The Lookat Transformation

CS418 Computer Graphics

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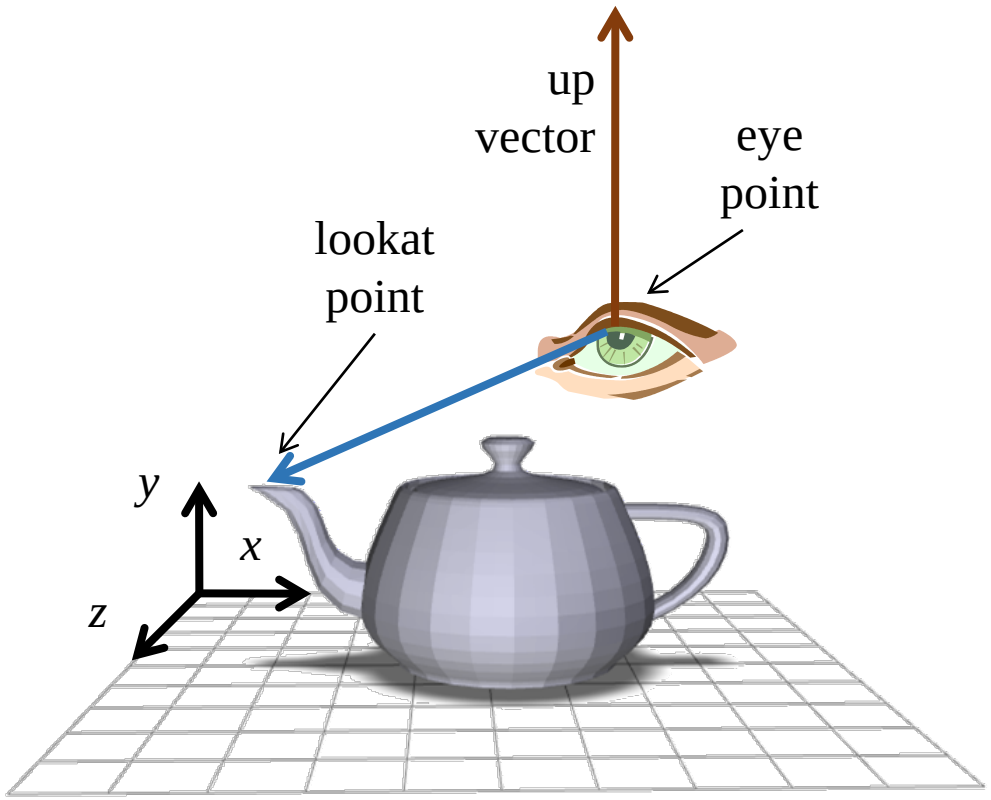
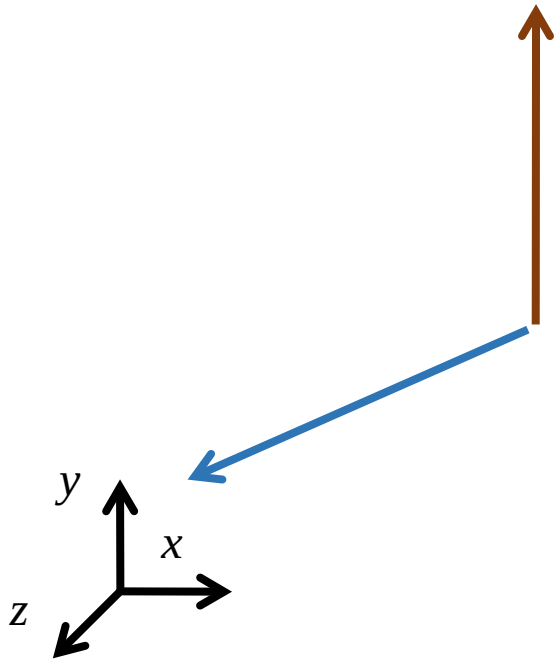
Lookat Transformation



Lookat Transformation

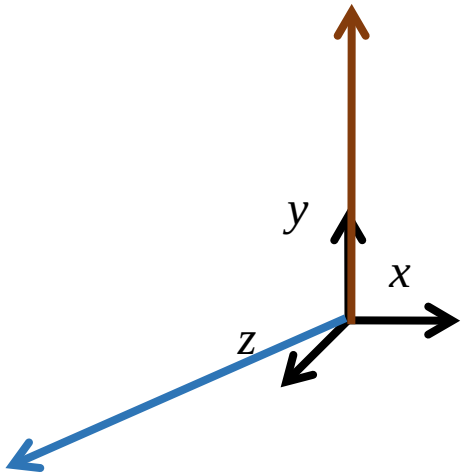
- Translate the eye point to the origin



$$\begin{bmatrix} 1 & & & -x \\ & 1 & & -y \\ & & 1 & -z \\ & & & 1 \end{bmatrix}$$

Lookat Transformation

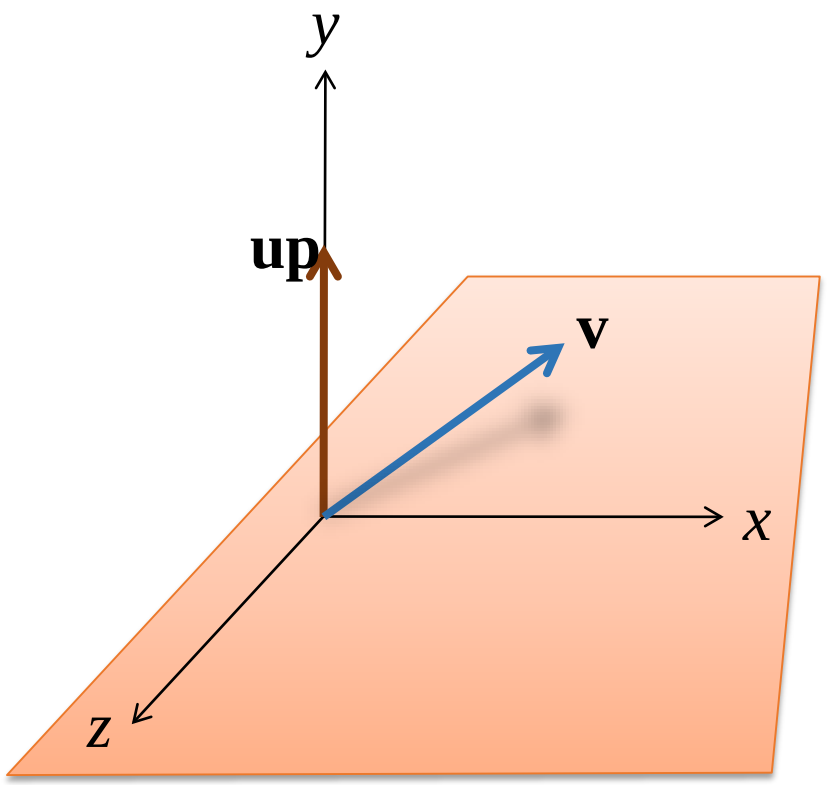
- Translate the eye point to the origin
- Rotate the view vector into the negative z-axis



$$\begin{bmatrix} & & & \\ & R & & \\ & & & \end{bmatrix} \begin{bmatrix} 1 & & & -x \\ & 1 & & -y \\ & & 1 & -z \\ & & & 1 \end{bmatrix}$$

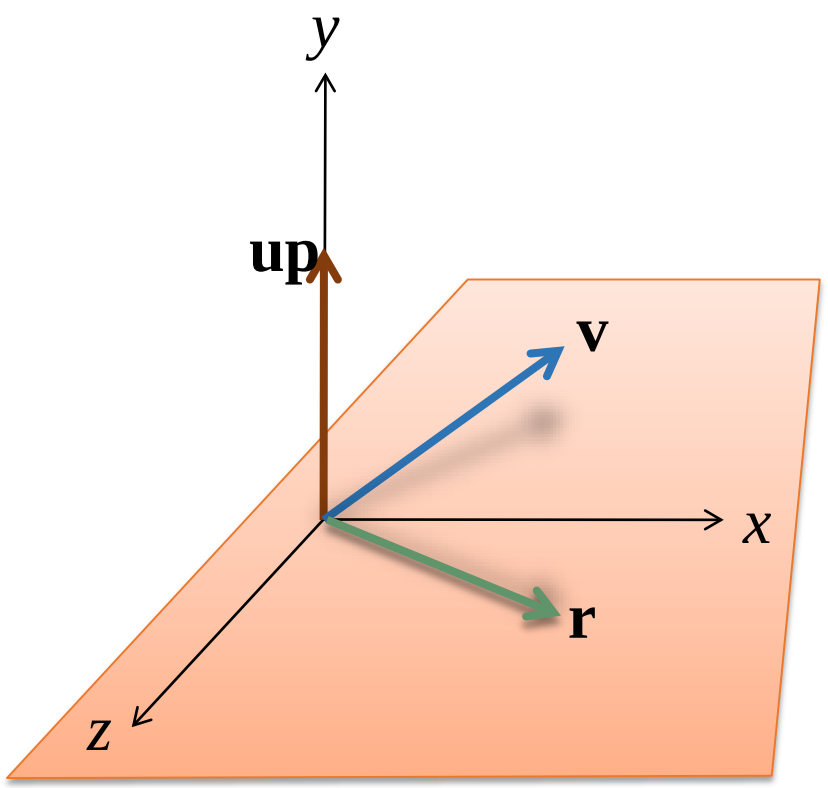
Easier Way

- Orthogonalize lookat vector system



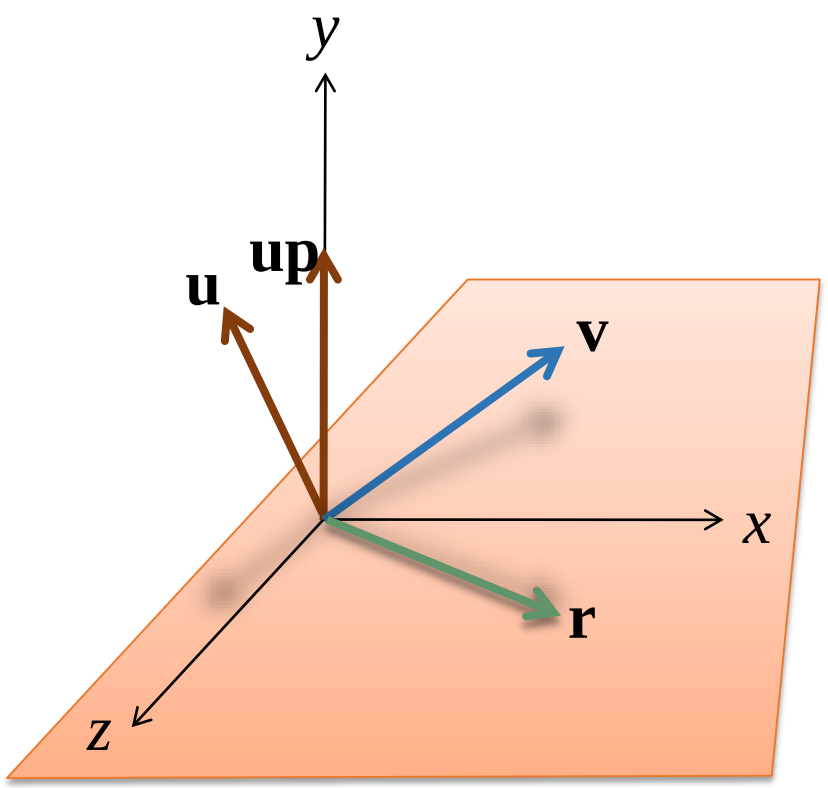
Easier Way

- Orthogonalize lookat vector system
  - Let **r** = **v** × **up**/||**v**×**up**||



Easier Way

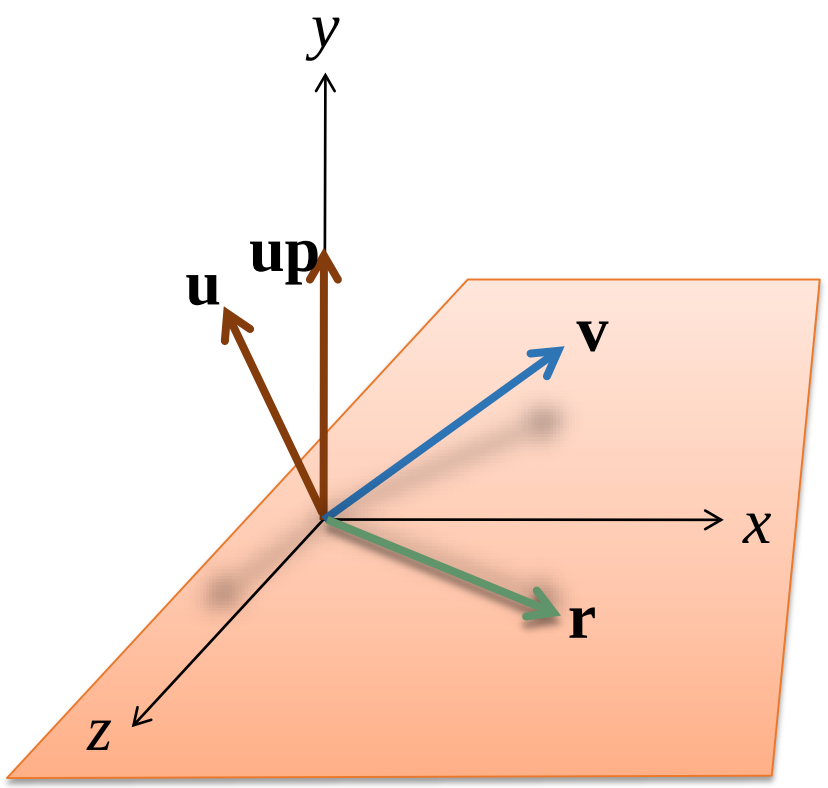
- Orthogonalize lookat vector system
  - Let **r** = **v** × **up**/||**v**×**up**||
  - Let **u** = **r** × **v**



Easier Way

- Orthogonalize lookat vector system
  - Let **r** = **v** × **up**/||**v**×**up**||
  - Let **u** = **r** × **v**
  - Create rotation matrix from <**r**,**u**,-**v**> to <*x*.*y*,*z*>

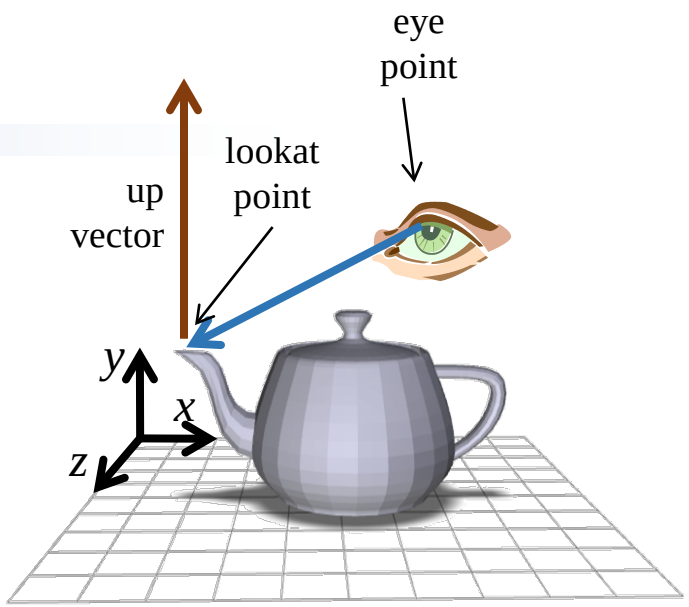
$$R = \begin{bmatrix} \mathbf{r} & 0 \\ \mathbf{u} & 0 \\ -\mathbf{v} & 0 \\ & 1 \end{bmatrix}$$



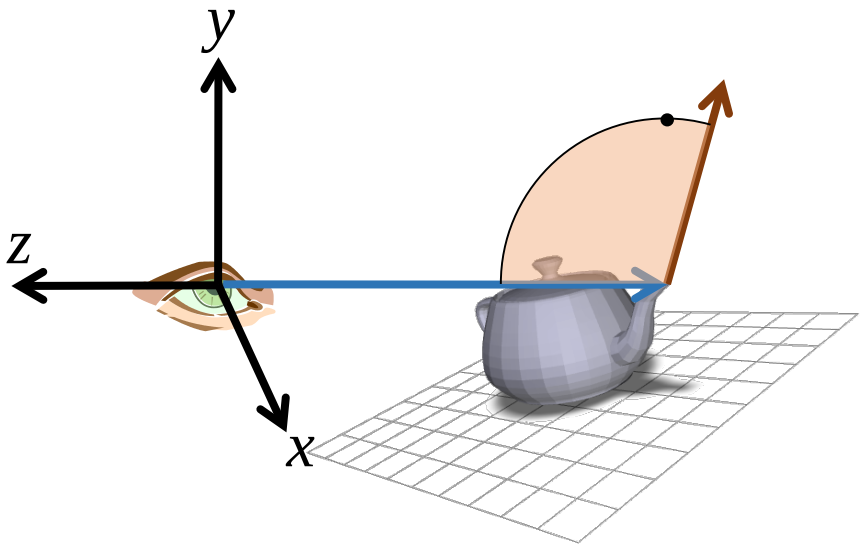
R **r** = **x**, R **u** = **y**, R **v** = -**z**

Construct Lookat

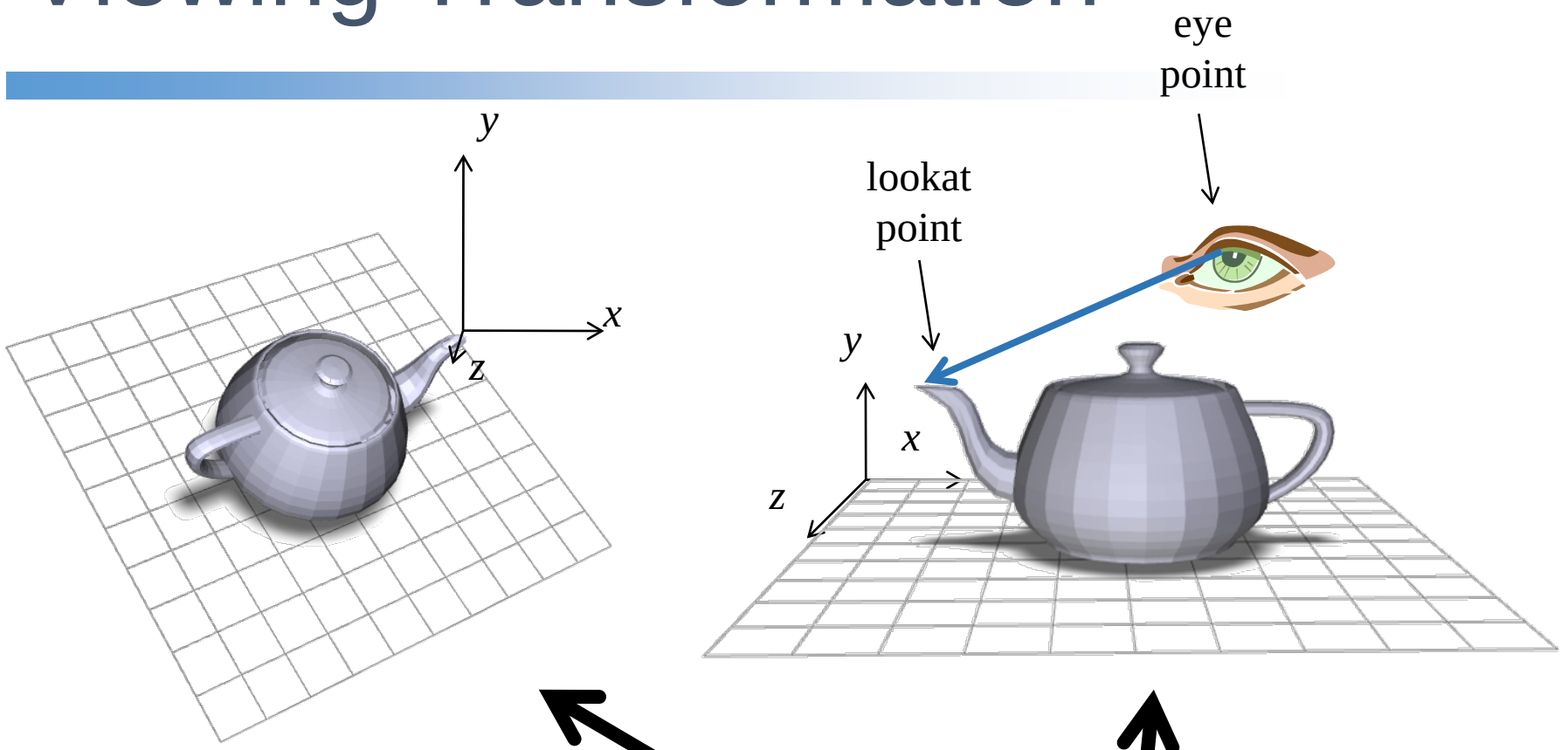
- Translate eye point to origin
- Rotate view into -z axis
  - Let v = (lookat - eye)/||lookat - eye||
  - Let r = v × up/||v×up||
  - Let u = r × v



$$\begin{bmatrix} r_x & r_y & r_z & \\ u_x & u_y & u_z & \\ -v_x & -v_y & -v_z & \\ & & & 1 \end{bmatrix} \begin{bmatrix} 1 & & & -eye_x \\ & 1 & & -eye_y \\ & & 1 & -eye_z \\ & & & 1 \end{bmatrix}$$



Viewing Transformation



Screen Coords ← [W2V] ← Clip Coords ← [Persp] ← Viewing Coords ← [View] ← World Coords ← [Model] ← Model Coords