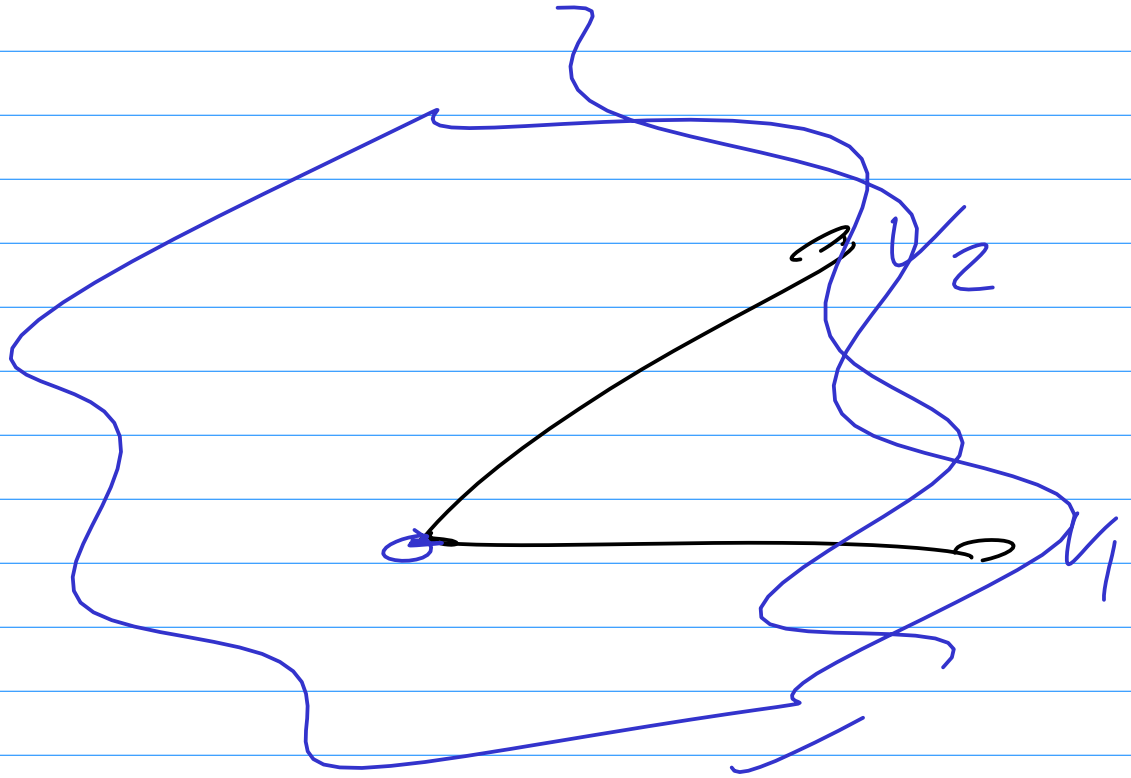
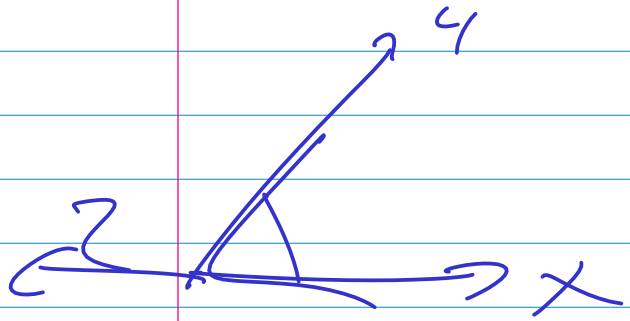
9/29/14 - 1

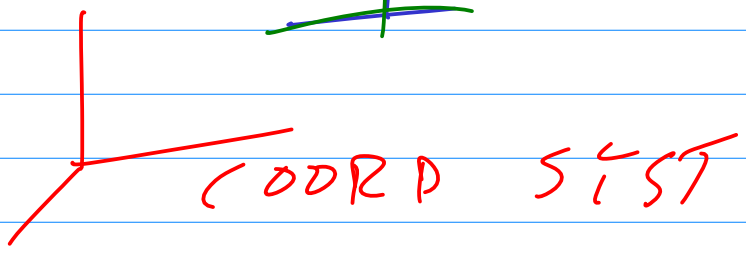
PLANE - 3D





CAMERA SYST

OBJECT



COORD SYST

HOMOGENEOUS COORDS

$$\begin{pmatrix} x_h \\ y_h \\ z_h \\ w \end{pmatrix} \rightarrow \begin{pmatrix} x_h/w \\ y_h/w \\ z_h/w \end{pmatrix}$$

HOMOG → CARTESIAN

$$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix} \rightarrow \begin{pmatrix} 1/4 \\ 1/2 \\ 3/4 \end{pmatrix}$$

$$\begin{pmatrix} 2 \\ 4 \\ 6 \\ 8 \end{pmatrix} \rightarrow \begin{pmatrix} 1/4 \\ 1/2 \\ 3/4 \end{pmatrix}$$

MANY HOMOG REPS FOR A CARTES POINT.

TRANSFORM MATRIX

SCALE CARTES

$$\begin{pmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & S_z \end{pmatrix}$$

$$\begin{pmatrix} 2x \\ 3y \\ 4z \end{pmatrix} = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

ROT

$$\begin{pmatrix} x' \\ y' \\ z' \end{pmatrix} = \begin{pmatrix} & 3\times3 & \\ & ROT & \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

ON VEUT TO MAKE TRANSLATION A MATRIX MULT.

WITH HOMOG

SCALE

$$\begin{pmatrix} S_x x \\ S_y y \\ S_z z \\ 1 \end{pmatrix} = \begin{pmatrix} S_x & 0 & 0 & 0 \\ 0 & S_y & 0 & 0 \\ 0 & 0 & S_z & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \\ 1 \end{pmatrix}$$

3 X 3 CARTES SCALE MAT

4 X 4 HOMOG SCALE MAT

$$\begin{pmatrix} 4 \\ 3 \\ 8 \end{pmatrix} \quad \begin{pmatrix} 2 \\ 1 \\ 4 \end{pmatrix} = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 4 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \begin{pmatrix} 2 \\ 3 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} 12 \\ 9 \\ 4 \\ 2 \end{pmatrix} \begin{pmatrix} 4 \\ 3 \\ 8 \\ 1 \end{pmatrix} \begin{pmatrix} 2 \\ 1 \\ 4 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 4 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix} \begin{pmatrix} 2 \\ 3 \\ 2 \\ 1 \end{pmatrix} \begin{pmatrix} 6 \\ 9 \\ 6 \\ 3 \end{pmatrix}$$

HOMOG. TRANS MAT

$$\begin{pmatrix} 1 & 0 & 0 & D_x \\ 0 & 1 & 0 & D_y \\ 0 & 0 & 1 & D_z \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

TO TRANS BY $(1, 2, 3)$

$$\begin{pmatrix} 9 \\ 15 \\ 21 \\ 3 \end{pmatrix} \begin{pmatrix} 3 \\ 5 \\ 7 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 2 \\ 3 \\ 4 \\ 1 \end{pmatrix} \begin{pmatrix} 6 \\ 9 \\ 12 \\ 3 \end{pmatrix}$$

WE CAN FIND MATRIX FOR SCALE THEN TRANS.

$$P' = \left[\begin{pmatrix} 1 & 0 & 0 & D_x \\ 0 & 1 & 0 & D_y \\ 0 & 0 & 1 & D_z \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} S_x & 0 & 0 & 0 \\ 0 & S_y & 0 & 0 \\ 0 & 0 & S_z & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \right] P$$

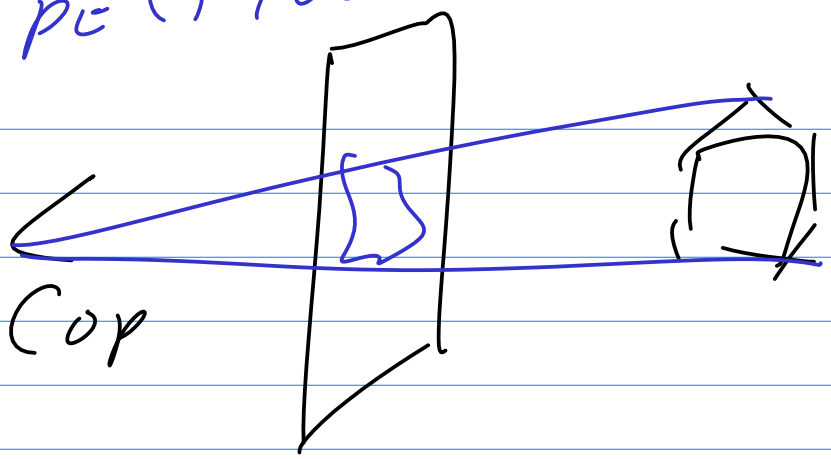
1 COMBO MAT

APPLY TO MATS

$$\boxed{M_{10} \cdots (M_3 (M_2 M_1) P}$$

$P' = MP$

PERSPECTIVE



ORTHOG