Matlab Review 6-1

x= a*b+c ; no output
x= a*b+c output → screen

debug: pause
(statements → m-file hw2a.m

keyboard , pauses w/ command prompt
return : continue
dbquit : stop
diary hw2a.lst } format compact
diaryoff

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fid = fopen ('filename', 'rt') text 6-2
'wt'
rb } binary
wb

reading: load file.txt
matrix : file

A = fscanf(fid, '%f')

fread: binary data

B = textscan (fid, '%s %f %d') cell array

writing fprintf(fid, '%6.2f % 12.8f \n', a, b)
\r\n

format short, long, short g, long g

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continue col.m : evaluate collin. equ's 6-3

uvw = M * [x-xL; y-yL; z-zL];

u=uvw(1);

v=uvw(2);

w=uvw(3);

$F_x = x - x_0 + foc*(u/w)$;

$F_y = y - y_0 + foc*(v/w)$;

result = [Fx; Fy];

—— col.m ——

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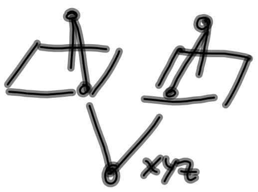
6-4



$deg \times \frac{180}{\pi} = rad$

enter: $X_{L1}, Y_{L1}, Z_{L1}, \omega_1, \varphi_1, k_1$ ← angles radians

$X_{L2}, Y_{L2}, Z_{L2}, \omega_2, \varphi_2, k_2$

$x_0\ y_0\ foc$

assume $Z \approx \underline{200}$

$X = X_L + (Z - Z_L)\left(\frac{u}{w}\right)$

$Y = Y_L + (Z - Z_L)\left(\frac{v}{w}\right)$

$$\begin{pmatrix} u \\ v \\ w \end{pmatrix} = M^T \begin{pmatrix} x - x_0 \\ y - y_0 \\ -foc \end{pmatrix}$$

good way for initial approx for XYZ

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6-5

```
p1 = zeros(14,1)
p2 = zeros(14,1)
dp = ones(14,1) * 1.0e-08
```

```
p1(1) = ..
p1(2) = ...
  ⋮
p1(14) = ..
```

photo 1

```
p2(1) = .
p2(2) = ..
  ⋮
p2(14) = ..
```

photo 2

x		
y		
x_0		
y_0	14	
foc	elements	
ω		
φ		
κ		
X_L		
Y_L		
Z_L		
X	12	
Y	13	
Z	14	

elements of p-vector

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6-6

```
partials = zeros(2,14);
for iter = 1:5
    B = zeros(4,3);
    f = zeros(4,1);
% left photo
F0 = col(p1);
for j=1:14
    pp = p1;
    pp(j) = pp(j) + dp(j);
    F1 = col(pp);
    partials(:,j) = (F1-F0) / dp(j)
    end
```

magic

partials =

$\partial F_x/\partial x \quad \partial F_x/\partial y \quad \partial F_x/\partial x_0 \quad \partial F_x/\partial y_0 \quad \partial F_x/\partial foc \quad \partial F_x/\partial \omega \quad \partial F_x/\partial \phi \quad \ldots\ldots$

$\partial F_y/\partial x \quad \partial F_y/\partial y \quad \partial F_y/\partial x_0 \quad \partial F_y/\partial y_0 \quad \partial F_y/\partial foc \quad \partial F_y/\partial \omega \quad \partial F_y/\partial \phi \quad \ldots\ldots$

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```
B(1:2, :) = partials(:, 12:14) ;
f(1:2) = -F0 ;
% right photo
 F0 = col(p2) ;
 for j = 1:14
     pp = p2 ;
     pp(j) = pp(j) + dp(j) ;
     F1 = col(pp) ;
     partials(:,j) = (F1-F0) / dp(j) ;
     end
```

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6-8

```
B(3:4, :) = partials(:, 12:14) ;
f(3:4) = -F0 ;
% weights are equal W = I
del = inv(B'*B)*B'*f   ←
x = x + del(1) ;
y = y + del(2) ;
z = z + del(3) ;
p1(12:14) = [x; y; z] ;
p2(12:14) = [x; y; z] ;
end ; % iteration loop
x
y
z  show results
```

normal convergence
monitor Δ vect.

make sure to show the Δ vector for each iteration so you + I can monitor convergence behavior

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(a)

$$\begin{bmatrix} v_{x_1} \\ v_{y_1} \\ v_{x_2} \\ v_{y_2} \\ \vdots \\ v_{x_6} \\ v_{y_6} \end{bmatrix} + \begin{bmatrix} - - - - - - \\ - - - - - - \\ \\ \\ \\ - - - - - - \\ - - - - - - \end{bmatrix} \begin{bmatrix} \Delta\omega \\ \Delta\varphi \\ \Delta\kappa \\ \Delta X_c \\ \Delta Y_c \\ \Delta Z_c \end{bmatrix} = \begin{bmatrix} -F_{x_1} \\ -F_{y_1} \\ -F_{x_2} \\ -F_{y_2} \\ \vdots \\ -F_{x_6} \\ -F_{y_6} \end{bmatrix}$$

6-9

$$v + B\,\Delta = f$$

one photo.

This represents equation layout for the RESECTION problem

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$$\begin{bmatrix} v_{x_1} \\ v_{y_1} \\ v_{x_2} \\ v_{y_2} \end{bmatrix} + \begin{bmatrix} - & - & - \\ - & - & - \\ - & - & - \\ - & - & - \end{bmatrix} \begin{pmatrix} \Delta X \\ \Delta Y \\ \Delta Z \end{pmatrix} = \begin{bmatrix} -F_{x_1} \\ -F_{y_1} \\ -F_{x_2} \\ -F_{y_2} \end{bmatrix}$$

6-10

$$v + B\,\Delta = f$$

residuals $v + B\Delta = f$

$$\boxed{v = f - B\Delta}$$

equation layout for the 2-photo (2-ray) intersection problem

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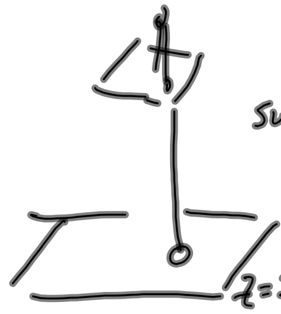
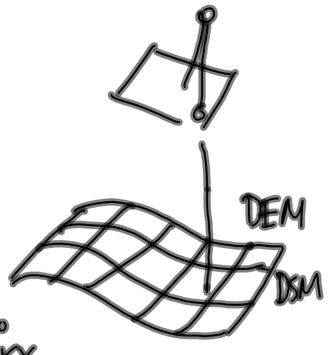
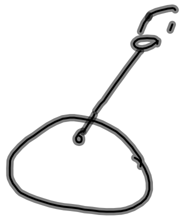
6-11

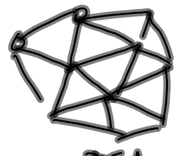


specify surface in object space



pick Z_0
solve for $X_1 Y_1$
interp. Z_1
solve for $X_2 Y_2$
interp. Z_2
$\vdots$





satellite applications intersect with earth ellipsoid

DEM = digital elevation model
DSM = digital surface model

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"linear" version of intersection equations

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$$\begin{pmatrix}x-x_0\\y-y_0\\-f\end{pmatrix} = \lambda M \begin{pmatrix}X-X_L\\Y-Y_L\\Z-Z_L\end{pmatrix}, \quad \frac{1}{\lambda}M^T\begin{pmatrix}x-x_0\\y-y_0\\-f\end{pmatrix} = \begin{pmatrix}X-X_L\\ \vdots\end{pmatrix}$$

$$X = X_L + (Z-Z_L)\underbrace{(u/w)}_{c_1}$$
$$Y = Y_L + (Z-Z_L)\underbrace{(v/w)}_{c_2}$$

$$\begin{pmatrix}u\\v\\w\end{pmatrix} = M^T\begin{pmatrix}x-x_0\\y-y_0\\-f\end{pmatrix}$$

$$X = X_L + c_1 Z - c_1 Z_L$$
$$Y = Y_L + c_2 Z - c_2 Z_L$$

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