Computer Graphics CS 4361
Homework 2
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Question 1: The answer was written into the attached files CvDefPoly.java and DefPoly.java. Specifically, the relevant code is lines 81 to 114 of CvDefPoly.java.
javac CvDefPoly.java DefPoly.java
java DefPoly
#repeat java DefPoly each time you wish to try a different instance of the problem.

Question 2: Describe scaling in 3D space with reference to a point C and three scale factors sx, sy and sz. Find the 4 x 4 matrix (similar to matrix M of exercise 3.1) for this transformation.

Answer: array([[sx, 0, 0, 0], [0, sy, 0, 0], [0, 0, sz, 0], [-C.x*sx+C.x, -C.y*sy+C.y, -C.z*sz+C.z, 1]])

step 1 to get this answer: translate everything by -C.x, -C.y, -C.z by multiplying by matrix

T_inv=numpy.array([[1, 0, 0, 0], [0, 1, 0, 0], [0, 0, 1, 0], [-C.x, -C.y, -C.z, 1]])

Step 2 to get the answer: scale everything by sx, sy, sz by multiplying by matrix

S=numpy.array([[sx, 0, 0, 0], [0, sy, 0, 0], [0, 0, sz, 0], [0, 0, 0, 1]])

Step 3 to get the answer: translate everything back by C.x, C.y, C.z by multiplying by matrix

T=numpy.array([[1, 0, 0, 0], [0, 1, 0, 0], [0, 0, 1, 0], [C.x, C.y, C.z, 1]])

Step 4 to get the general form:

numpy.matmul(T_inv, numpy.matmul(S, T))

Question 3: Compute the pixel co-ordinates for a circle centered at (0, 0) with radius r=8. Show all the steps involved (follow class example) and mark the computed pixels for the full circle (not just one octant) on the blank pixel grid.

Step 1:

Place the origin (colored R256, G0, B0 on the attached file).

Step 2:

Place point (0, 8) and the symmetry points (-8, 0), (0, -8), (8, 0) (colored R164, G82, B182 on attached file).

Step 3:

Calculate p0=5/4-r=5/4-8=6+3/4

pk	xk	yk	xk+1	yk+1
6+3/4	0	8	1	7
-10	1	7	2	7
-5	2	7	3	7
2	3	7	4	6
0	4	6	5	5

Step 4:stop, since x==y, now draw out these dots

Step 5: draw out the symmetric dots: