











Transformations An operation that changes one configuration into another. A geometric transformation maps positions that define the object to other positions. Linear transformation means the transformation is defined by a linear function... which is what matrices are good for Image: Construction of the construction of

What commutes?	
Two translations commute $T_1^*T_2 = T_2^*T_1$	
Two scales commute $S_1^*S_2 = S_2^*S_1$	
Two rotations <i>sometimes</i> commute. In 2D rotations do commute, while in 3D most pairs of rotations do not commute.	
Rotations and translations do <i>not</i> commute $R^* T \neq T^* R$	
Translations and scales do <i>not</i> commute $S^*T \neq T^*S$	
Scales and rotations commute only in the <i>special case</i> when scaling by the same amount in all directions.	
in general the two operations do not commute.	
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Camera ModelsEach vertex in our model must be projected onto the 2D
camera viewport plane in order to be display on the screen.The CTM is employed to determine the location of each vertex
in the camera coordinate system: $\vec{x}' = \mathbf{M}_{CTM} \vec{x}$ We then employ a projection matrix defined by GL_PROJECTION
to map this to a 2D viewport coordinate.Finally, this 2D coordinate is mapped to device coordinates
using the viewport definition (given by glviewport()).





















