

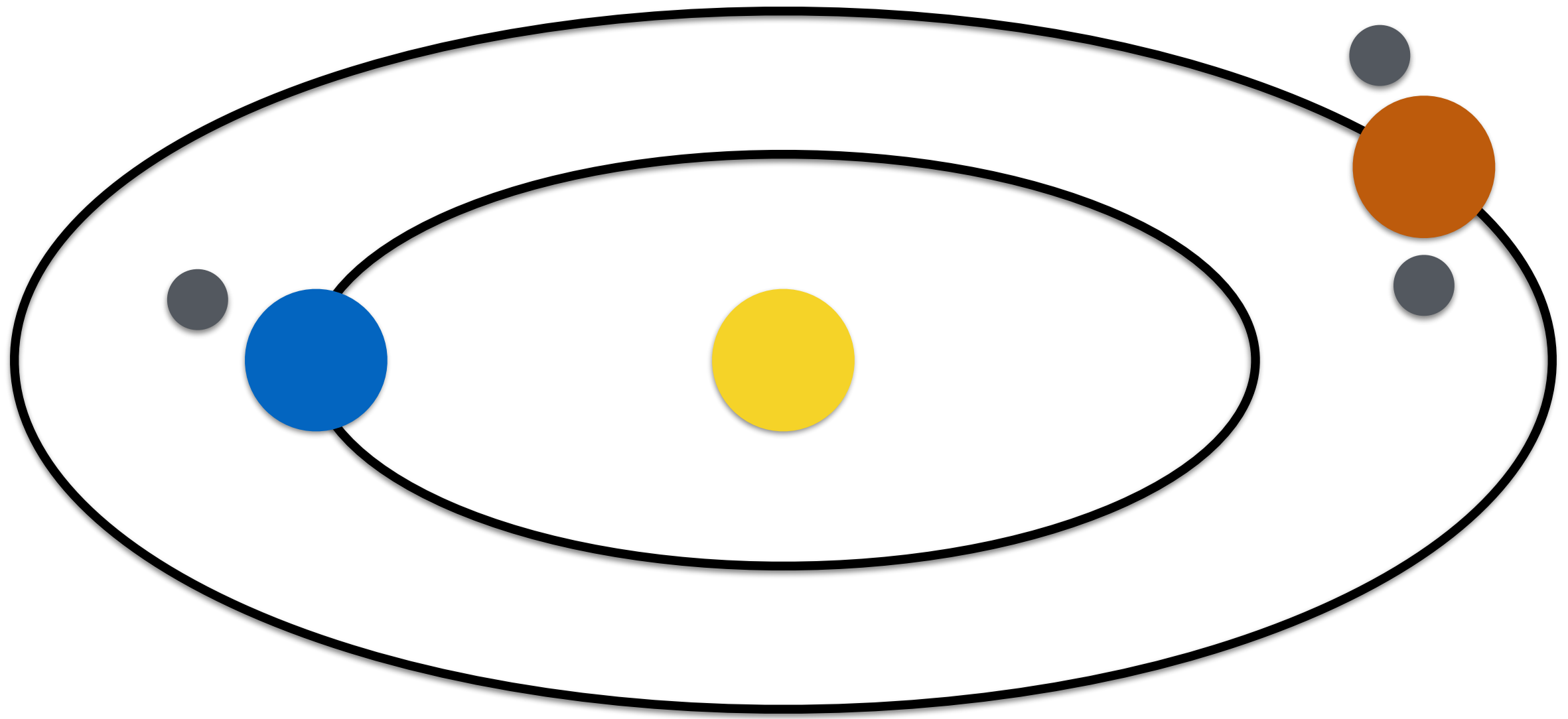


Transformation Hierarchies

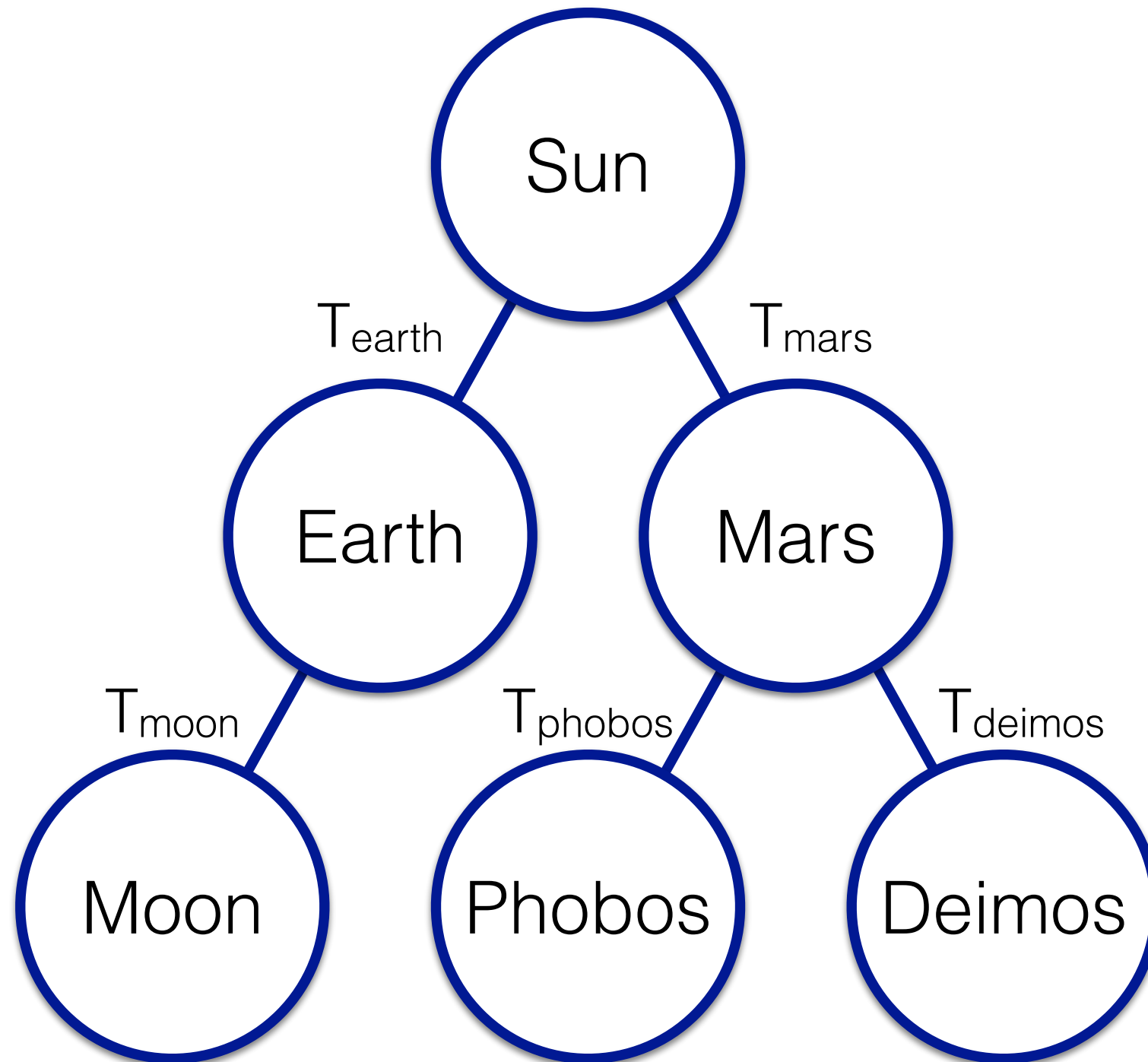
CS 355: Interactive Graphics and Image Processing



Object Hierarchies



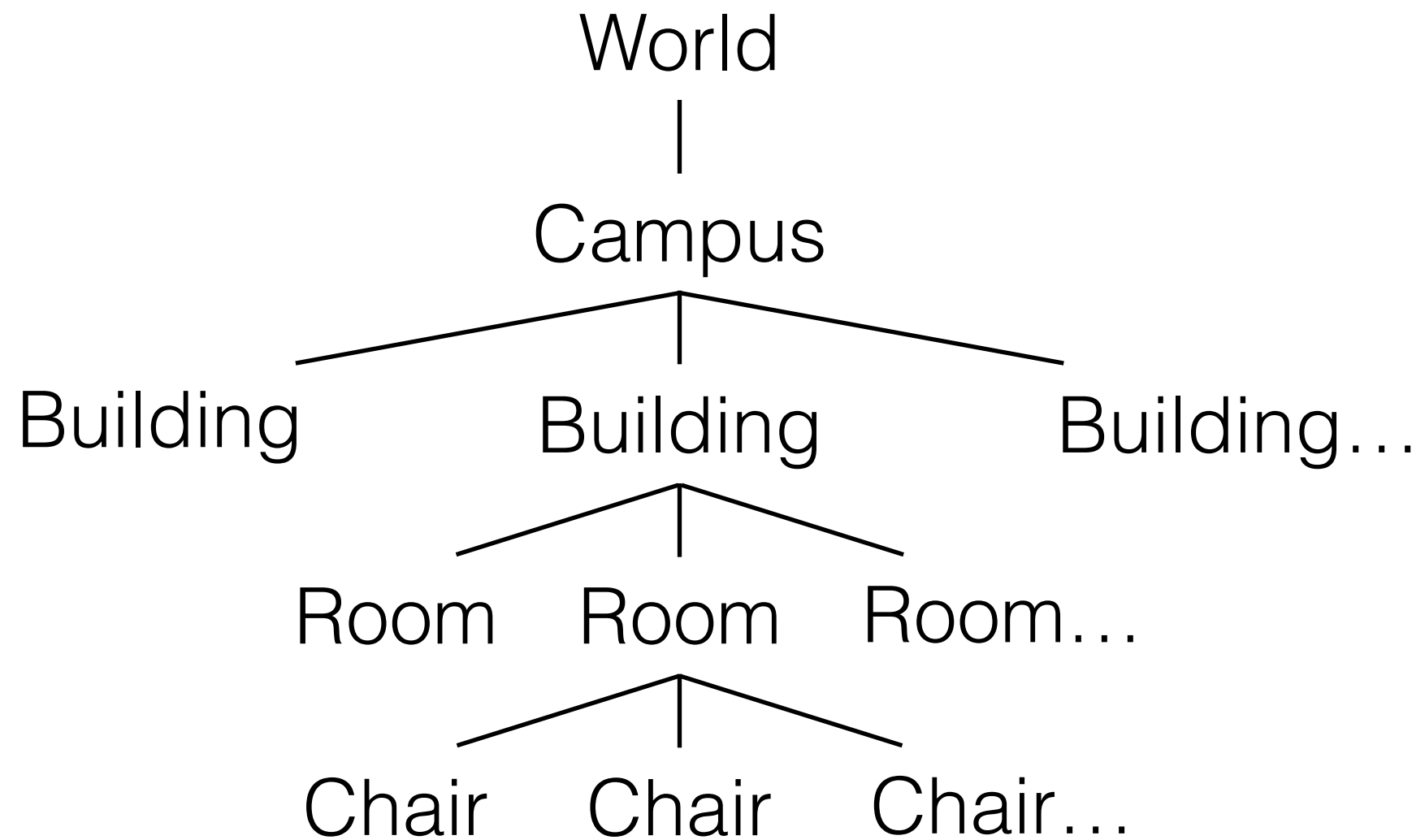
Transformation Hierarchies



Hierarchical Models

- Use same model for each chair in the classroom
 - each has a different orientation and position in the room
 - which is oriented and positioned in the building
 - which is oriented and positioned on campus
 - which is oriented and positioned in the world

Hierarchical Models



Order of Transformations

Chair 1: $\mathbf{p}_{\text{world}} = \mathbf{T}_{\text{campus}} \mathbf{T}_{\text{MARB}} \mathbf{T}_{373} \mathbf{T}_{\text{chair}_1} \mathbf{p}$

Chair 2: $\mathbf{p}_{\text{world}} = \mathbf{T}_{\text{campus}} \mathbf{T}_{\text{MARB}} \mathbf{T}_{373} \mathbf{T}_{\text{chair}_2} \mathbf{p}$

Chair 3: $\mathbf{p}_{\text{world}} = \mathbf{T}_{\text{campus}} \mathbf{T}_{\text{MARB}} \mathbf{T}_{373} \mathbf{T}_{\text{chair}_3} \mathbf{p}$

$\underbrace{\hspace{10em}}_{\text{room-to-world}} \quad \underbrace{\hspace{2em}}_{\text{chair}}$

Leveraging Composition

Chair 1: $\mathbf{p}_{\text{world}} = (((\mathbf{T}_{\text{campus}} \mathbf{T}_{\text{MARB}}) \mathbf{T}_{373}) \mathbf{T}_{\text{chair}_1}) \mathbf{p}$

Chair 2: $\mathbf{p}_{\text{world}} = (((\mathbf{T}_{\text{campus}} \mathbf{T}_{\text{MARB}}) \mathbf{T}_{373}) \mathbf{T}_{\text{chair}_2}) \mathbf{p}$

Chair 3: $\mathbf{p}_{\text{world}} = (((\mathbf{T}_{\text{campus}} \mathbf{T}_{\text{MARB}}) \mathbf{T}_{373}) \mathbf{T}_{\text{chair}_3}) \mathbf{p}$

Transformation Stacks

DrawCars:

push()

For all cars i

 DrawCar(i)

pop()

DrawCar(i):

push()

concatonate(carTransform[i])

drawCarBody()

for all tires j

 drawTire(j)

pop()

DrawTire(j):

push()

concatonate(tireTransform[j])

drawOneTire()

pop()

Coming up...

- 3D!