Homework 4

CSE 527

Atul Jha 110350053

1.

a)

f = 8mm

α = f\*ux = 8\*800/4 = 1600

β = f\*uy = 8\*600/3 = 1600

u0 = 400, v0 = 300

Intrinsic Matrix =

b)

Quaternion =

= 0.8660 + 1.5i + 2j + 0.5k

4x4 rotation matrix was calculated using *makehgtform* with option as ‘*axisrotate’*

0.6731 0.4006 0.6217 0

0.0609 0.8077 -0.5864 0

-0.7371 0.4326 0.5192 10

0 0 0 1

c)

Cube Coordinates:

[1 1 1 1; 1 1 -1 1; 1 -1 1 1; 1 -1 -1 1; -1 1 1 1; -1 1 -1 1; -1 -1 1 1; -1 -1 -1 1]

Pixel Coordinates = Intrinsic Matrix\*Identity(3x4)\*Rotation Matrix\*Cube Coordinates’

Pixel Coordinates in homogenous form:

665.5544 478.8140 553.0149 332.7728 447.8003 265.6745 333.1815 122.7884

344.1983 553.7085 71.8462 269.1368 321.9445 500.2867 84.9062 253.8615

1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000

Cube plot location: 1/cube.jpg

d)

Inf PointX = [2^100 1 1 1]

PixelCoordinate in homogenous form:

1.0e+03 \*

-1.0611

0.1677

0.0010

Inf PointY = [1 2^100 1 1]

PixelCoordinate in homogenous form:

1.0e+03 \*

1.8817

3.2873

0.0010

Inf PointZ = [1 1 2^100 1]

PixelCoordinate in homogenous form:

1.0e+03 \*

2.3157

-1.5071

0.0010

Inf PointXYZ = [2^100 2^100 2^100 1]

PixelCoordinate in homogenous form:

1.0e+04 \*

1.3030

0.2402

0.0001

2.

a)

a) Perspective Camera Model:

Intrinsic Matrix =

Extrinsic Matrix =

b) Projective Camera Model: A 3X4 Matrix as a result of Intrinsic X Extrinsic

In the given problem, Light is travelling in 1 dimension. So we can set Y and Z to 0. (Assuming light is travelling in X direction). Now the Projective matrix is 3x2.

b) There are 5 degrees of freedom.

c)

C = Calibration parameters

[100 140 200; 250 340 450; 1 1 1] = C\*[50 100 200; 1 1 1]

C = 0.6571 70.0000

1.3000 195.0000

0.0000 1.0000

d)

(130, 310)

pinv(C)\*[130; 310; 1] = [98.2551; 0.9347]

height = 105.1194 mm

(170, 380)

pinv(C)\*[170; 380; 1] = [176.2970; 0.7734]

height = 227.9506 mm

(190, 300)

pinv(C)\*[190; 300; 1] = [431.6077; 1.3387]

height = 322.4081 mm

3.

a)

Images used ‘humanity01.JPG’ and ‘humanity02.JPG’

Points in image 1 chosen:

points1 = [439 837 1;

763 979 1;

369 1173 1;

583 731 1;

123 1153 1;

567 833 1;

442 816 1];

points2 = [419 215 1;

743 361 1;

357 545 1;

570 100 1 ;

127 531 1;

551 209 1;

423 192 1];

b)

a)

Linear equation is of the form

where A is a 3x3 matrix of the form

Now A\*points1 = points2

i.e a\*439 + b\*837 + c\*1 = 419

d\*439 + e\*837 + f\*1 = 215

a\*763 + b\*979 + c\*1 = 743

d\*763 + e\*979 + f\*1 = 361 and so on…

b)

location: 3/ComputeWarpMapping.m

c)

location: 3/WarpImage.m

c)

location: 3/mosaic.m

result location: 3/mosaic.jpg