EECS101 Discussion 8

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Stereo Photography

- World coordinate of the point
  - $x = \frac{b(x'_l + x'_r)}{2(x'_l - x'_r)}$
  - $y = \frac{b(y'_l + y'_r)}{2(x'_l - x'_r)}$
  - $z = \frac{bf}{x'_l - x'_r}$

  - (x,y,z) is the world coordinate of the point
  - (x'_l, y'_l), (x'_r, y'_r) are the image coordinates of the point in the left and right images respectively
  - b: length of the baseline connecting the lens centers
  - Disparity: $x'_l - x'_r$

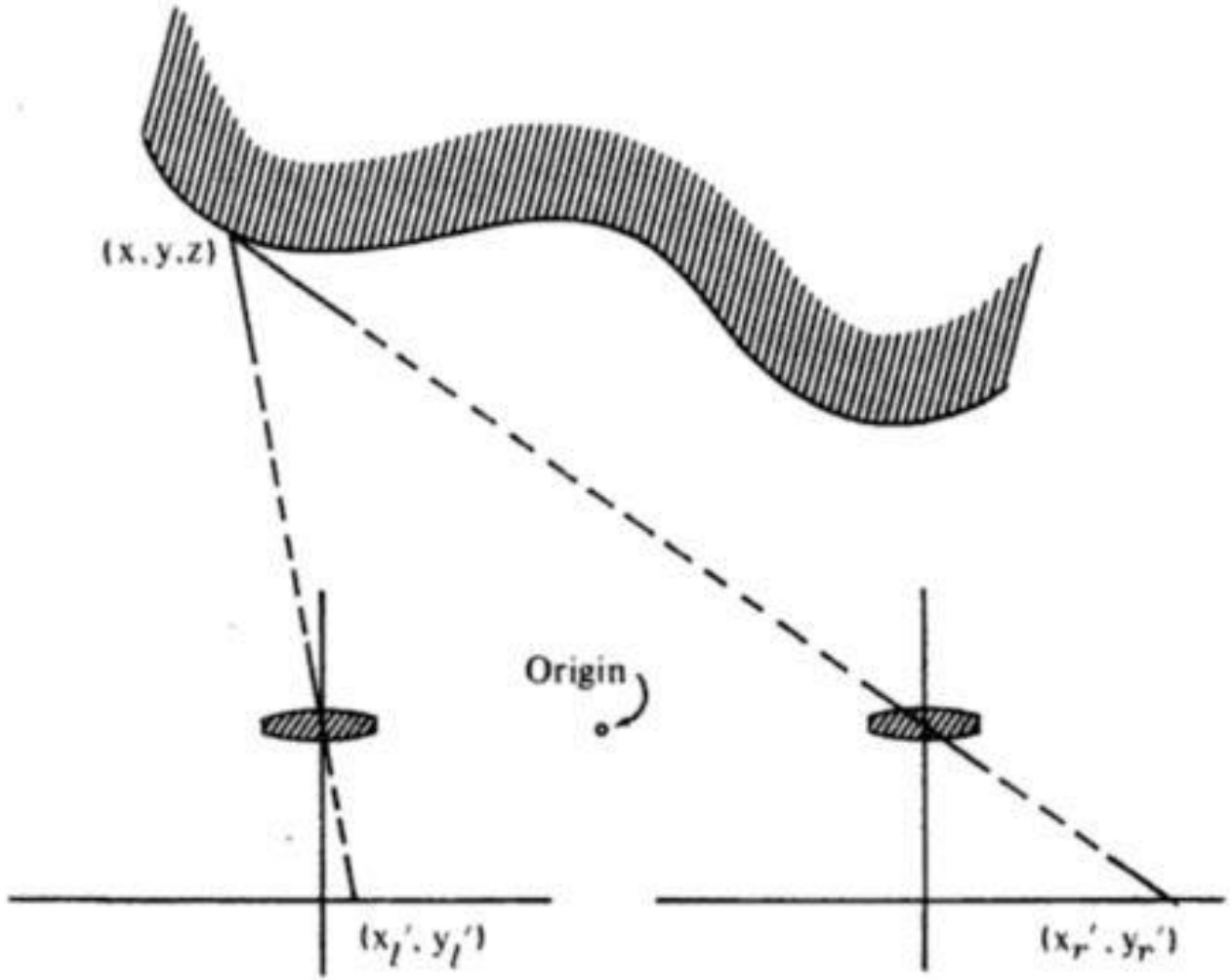

Figure 13-1. Simple camera geometry for stereo photography. The optical axes are parallel to one another and perpendicular to the baseline connecting the two cameras.

Surface Normal

- The plane normal can be found out by the cross product of any two vectors on the plane.
  - $A=(A_1, A_2, A_3)$
  - $B=(B_1, B_2, B_3)$
  - $A \times B = (A_2B_3-A_3B_2, A_3B_1-A_1B_3, A_1B_2-A_2B_1)$
- The normal is related to (p,q) by
  - $N = (-p, -q, 1)$
  - Scale A x B to the template to find p and q

Optical Flow

- Given an expression of the image irradiance, the key is to find out u(x,y,t) and v(x,y,t) where u and v are the x and y components of the optical flow of the pixel (x,y) at time t
- Example

  u and v for $E(x,y,t) = \cos(x-t)+1$?
  - By definition
  - draw out some instances of E(x,y,t) at different t values

Submission Guideline

Homework 7

Submit written problems by Mar 3 midnight.
Submit programs and images by Mar 10 midnight.