Solution - Exercise [5]

Introduction to Computer Graphics - B-IT Master Course

[Vitaly Kurin] [Valentin Belonogov] [Asif Mayilli]

December 8, 2015

First Exercise

1)
To define the clipping space in n-dimensions we need to define a point in n-space and a n-dimensional vector.
Line through n-dimensional space can be described by a single n-dimensional point somewhere on the line and an n-dimensional vector in the direction the line is travelling.
2)
Pseudo-code:

```
List outputList = subjectPolygon;
  for (Edge clipEdge in clipPolygon) do
    List inputList = outputList;
    outputList.clear();
    Point S = inputList.last;
    for (Point E in inputList) do
      if (E inside clipEdge) then
        if (S not inside clipEdge) then
          outputList.add(ComputeIntersection(S,E,clipEdge));
        end if
          outputList.add(E);          else if (S inside clipEdge) then
        outputList.add(ComputeIntersection(S,E,clipEdge));
      end if
      S = E;
    done
  done
```

Second Exercise

1)
A - the area of a triangle
$x = (0.6, 0.4)^T$
$\lambda_1 = \frac{A(\triangle(x,v_2,v_3))}{A(\triangle(v_1,v_2,v_3))}$

$\lambda_2 = \frac{A(\triangle(x,v_1,v_3))}{A(\triangle(v_1,v_2,v_3))}$

$\lambda_3 = \frac{A(\triangle(x,v_1,v_2))}{A(\triangle(v_1,v_2,v_3))}$

$A(\triangle(v_1, v_2, v_3)) = \frac{1}{2}||(1,0) \times (0.5,1)|| = \frac{1}{2}$

$A(\triangle(x, v_2, v_3)) = \frac{1}{2}||(v_2 - x) \times (v_3 - x)|| = \frac{1}{2}(0.24 - 0.04) = 0.1$

$A(\triangle(x, v_1, v_3)) = \frac{1}{2}||(v_1 - x) \times (v_3 - x)|| = \frac{1}{2}||(-0.6, -0.4) \times (-0.1, 0.6)|| = \frac{1}{2}(|-0.36 - 0.04|) = 0.2$

$A(\triangle(x, v_1, v_2)) = \frac{1}{2}||(v_1 - x) \times (v_2 - x)|| = \frac{1}{2}||(-0.6, -0.4) \times (0.4, -0.4)|| = \frac{1}{2}(|0.24 + 0.16|) = 0.2$

So: $\lambda_1 = 0.2 \quad \lambda_2 = 0.4 \quad \lambda_3 = 0.4$

2)
The color value will be:
$c(x) = 0.2 * c(v_1) + 0.4 * c(v_2) + 0.4 * c(v_3) = (0.2, 0, 0) + (0, 0.4, 0) + (0, 0, 0.4) = (0.2, 0.4, 0.4)$