CASE#3

RESULT:

GCP =

11×4 table

ID X Y Z

\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1109 474.764663656744 6397.22766169868 617.821046289906

1128 1784.69230121925 5589.91213551029 646.669588276241

1309 208.58107943712 4605.75591184802 642.106409560179

1648 1848.68054020963 1547.25084761729 682.742479944888

1709 208.300394269915 1223.74856331436 670.944385442386

2189 3739.28764408759 5918.70295479034 650.866162960247

2389 3778.46091514244 4279.40233935276 669.813913558882

2789 3785.55348133753 715.59351456786 700.371113369964

1509 149.013804954488 2846.62390261321 614.06676020593

2589 3715.70217568529 2500.28216868719 684.895541576943

1338 1817.33777612266 3829.46144864152 659.455739634171

result\_coordinates =

1 2091.25139332624 5867.59574987108 644.109336691504

2 1326.95536242309 6533.7184255692 611.369346676815

3 2071.2385661975 6434.73175476225 635.160846443199

4 261.936604827376 5457.45932684339 632.300314759344

5 2170.79072932696 5166.08361840623 652.304806614043

6 1783.14069869724 4983.27344231544 651.183923118016

7 2156.45965653092 4629.74001909905 658.527250866222

8 1231.01853135657 5468.49904279962 646.400096422168

9 2111.6016518262 5434.71538717299 650.080160233806

10 1792.93139425676 4348.3161180228 656.526256075776

11 2157.35427394084 4131.15536320138 659.297703986173

12 1174.26361540542 4712.73676009809 650.008331134151

13 2034.83995495188 4626.47557402528 656.621542010516

14 282.945921139958 3660.178589412 619.428489972932

15 2183.12198262811 3681.2689285462 668.385872594267

16 1920.14851124862 3401.02549439029 667.707043961159

17 2147.30265081906 3171.71369145452 670.462310956955

18 1809.43490554649 3026.40233545285 671.184511146764

19 1050.91728575666 3842.34481403268 656.255333625003

20 2145.44500488747 3742.46529411654 666.355876399568

21 2149.93103328838 2774.00175430883 674.942018522447

22 1867.3501060492 2536.00592395723 674.679900601262

23 1186.95130123051 2939.38147321458 663.129370605594

24 2110.16515528993 2797.81844819948 673.982348831473

25 359.75067664826 2053.63894218761 666.88386977749

26 1837.97007749899 2001.01111472362 678.564105528449

27 2073.48632116939 1347.11126642839 685.43884281072

28 2130.32261733204 1831.75754264701 683.476395598205

29 1228.33143075834 2091.3998215986 674.816705496503

30 2070.37199566896 2039.69706675659 680.681815716187

31 2125.14818993062 843.344158375859 685.72624769085

32 1167.59732401766 1198.06358161166 677.509739873226

33 2061.20964820318 1230.72753798273 687.310566273583

34 1776.39821516677 5915.50766509066 643.770260736166

35 2858.80974032535 5967.42685724883 644.088609383156

36 1877.56840336073 5119.31447138053 649.527431387606

37 2665.47421105861 5092.92856843393 657.333128628736

38 3718.92724344771 5044.83397809573 659.350938305555

39 1866.3051193134 4216.96641573169 656.278662054483

40 2825.72610147042 4244.80597947599 666.354298999461

41 1818.88238660785 3361.66619541766 665.635574306886

42 2840.88918728111 3279.77669558318 673.516876159748

43 3812.99678141203 3321.86986972568 677.609048540539

44 1893.30120962522 2494.06382445897 675.606987753714

45 2898.73572392742 2529.79173307262 678.286549761231

46 1966.49629995594 1591.66180891946 683.658502030382

47 2799.08276978415 1574.82330671635 683.158042343971

48 3774.77214328064 1583.07746515069 695.323793349611

49 2011.74250741721 742.107375579489 685.243169187969

50 2918.9942823478 669.142428120498 688.604242338509

Norm delta\_x:

3.92293724828198e-12

Elapsed time is 0.729567 seconds.

CODE:

**%% Project 3 --> SK\_CASE3**

**tic; close all; clear; clc; format long g**

**%% First We Load Our Parameters Coumputed In Last Project And Our Data**

**load('parameters1.mat');**

**load('parameters2.mat');**

**load('data.mat');**

**load('data\_control\_points.mat');**

**plot(result\_coordinates(:,2), result\_coordinates(:,3), '\*m', 'MarkerSize', 8);%Computed Control Points.**

**hold on;%we plot Tie coordinates this soon becuse it will change douring the App.**

**%% These Variables Are Primary Values**

**data\_control\_points(4, 4) = 641.272969739521;**

**data\_control\_points(10, 4) = 657.615318655257;**

**data\_control\_points(6, 2) = 1.817848254013564e+03;**

**data\_control\_points(6, 3) = 3.830066680064776e+03;**

**compelete\_control\_point = [data\_control\_points(1 : 3, :);data\_control\_points(5, :); data\_control\_points(7 : 9, :); data\_control\_points(11, :)];**

**compelete\_control\_point\_copy = compelete\_control\_point;**

**height\_control\_point = [data\_control\_points(6, :)];**

**height\_control\_point\_copy = height\_control\_point;**

**plan\_control\_point = [data\_control\_points(4, :); data\_control\_points(10, :)];**

**plan\_control\_point\_copy = plan\_control\_point;**

**C = 153.692 / 1000; % mm -> m**

**%% Now We Will Create Our Main Matrix**

**result\_images(:, 8) = result\_images(:, 6);%addup 2 columns for Omega and phi**

**result\_images(:, 6 : 7) = zeros(14, 2);**

**len\_data = length(data);**

**% syms X0 Y0 Z0 Omega Phi Kappa X Y Z x y**

**% R = [cos(Kappa), -sin(Kappa), 0; sin(Kappa), cos(Kappa), 0; 0, 0, 1] \* ...**

**% [cos(Phi), 0, sin(Phi); 0, 1, 0; -sin(Phi), 0, cos(Phi)] \* ...**

**% [1, 0, 0; 0, cos(Omega), -sin(Omega); 0, sin(Omega), cos(Omega)];**

**%**

**% temp = R \* [(X - X0); (Y - Y0); (Z - Z0)];**

**% m = temp(1);**

**% n = temp(2);**

**% q = temp(3);**

**% clear temp;**

**% r = m / q;**

**% s = n / q;**

**% Fx = x + C \* r;**

**% Fy = y + C \* s;**

**%**

**% F = [jacobian(Fx, [X0, Y0, Z0, Omega, Phi, Kappa]); jacobian(Fy, [X0, Y0, Z0, Omega, Phi, Kappa])];**

**% Fg = [jacobian(Fx, [X, Y, Z]); jacobian(Fy, [X, Y, Z])];**

**% Fg\_V = [jacobian(Fx, [X, Y]); jacobian(Fy, [X, Y])];**

**% Fg\_Plan = [jacobian(Fx, Z); jacobian(Fy, Z)];**

**%The computed values are added to loop.**

**VARIANCE = [(eye(len\_data \* 2) \* 7 / 1000000) .^ 2, zeros(len\_data \* 2, 8 \* 3 + 2 \* 2 + 1 \* 1); zeros(29, len\_data \* 2), (eye(29) \* 15 / 100) .^ 2];**

**for i=1:8%sigma for Z is diffrent.**

**VARIANCE(len\_data \* 2 + 3\*i,len\_data \* 2 + 3\*i) = (20 / 100) .^ 2;%Z full**

**if i<2**

**VARIANCE(len\_data \* 2 + 3\*8 + 2\*2 +1) = (20 / 100) .^ 2;%Z Vertical**

**end**

**end**

**P = inv(VARIANCE);**

**AEO = zeros(2 \* len\_data, 6 \* 14);**

**Ag = zeros(2 \* len\_data, 50 \* 3 + 1 \* 2 + 2 \* 1);**

**w = zeros(len\_data \* 2, 1);**

**delta\_x = 1;**

**while norm(delta\_x) > 10e-12**

**for i = 1 : len\_data**

**image\_num = data(i, 2);**

**if data(i, 1) == 2**

**image\_num = image\_num + 7;**

**end**

**x = data(i, 4);**

**y = data(i, 5);**

**X0 = result\_images(image\_num, 3);**

**Y0 = result\_images(image\_num, 4);**

**Z0 = result\_images(image\_num, 5);**

**Omega = result\_images(image\_num, 6);**

**Phi = result\_images(image\_num, 7);**

**Kappa = result\_images(image\_num, 8);**

**if data(i, 6) == 1%FULL -> It's waigted so we have Ag here too**

**num = data(i, 7) - 100;**

**X = compelete\_control\_point(num, 2);**

**Y = compelete\_control\_point(num, 3);**

**Z = compelete\_control\_point(num, 4);**

**Ag(2 \* i - 1 : 2 \* i, 154 + num \* 3 - 2 : 154 + num \* 3) = [ (2768668935719305\*cos(Kappa)\*cos(Phi))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*sin(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), - (2768668935719305\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Phi)\*sin(Omega)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Omega)\*cos(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2);**

**(2768668935719305\*cos(Phi)\*sin(Kappa))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*sin(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Phi)\*sin(Omega)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), - (2768668935719305\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Omega)\*cos(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2)];**

**elseif data(i, 6) == 2 % Ag1 -> Z / Ag2 -> XY**

**num = data(i, 7) - 1000;**

**X = plan\_control\_point(num, 2);**

**Y = plan\_control\_point(num, 3);**

**Z = plan\_control\_point(num, 4);**

**Ag(2 \* i - 1 : 2 \* i, 50 \* 3 + 2 + num) = [(2768668935719305\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Omega)\*cos(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2);**

**- (2768668935719305\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Omega)\*cos(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2)];**

**Ag(2 \* i - 1 : 2 \* i, 154 + 8 \* 3 + num \* 2 - 1 : 154 + 8 \* 3 + num \* 2) = [ (2768668935719305\*cos(Kappa)\*cos(Phi))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*sin(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), - (2768668935719305\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Phi)\*sin(Omega)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2);**

**(2768668935719305\*cos(Phi)\*sin(Kappa))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*sin(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Phi)\*sin(Omega)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2)];**

**elseif data(i, 6) == 3% Ag1 -> XY / Ag2 -> Z**

**num = data(i, 7) - 10000;**

**X = height\_control\_point(num, 2);**

**Y = height\_control\_point(num, 3);**

**Z = height\_control\_point(num, 4);**

**Ag(2 \* i - 1 : 2 \* i, 50 \* 3 + 1 : 50 \* 3 + 2) = [ (2768668935719305\*cos(Kappa)\*cos(Phi))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*sin(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), - (2768668935719305\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Phi)\*sin(Omega)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2);**

**(2768668935719305\*cos(Phi)\*sin(Kappa))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*sin(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Phi)\*sin(Omega)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2)];**

**Ag(2 \* i - 1 : 2 \* i, 154 + 3 \* 8 + 2 \* 2 + 1) = [(2768668935719305\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Omega)\*cos(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2);**

**- (2768668935719305\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Omega)\*cos(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2)];**

**elseif data(i, 6) == 0**

**num = data(i, 7);**

**X = result\_coordinates(num, 2);**

**Y = result\_coordinates(num, 3);**

**Z = result\_coordinates(num, 4);**

**Ag(2 \* i - 1 : 2 \* i, num \* 3 - 2 : num \* 3) = [ (2768668935719305\*cos(Kappa)\*cos(Phi))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*sin(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), - (2768668935719305\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Phi)\*sin(Omega)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Omega)\*cos(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2);**

**(2768668935719305\*cos(Phi)\*sin(Kappa))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*sin(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Phi)\*sin(Omega)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), - (2768668935719305\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*cos(Omega)\*cos(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2)];**

**end**

**AEO(2 \* i - 1 : 2 \* i, 6 \* image\_num - 5 : 6 \* image\_num) = [ - (2768668935719305\*cos(Kappa)\*cos(Phi))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*sin(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*cos(Phi)\*sin(Omega)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*cos(Omega)\*cos(Phi)\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2) - (2768668935719305\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))), (2768668935719305\*((Y - Y0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) + (Z - Z0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi))))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*(cos(Omega)\*cos(Phi)\*(Y - Y0) - cos(Phi)\*sin(Omega)\*(Z - Z0))\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*(cos(Kappa)\*cos(Omega)\*cos(Phi)\*(Z - Z0) - cos(Kappa)\*sin(Phi)\*(X - X0) + cos(Kappa)\*cos(Phi)\*sin(Omega)\*(Y - Y0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*(cos(Phi)\*(X - X0) + cos(Omega)\*sin(Phi)\*(Z - Z0) + sin(Omega)\*sin(Phi)\*(Y - Y0))\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), -(2768668935719305\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0)));**

**- (2768668935719305\*cos(Phi)\*sin(Kappa))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*sin(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*cos(Phi)\*sin(Omega)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2) - (2768668935719305\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))), (2768668935719305\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*cos(Omega)\*cos(Phi)\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), - (2768668935719305\*((Y - Y0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + (Z - Z0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi))))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) - (2768668935719305\*(cos(Omega)\*cos(Phi)\*(Y - Y0) - cos(Phi)\*sin(Omega)\*(Z - Z0))\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*(cos(Phi)\*sin(Kappa)\*sin(Omega)\*(Y - Y0) - sin(Kappa)\*sin(Phi)\*(X - X0) + cos(Omega)\*cos(Phi)\*sin(Kappa)\*(Z - Z0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))) + (2768668935719305\*(cos(Phi)\*(X - X0) + cos(Omega)\*sin(Phi)\*(Z - Z0) + sin(Omega)\*sin(Phi)\*(Y - Y0))\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0))^2), (2768668935719305\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0)))];**

**w(2 \* i - 1) = x + (2768668935719305\*((Z - Z0)\*(sin(Kappa)\*sin(Omega) + cos(Kappa)\*cos(Omega)\*sin(Phi)) - (Y - Y0)\*(cos(Omega)\*sin(Kappa) - cos(Kappa)\*sin(Omega)\*sin(Phi)) + cos(Kappa)\*cos(Phi)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0)));**

**w(2 \* i) = y + (2768668935719305\*((Y - Y0)\*(cos(Kappa)\*cos(Omega) + sin(Kappa)\*sin(Omega)\*sin(Phi)) - (Z - Z0)\*(cos(Kappa)\*sin(Omega) - cos(Omega)\*sin(Kappa)\*sin(Phi)) + cos(Phi)\*sin(Kappa)\*(X - X0)))/(18014398509481984\*(cos(Omega)\*cos(Phi)\*(Z - Z0) - sin(Phi)\*(X - X0) + cos(Phi)\*sin(Omega)\*(Y - Y0)));**

**end**

**for i = 1 : 8%-I3\*3 for Full**

**Ag(376 + i \* 3 - 2 : 376 + i \* 3, 154 + i \* 3 - 2 : 154 + i \* 3) = -eye(3);**

**end**

**for i = 1 : 2%-I2\*2 for Horizental**

**Ag(376 + 24 + i \* 2 - 1 : 376 + 24 + i \* 2, 154 + 24 + i \* 2 - 1 : 154 + 24 + i \* 2) = -eye(2);**

**end**

**Ag(376 + 24 + 5, 154 + 24 + 5) = -eye(1);%-I1\*1 for vertical**

**AEO(376 + 24 + 5, 1) = 0;%Dimantion**

**for i = 1 : 8**

**w(376 + 3 \* i - 2 : 376 + 3 \* i, 1) = compelete\_control\_point\_copy(i, 2 : 4) - compelete\_control\_point(i, 2 : 4);**

**end**

**for i = 1 : 2**

**w(376 + 24 + 2 \* i - 1 : 376 + 24 + 2 \* i, 1) = plan\_control\_point\_copy(i, 2 : 3) - plan\_control\_point(i, 2 : 3);**

**end**

**w(376 + 24 + 4 + 1, 1) = height\_control\_point\_copy(1, 4) - height\_control\_point(1, 4);**

**A = [AEO, Ag];**

**delta\_x = -inv(A' \* P \* A) \* A' \* P \* w;**

**for i = 1 : 14% 1:EOP**

**result\_images(i, 3 : 8) = delta\_x(i \* 6 - 5 : i \* 6, 1)' + result\_images(i, 3 : 8);**

**end**

**for i = 1 : 50% 2:Tie\_Coords ->X,Y for V & Z for H**

**result\_coordinates(i, 2 : 4) = result\_coordinates(i, 2 : 4) + delta\_x(14 \* 6 + 3 \* i - 2 : 14 \* 6 + 3 \* i)';**

**end**

**height\_control\_point(1, 4) = height\_control\_point(1, 4) + delta\_x(end);**

**height\_control\_point(1, 2 : 3) = height\_control\_point(1, 2 : 3) + delta\_x(14 \* 6 + 3 \* 50 + 1 : 14 \* 6 + 3 \* 50 + 2)';**

**plan\_control\_point(1 : 2, 4) = plan\_control\_point(1 : 2, 4) + delta\_x(14 \* 6 + 3 \* 50 + 2 + 1 : 14 \* 6 + 3 \* 50 + 2 + 2);**

**plan\_control\_point(1 : 2, 2 : 3) = [delta\_x(154 + 84 + 24 + 1), delta\_x(154 + 84 + 24 + 2); delta\_x(154 + 84 + 24 + 3), delta\_x(154 + 84 + 24 + 4)] + plan\_control\_point(1 : 2, 2 : 3);**

**for i = 1 : 8% 3.Full\_Coords**

**compelete\_control\_point(i, 2 : 4) = compelete\_control\_point(i, 2 : 4) + delta\_x(154 + 84 + 3 \* i - 2 : 154 + 84 + 3 \* i)';**

**end**

**end**

**GCP = table;**

**GCP.ID = [compelete\_control\_point(:, 1); plan\_control\_point(:, 1); height\_control\_point(:, 1)];**

**GCP.X = [compelete\_control\_point(:, 2); plan\_control\_point(:, 2); height\_control\_point(:, 2)];**

**GCP.Y = [compelete\_control\_point(:, 3); plan\_control\_point(:, 3); height\_control\_point(:, 3)];**

**GCP.Z = [compelete\_control\_point(:, 4); plan\_control\_point(:, 4); height\_control\_point(:, 4)];**

**GCP**

**result\_coordinates**

**disp('Norm delta\_x: ');**

**disp(norm(delta\_x));**

**%% Intersection -> No Need :)**

**data\_control\_points(4, 4) = 0;**

**data\_control\_points(10, 4) = 0;**

**data\_control\_points(6, 2) = 0;**

**data\_control\_points(6, 3) = 0;**

**pair\_points\_matrix = zeros(20, 5);**

**temp = 1;**

**for i = 1 : 11%Number of Controls**

**if data\_control\_points(i, 2) == 0**

**continue;**

**end**

**temp2 = 1;**

**for j = 1 : len\_data**

**if data(j, 3) == data\_control\_points(i, 1)**

**if temp2 == 1**

**pair\_points\_matrix(2 \* temp - 1, :) = data(j, 1 : 5);**

**elseif temp2 == 2**

**pair\_points\_matrix(2 \* temp, :) = data(j, 1 : 5);**

**end**

**temp2 = temp2 + 1;**

**end**

**end**

**temp = temp + 1;**

**end**

**clear temp temp2;**

**for i = 1 : 10**

**temp\_image\_number1 = pair\_points\_matrix(2 \* i - 1, 2);**

**temp\_image\_number2 = pair\_points\_matrix(2 \* i, 2);**

**if pair\_points\_matrix(2 \* i - 1, 1) == 2**

**temp\_image\_number1 = temp\_image\_number1 + 7;**

**end**

**if pair\_points\_matrix(2 \* i, 1) == 2**

**temp\_image\_number2 = temp\_image\_number2 + 7;**

**end**

**omegal = result\_images(temp\_image\_number1, 6);**

**omegar = result\_images(temp\_image\_number2, 6);**

**phil = result\_images(temp\_image\_number1, 7);**

**phir = result\_images(temp\_image\_number2, 7);**

**kappal = result\_images(temp\_image\_number1, 8);**

**kappar = result\_images(temp\_image\_number2, 8);**

**Ml = [cos(kappal), -sin(kappal), 0;**

**sin(kappal), cos(kappal), 0;**

**0, 0, 1;] \* [cos(phil), 0, sin(phil); 0, 1, 0; -sin(phil), 0, cos(phil)] \* ...**

**[1, 0, 0; 0, cos(omegal), -sin(omegal); 0, sin(omegal), cos(omegal)];**

**Mr = [cos(kappar), -sin(kappar), 0;**

**sin(kappar), cos(kappar), 0;**

**0, 0, 1;] \* [cos(phir), 0, sin(phir); 0, 1, 0; -sin(phir), 0, cos(phir)] \* ...**

**[1, 0, 0; 0, cos(omegar), -sin(omegar); 0, sin(omegar), cos(omegar)];**

**L = Ml' \* [pair\_points\_matrix(2 \* i - 1, 4); pair\_points\_matrix(2 \* i - 1, 5); -C];**

**R = Mr' \* [pair\_points\_matrix(2 \* i, 4); pair\_points\_matrix(2 \* i, 5); -C];**

**K = ((result\_images(temp\_image\_number2, 3) - result\_images(temp\_image\_number1, 3)) \* L(2) - ...**

**(result\_images(temp\_image\_number2, 4) - result\_images(temp\_image\_number1, 4)) \* L(1)) / ...**

**(R(2)\*L(1) - L(2)\*R(1));**

**X(i) = K \* R(1) + result\_images(temp\_image\_number2, 3);**

**Y(i) = K \* R(2) + result\_images(temp\_image\_number2, 4);**

**Z(i) = K \* R(3) + result\_images(temp\_image\_number2, 5);**

**end**

**plot(X, Y, '\*r', 'MarkerSize', 10);%Computed Control Points.**

**plot(data\_control\_points(:, 2), data\_control\_points(:, 3), '\*g');%Origin Control Points.**

**plot(result\_coordinates(:,2), result\_coordinates(:,3) , 'ob')%Computed Tie points Coordinates.**

**legend('Tie Points','Control Points Computed', 'Control Points', 'Tie Points Computed');**

**clear temp\_image\_number1 temp\_image\_number2 kappal kappar Ml Mr L R K;**

**toc**

