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Dense Stereo

Basic Dense Stereo Depth Calculation

Robert B. Fisher School of Informatics University of Edinburgh

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?

based stereo

- Use stereo image pair
- Features are neighborhoods at each pixel



• Match using similarity metric: SSD - Sum of Squared Differences (of pixel values) of left image at (u, v) to right image at (r, s):

$$SSD(u, v, r, s) = \sum_{i = -\frac{N}{2}}^{\frac{N}{2}} \sum_{j = -\frac{N}{2}}^{\frac{N}{2}} (L(u + i, v + j) - R(r + i, s + j))^{2}$$

?

Depth Data

Problem: have depth only at triangulated feature locations

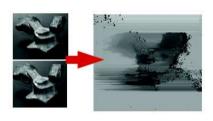
Solution 1: Linear interpolate known values at all other pixels

Solution 2: Correlation-based stereo

Use pixel neighborhoods as features

Triangulate depth at every pixel

But needs to find matching pixel - not easy



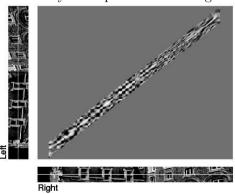
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Finding best match

For each scanline on rectified image pair:

1. Build array of all possible matching scores



2. ? programming finds lowest cost path (bright line thru middle of array above - optimisation problem)

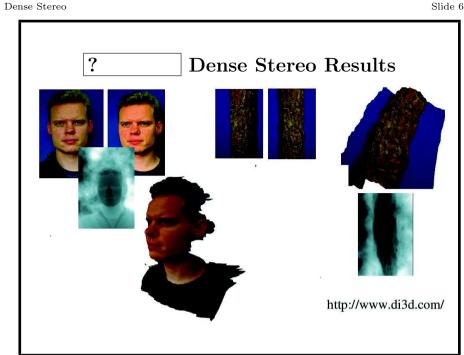
Technique = [Cox et al. 1996]

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What We Have ?

- Can use local intensity to make pixel-to-pixel matches
- Can triangulate every pixel to get dense depth data
- Matching errors still happen



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