

Medical Augmented Reality

Exercise 1 Alpha Blending

Which color does a pixel get if the following four fragments are generated for a pixel? Assume that a mechanism is in place that sorts the fragments according to depth before blending, such as depth peeling. Use alpha-blending as discussed in the lecture to compute the pixel color.

- Fragment A:
RGBA = (0.4, 0.2, 0.4, 0.7), $z = 0.2$
- Fragment B:
RGBA = (1.0, 1.0, 0.5, 0.8), $z = 0.8$
- Fragment C:
RGBA = (0.6, 1.0, 1.0, 0.3), $z = 0.22$
- Fragment D:
RGBA = (0.2, 0.4, 0.4, 1.0), $z = 0.6$

Exercise 2 Materials and Shaders in Unity

Look at this very simple Unity shader. We will analyse it a bit in this exercise.

```
Shader "Custom/MysteriousShader"
{
    Properties
    {
        _InputValue ("InputValue", Range(0,1)) = 1.0
    }
    SubShader
    {
        Tags { "RenderType"="Opaque" }

        CGPROGRAM
        #pragma surface surf Standard fullforwardshadows

        struct Input {
            float2 uv_MainTex;
        };

        half _InputValue;

        void surf (Input IN, inout SurfaceOutputStandard o)
```

```
    {  
        o.Albedo = fixed3 (1.0, 0.0, 0.0);  
        o.Metallic = 0.0;  
        o.Smoothness = _InputValue;  
    }  
    ENDCG  
}  
Fallback " Diffuse "  
}
```

- (a) What is a material in Unity? How is it created and how can it be applied to an object?
- (b) What is a shader? What is the difference between a shader and a material in Unity?
- (c) What is a fragment shader? What is a vertex shader? What is a compute shader?
- (d) What is Culling, Depth Testing and Blending?
- (e) Read up on shaders in the Unity documentation. What is ShaderLab? What are SubShaders and fallback-shaders? What are passes?
- (f) Can you describe what the simple shader at the beginning of the exercise does?