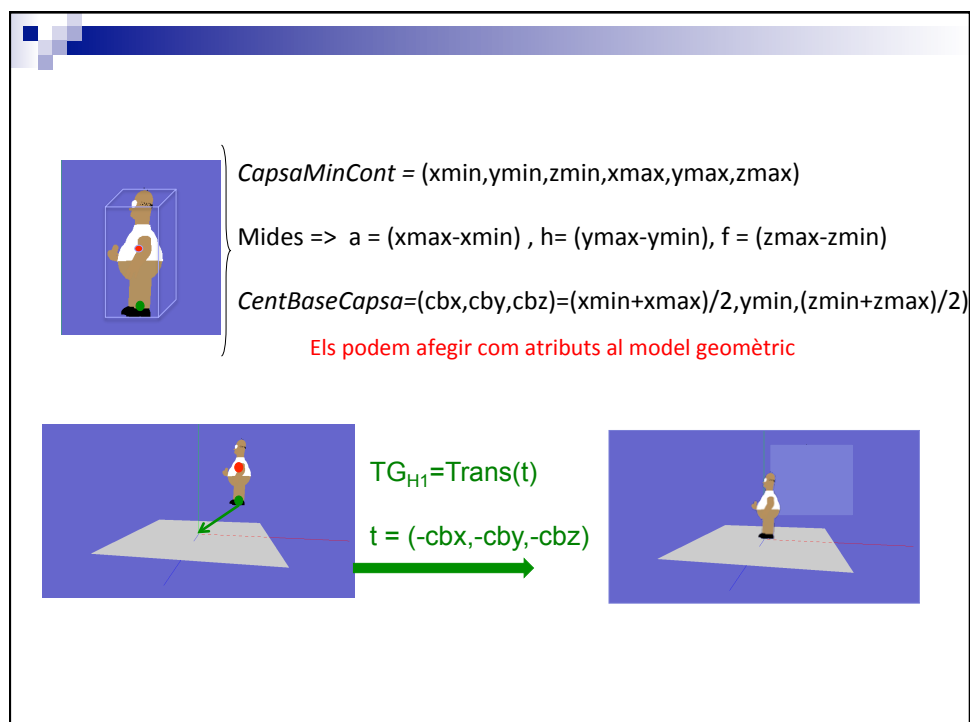
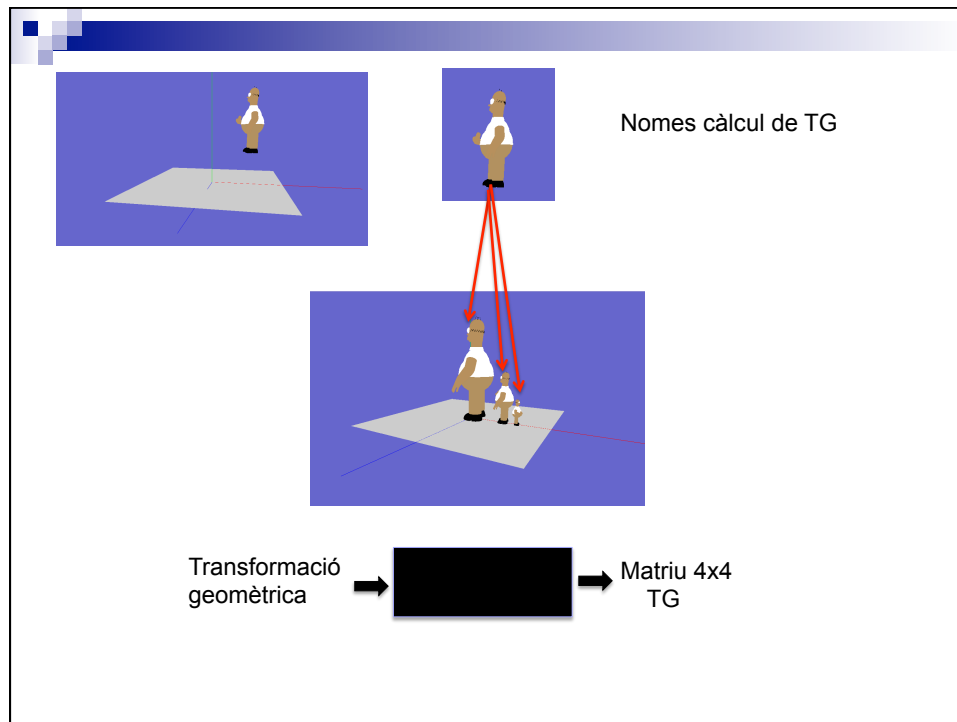


Diagram illustrating the transformation of a 3D model (Homer) from a default position to a specific pose using transformation matrices.

Top row: Initial position (left) and transformed position (right). Transformation:  $TG_{H1} = \text{Trans}(t)$  where  $t = (-cbx, -cby, -cbz)$ .

Bottom row: Transformed position (left) and final pose (right). Transformation:  $TG_{H2} = \text{Trans}(3a/4, 0, 0) S(1/2, 1/2, 1/2) \text{Trans}(t)$ .

Bottom row (continued): Final pose (left) and final pose (right). Transformation:  $TG_{H3} = \text{Trans}(9a/8, 0, 0) S(1/4, 1/4, 1/4) R_y(-180) \text{Trans}(t)$  and  $TG_{H3} = \text{Trans}(9a/8, 0, 0) R_y(-180) S(1/4, 1/4, 1/4) \text{Trans}(t)$ .

Models en SCM

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

Diagram illustrating the transformation of a 3D model (Homer) from a default position to a specific pose using transformation matrices.

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Bottom row (continued): Final pose (left) and final pose (right). Transformation:  $TG_{H3} = \text{Trans}(9a/8, 0, 0) S(1/4, 1/4, 1/4) R_y(-180) \text{Trans}(t)$  and  $TG_{H3} = \text{Trans}(9a/8, 0, 0) R_y(-180) S(1/4, 1/4, 1/4) \text{Trans}(t)$ .

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Bottom row (continued): Final pose (left) and final pose (right). Transformation:  $TG_{H3} = \text{Trans}(9a/8, 0, 0) S(1/4, 1/4, 1/4) R_y(-180) \text{Trans}(t)$  and  $TG_{H3} = \text{Trans}(9a/8, 0, 0) R_y(-180) S(1/4, 1/4, 1/4) \text{Trans}(t)$ .

Diagram illustrating the transformation of a 3D model (Homer) from a default position to a specific pose using transformation matrices.

Top row: Initial position (left) and transformed position (right). Transformation:  $TG_{H1} = \text{Trans}(t)$  where  $t = (-cbx, -cby, -cbz)$ .

Bottom row: Transformed position (left) and final pose (right). Transformation:  $TG_{H2} = \text{Trans}(3a/4, 0, 0) S(1/2, 1/2, 1/2) \text{Trans}(t)$ .

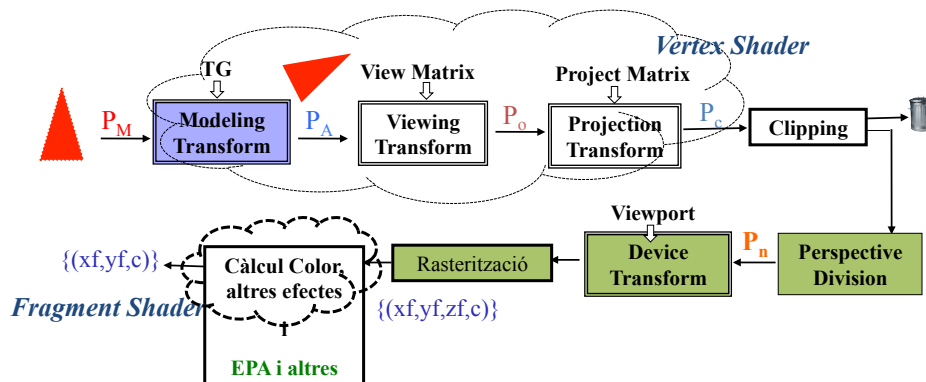
Bottom row (continued): Final pose (left) and final pose (right). Transformation:  $TG_{H3} = \text{Trans}(9a/8, 0, 0) S(1/4, 1/4, 1/4) R_y(-180) \text{Trans}(t)$  and  $TG_{H3} = \text{Trans}(9a/8, 0, 0) R_y(-180) S(1/4, 1/4, 1/4) \text{Trans}(t)$ .

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

```

per cada objecte o fer
TG = o.TG
modelMatrix (TG);
pinta_model();
fper

```

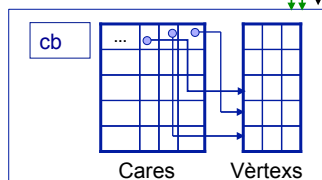
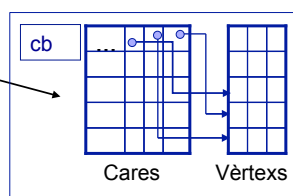


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## Visualització OpenGL: models en SCM i paràmetres (2)

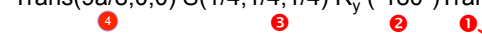
nom	s, pos,...	TG
Terra		I
Homer-1		$TG_{H1}$
Homer-2		$TG_{H2}$
Homer-3		$TG_{H3}$



Homer.OBJ



$TG_{H1} = \text{Trans}(t) \quad t = (-cbx, -cby, -cbz)$   
 $TG_{H2} = \text{Trans}(3a/4, 0, 0) S(1/2, 1/2, 1/2) \text{Trans}(t)$   
 $TG_{H3} = \text{Trans}(9a/8, 0, 0) S(1/4, 1/4, 1/4) R_y(-180^\circ) \text{Trans}(t)$



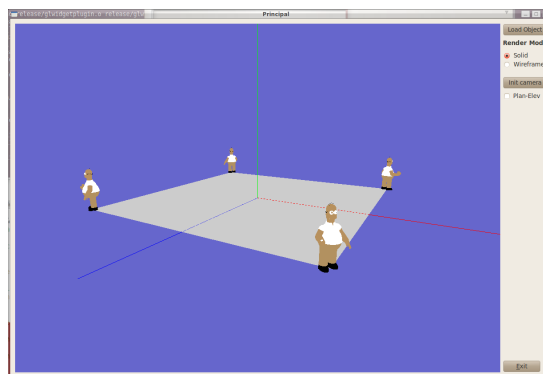
## Visualització OpenGL: models en SCM (3)

per cada objecte o  
 Càlcul TG a partir o.param  
 modelMatrix(TG);  
 pinta\_model();  
 fper

$$TG_{H3} = \overset{4}{\text{Trans}(7a/8, 0, 0)} \overset{3}{\text{S}(1/4, 1/4, 1/4)} \overset{2}{R_y(-180^\circ)} \overset{1}{\text{Trans}(t)}$$

```
//tercer homer
glm::mat4 TG;
TG= glm::translate(glm::mat4(1.f), glm::vec3(posx, posy, posz));
TG= glm::scale(TG, glm::vec3(s,s,s));
TG= glm::rotate(TG, -180, glm::vec3(0,1,0));
TG= glm::translate(TG, glm::vec3(-cb.x, -cb.y, -cb.z));
modelMatrix(TG);
pinta_model(); //pinta_homer();
```

## Exercicis



Mireu la col·lecció de problemes del racó.  
 Proposta de mínims: 16, 19, 24, 25