

1 Texturing

Question 4

The textured square can be seen in Figure 1. The minification and magnification sampling filters are both *GL_LINEAR*.

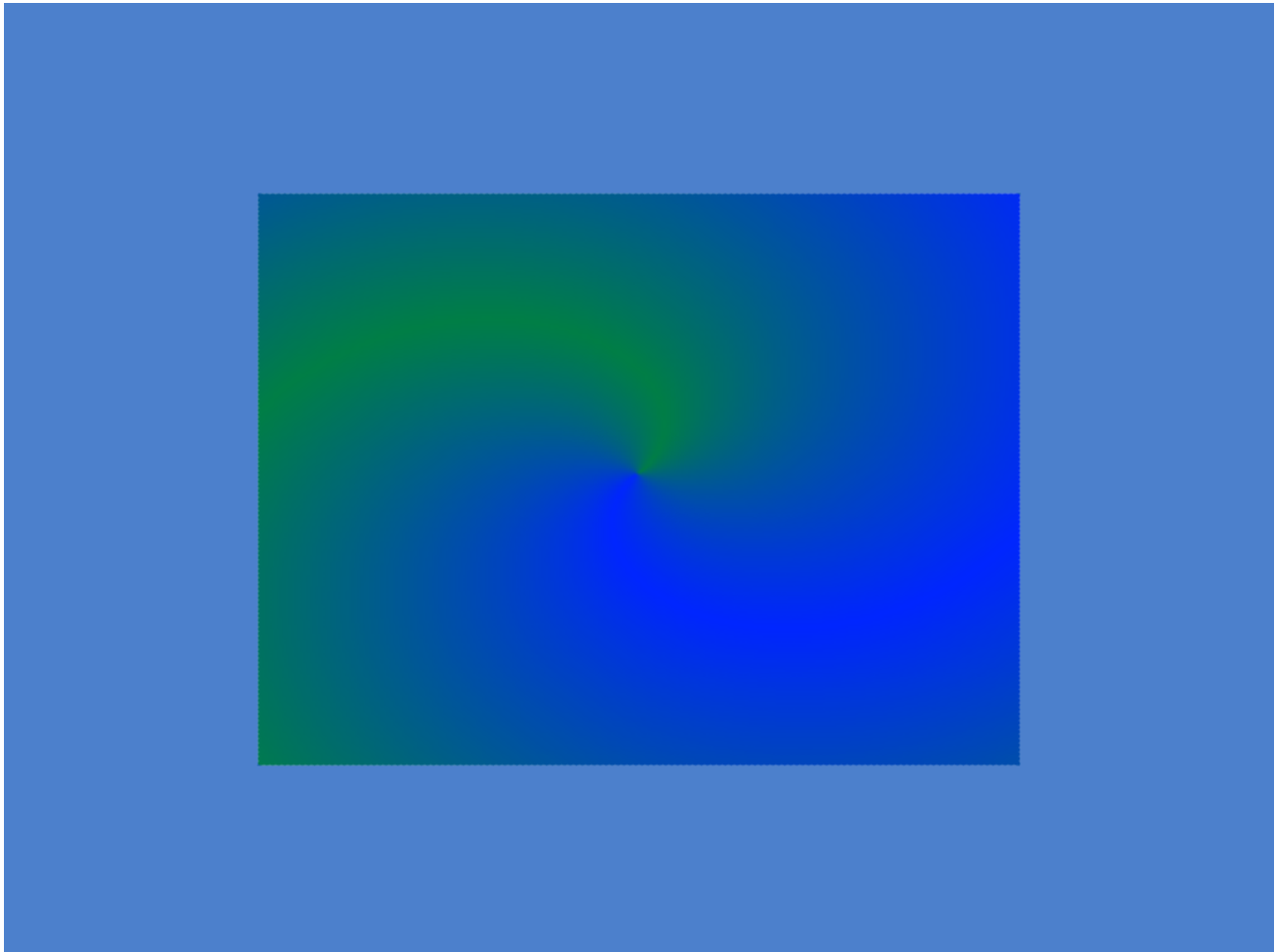


Figure 1: A square textured with the diamond.png texture.

Question 5

Set the minification and magnification filters to be *GL_NEAREST*. Mipmapping should still be used to remove aliasing. So *GL_NEAREST_MIPMAP_NEAREST* could be used to achieve this.

Question 6

Mipmaps are a sequence of images that each have a progressively lower resolution. This is done for two reasons: better performance and reduction of aliasing. The performance gains is because textures further away can use a lower resolution texture. It also reduced aliasing because the textured sampled from has a lower resolution, meaning there are fewer pixels to be sampled from.

Question 8

The texture gets blurry. Mipmaps causes this because the texture is now small, so a low resolution texture is being sampled from. Linear filtering gives the weighted average of the closest pixels, but when there are so few pixels, they end up looking a little blurry.

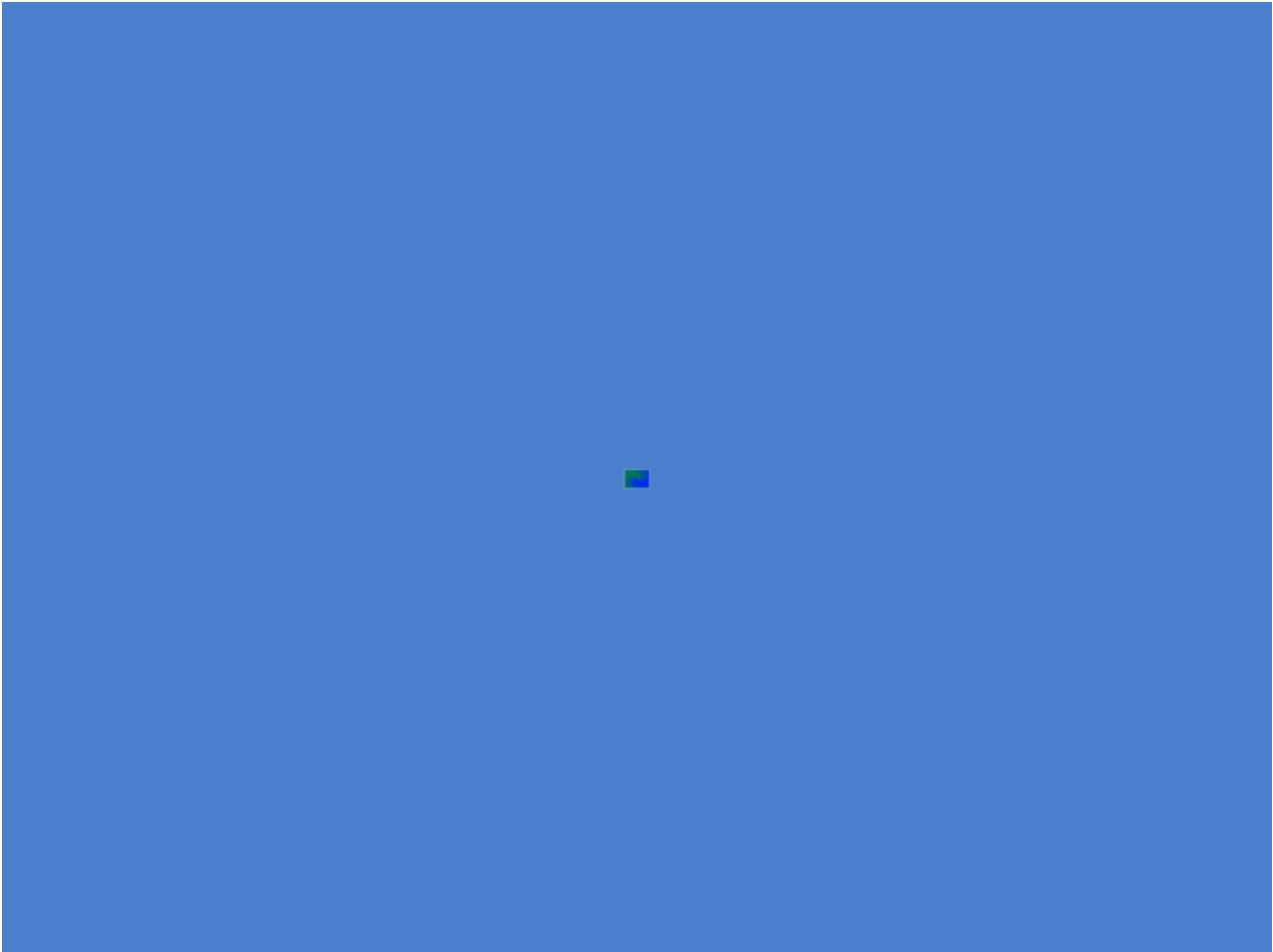


Figure 2: A small square textured with mipmaps

Question 9

Anisotropic filtering produces a better looking image than mipmaps and linear filtering because it reduces blur and provides a better view at obtuse angles. The trade-off, however, is that anisotropic filtering is computationally expensive.

2 Lighting

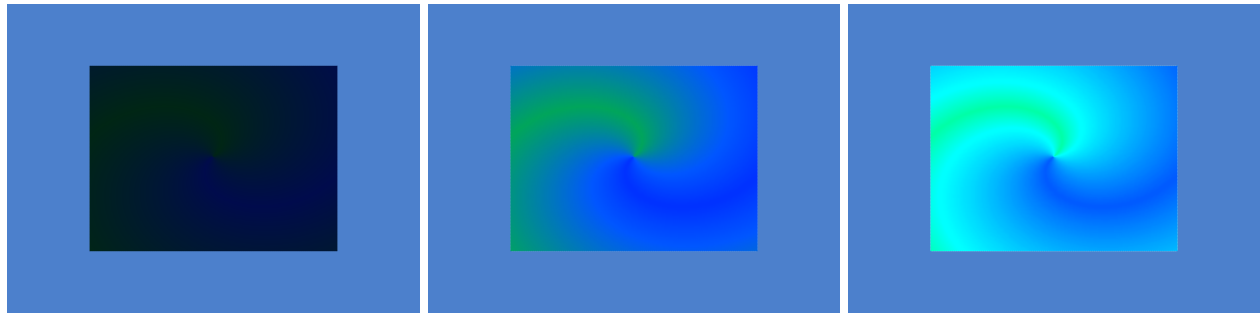
Question 10

The amount of light the diffuse component reflects depends on the normal of the surface. This means that the larger the angle between the light source and the surface normal the less light it will create.

Question 11

Global illumination is a technique that add more realistic lighting to 3D scenes by taking into account both direct and indirect illumination. This means that a surface is lighted up directly by a light source, but also by light rays that have bounced of other surfaces in the scene. This procedure is not (yet) suitable for real time rendering because of the amount of processing that is required.

Question 15



(a) Only ambient lighting.

(b) Ambient and diffuse.

(c) Ambient, diffuse and specular.

Figure 3: Three screenshots from different points in time.

Question 16

Gouraud shading will produce worse looking images when the vertex count for a model is low. Specular lighting will look very unnatural as it is calculated for vertices. So when there are few vertices the specular lighting will fade in and out as it moves from vertex to vertex, instead of providing a smooth transition like in Phong.