Tech document

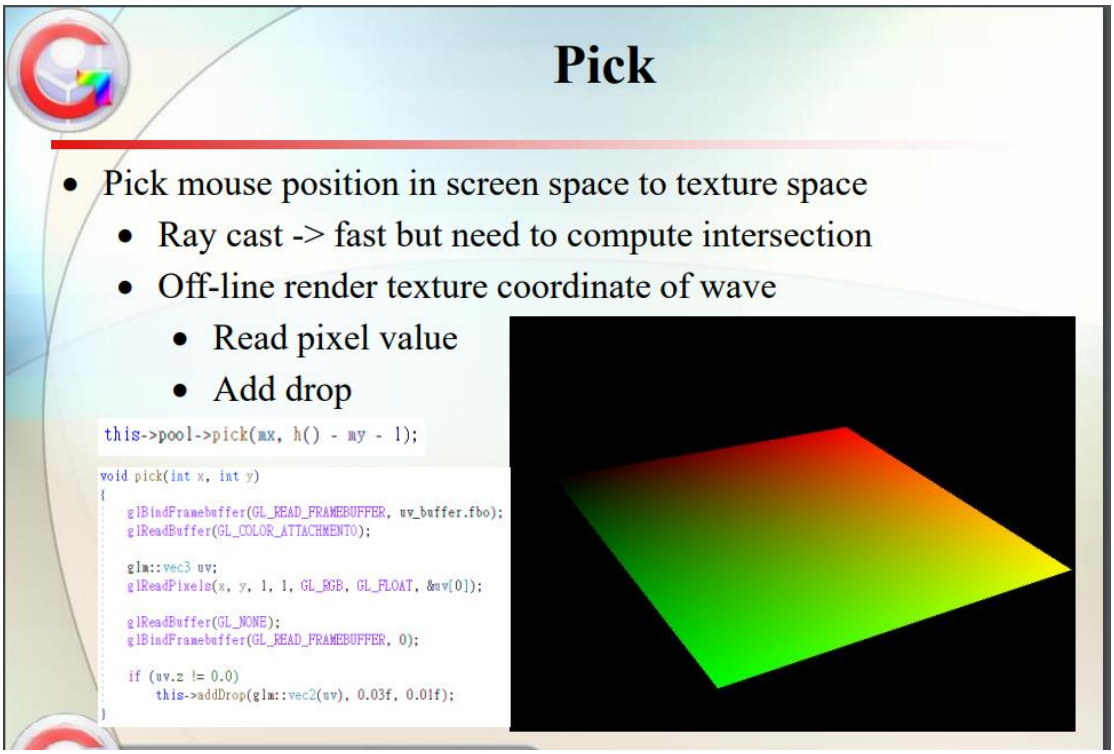
1. SinWave

   對一個平面的座標點做 sin 函數運算來做出起伏，並利用時間 t 來讓函數可以連續。

```
if(wave_mode == 1){
    float k = 2 * PI * frequency;
    float w =  k * (position.x)+t;
    vec3 p = position;
    p.y = amplitude * sin(w);
    v_out.normal = mat3(transpose(inverse(model_matrix)))*normal;
    gl_Position = proj_matrix * view_matrix * model_matrix * vec4(p, 1.0f);
    v_out.position = vec3(model_matrix * vec4(p, 1.0));
    v_out.texture_coordinate = texture_coordinate;
}
```

   參考資料: https://catlikecoding.com/unity/tutorials/flow/waves/

2. Interactive wave-function-based height maps
   1. 把 texture 座標轉換為顏色，再讀取顏色來轉換成點到的位置。



   2. 儲存點擊到的顏色(也就是座標)與時間 uv_t。
   3. Uniform 點擊到的座標與時間 uv_t 帶入函式來產生波型

```
sin((dist-t_c)*clamp(0.0125*t_c,0,1))/(exp(0.1*abs(dist-t_c)+(0.05*t_c)))*1.5;
```

   備註:波型產生函式參考自蘇泓嘉
   4. 傳入時間 t 與剛剛儲存的 uv_t 做差來 updata 即可產生連續的波型

3. Skymapping reflection

用 GLSL 的 function Reflect and Refract 來達成效果

```
vec3 norm=-normalize(cross(dFdy(f_in.position),dFdx(f_in.position)));

vec3 result=(0.0,0.0,0.0);
vec3 viewDir = normalize(viewPos - f_in.position);

float ratio = 1.00 / 1.52;
vec3 I = normalize(f_in.position - viewPos);



if(reflect_enable){
    result += reflect(I, normalize(norm));
    f_color = vec4(texture(skybox, result).rgb, 1.0);
}
else if(refract_enable){
    result += refract(I, normalize(norm), ratio);
    f_color = vec4(texture(skybox, result).rgb, 1.0);
}
else{
    f_color = vec4(texture(skybox, result).rgb, 1.0);
}
```

參考資料: https://learnopengl.com/Advanced-OpenGL/Cubemaps