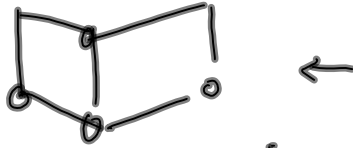HWS:

26-1

1 set of 4 pts. visible on each photo
initial approximations EO $(x_i, y_i, z_i, \omega \phi k)$

2nd set of points for "control" or minimal
                constraints
widest possible baseline

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---

1 cm meas. error : 1 m object
                     1% meas error

26-2

1 cm meas error : 10 m length
                     0.1 % meas error

you could use points from group 2 for
approx EO,

do not use points from group 1 for control

I must post bld_geom. on
             ∟ point_list.txt, quads.txt

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Matching or correspondence problem 26.3

CC : workhorse tool for
similarity metric NCC $-1 \to +1$
cross correlation

LSM : refinement to subpixel accuracy
least squares matching
cond. equation $I \cdot rt_1 = \frac{d}{dt} I \cdot rt_2$
parameters : $shift_x$, $shift_y$, rotation, scale
leads to : automated approach to
tie point selection

after LSM : estimated d_x, d_y
$\Sigma \binom{dx}{dy}$: λ_1, λ_2 26-4

λ_1, λ_2 : small + approx equal

$\Rightarrow$ compute $\Sigma \binom{dx}{dy}$
look for λ's small + equal
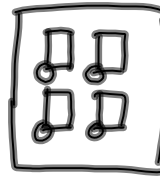$\Rightarrow$ Interest Points (corner detector)

I.P.

26-5
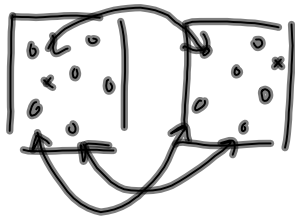
determine conjugates:

IP + CC + RANSAC

(random sample consensus)

Select @ random 5 pts 1, converg. 2

get RO parameters   inliers

Choose the one with most inliers

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CC:

$$\sigma_x^2 = E\{(x-\mu_x)^2\}$$

$$\sigma_y^2 = E\{(y-\mu_y)^2\}$$

$$\Sigma = \begin{bmatrix} \sigma_x^2 & \sigma_{xy} \\ \cdot & \sigma_y^2 \end{bmatrix}$$

26-6

$$\sigma_{xy} = E\{(x-\mu_x)(y-\mu_y)\}$$

population values

$$\rho_{xy} = \frac{\sigma_{xy}}{\sigma_x \sigma_y}$$

$$-1 \rightarrow +1$$

ρ standardized, normalized covariance
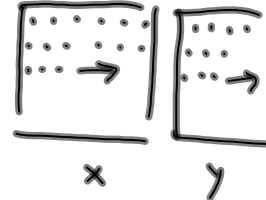
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3

Sample : Sample cov. matrix 26-7

$$\begin{bmatrix} S_x^2 & S_{xy} \\ S_{yx} & S_y^2 \end{bmatrix} = \Sigma_{sample}$$

$$\begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}, \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix}$$

$$S_x = \sqrt{\frac{\sum(x_i - \bar{x})^2}{N-1}}$$

$$S_y = \sqrt{\frac{\sum(x - \bar{x})^2}{N-1}}$$

$$S_{xy} = \frac{1}{N-1}\sum(x_i - \bar{x})(y_i - \bar{y})$$

r_{xy} : sample C.C. $\boxed{\dfrac{S_{xy}}{S_x S_y}}$

x   y

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$$r_{xy} = \frac{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\left(\frac{1}{N-1}\right)^2 \sum(x_i-\bar{x})^2 \sum(y_i-\bar{y})^2}}$$

26-8

$$\boxed{r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\left[\sum(x_i - \bar{x})^2(y_i - \bar{y})^2\right]^{1/2}}}$$
Sample
corel.
coeff.

Normalized C.C.

x_i, y_i μ_i, ν_i x : image 1
                               y : image 2
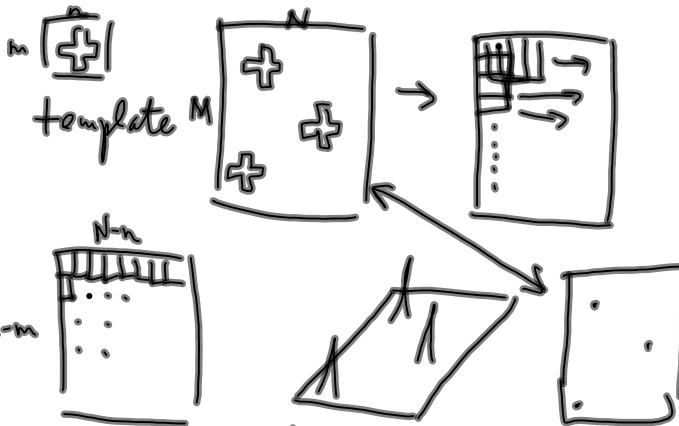
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4

app's for CC

26-9

photogrammetry : 1. signalized pt. detection

2. terrain extraction
(surface)

3. detect conjugates, IP

_____

elsewhere : 1. GPS acquisition

2. Relar matched filter

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26-10

template M

response map

look through response map
look for values exceed
threshold

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