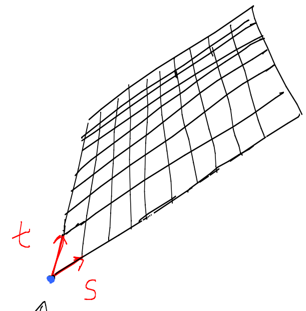
# lecture 19 part 2

## homographies (introduction)

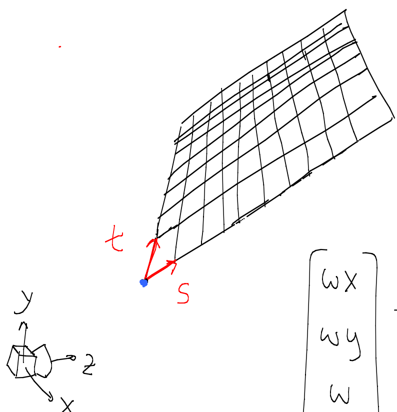
Suppose we have a scene plane.



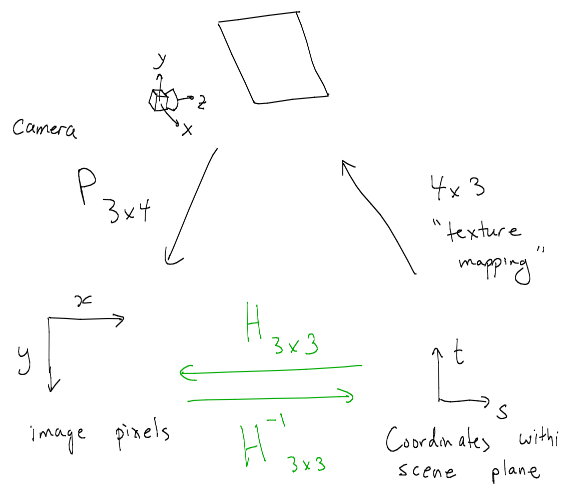

origin $(s,t)=(0,0)$ is at $(X_0\ Y_0\ Z_0)$

Vectors corresponding to unit s and t steps

$$\begin{bmatrix} X \\ Y \\ Z \\ 1 \end{bmatrix} = \begin{bmatrix} a_x & b_x & X_0 \\ a_y & b_y & Y_0 \\ a_z & b_z & Z_0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} s \\ t \\ 1 \end{bmatrix}.$$

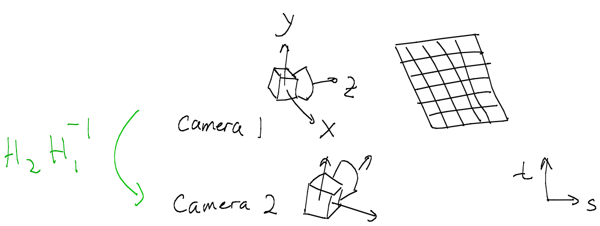



$$\begin{bmatrix} wx \\ wy \\ w \end{bmatrix} = \overbrace{\underbrace{\underset{3\times4}{P} \ \underset{4\times3}{\begin{bmatrix} a_x & b_x & X_0 \\ a_y & b_y & Y_0 \\ a_z & b_z & Z_0 \\ 0 & 0 & 1 \end{bmatrix}}}_{3\times3}}^{H \text{ "homography"}} \begin{bmatrix} s \\ t \\ 1 \end{bmatrix}$$




See lecture notes for a discussion of when H is invertible.

## Homography - Example 2




We now have $H_1$ and $H_2$.

Each takes $(s,t)$ to $(x,y)$.

Thus, $H_1^{-1}$ and $H_2^{-1}$ take $(x,y)$ to $(s,t)$

Thus, $H_2 H_1^{-1}$ takes $(x^1, y^1)$ to $(x^2, y^2)$.