Real-Time Relief Mapping on Arbitrary Polygonal Surfaces

Master IMA IG3D - **Kewei XU**

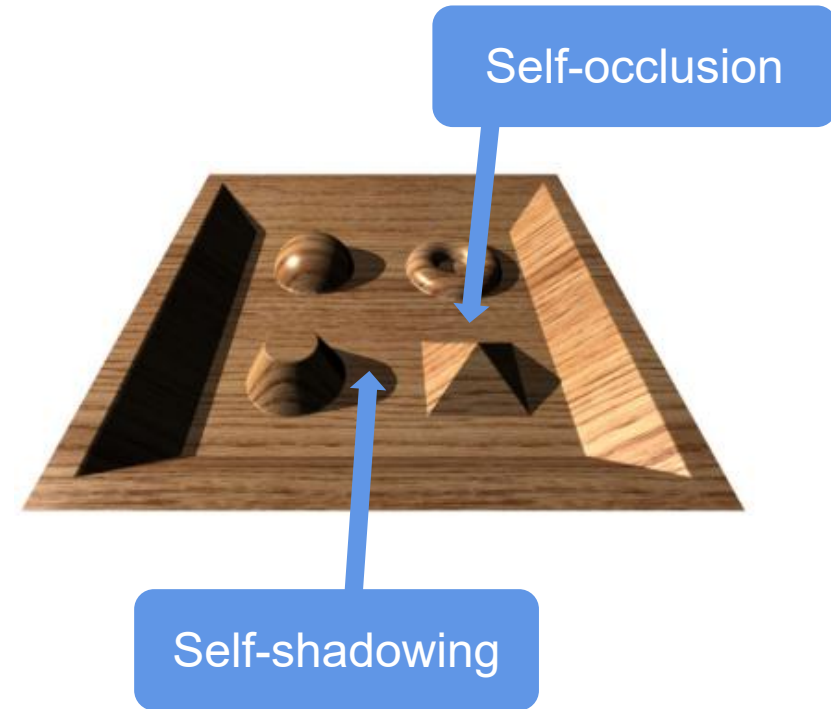# Contents

Introduction:

Realistic

Calculation cost
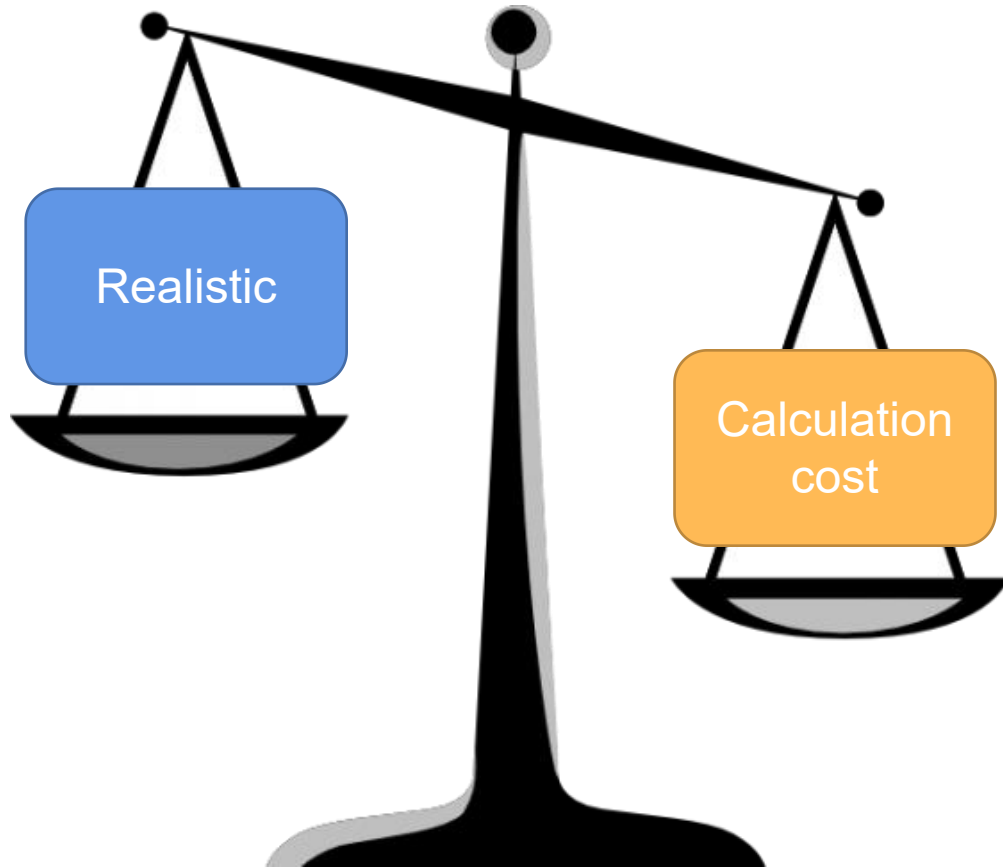
Relief mapping

- Self-occlusion

- Self-shadowing

Self-occlusion

Self-shadowing

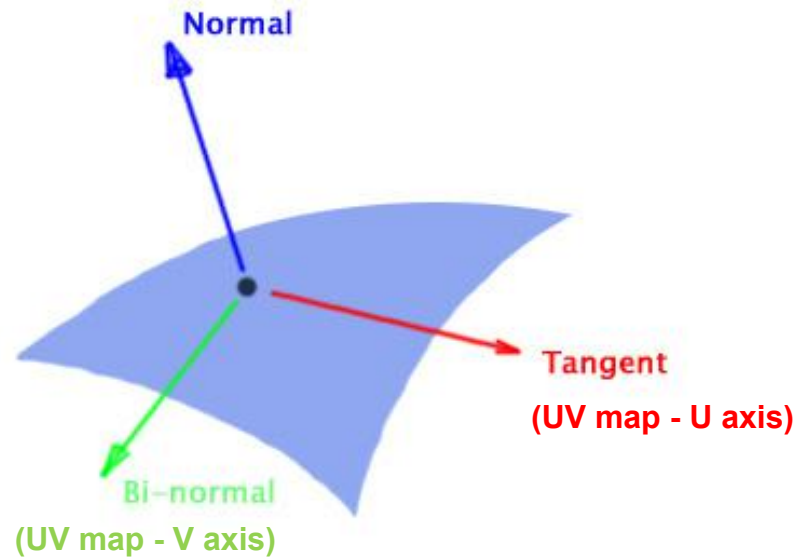# Related work

Normal mapping

- No Self-occlusion

- No Self-shadowing

Parallax mapping
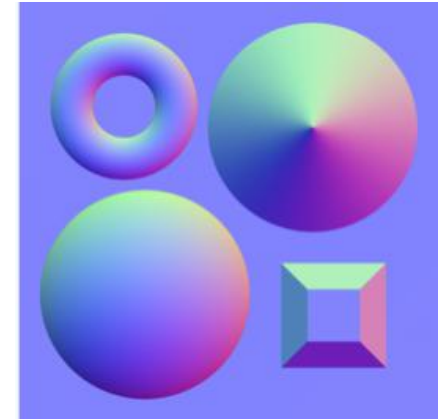
- Self-occlusion

- No Self-shadowing

Normal mapping

Normal

Tangent
(UV map - U axis)

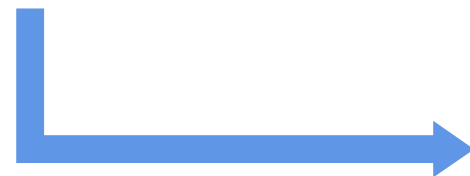Bi-normal
(UV map - V axis)
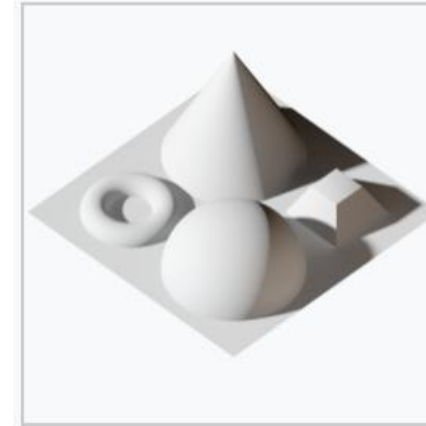
Tangent Space

The model used to
calculate the texture

Normal map calculated
from the model

(T, B, N)

(R, G, B)

Normal mapping

World Space

Tangent Space

Light souce position

Viewpoint position

Model vertex position

TBN matrix
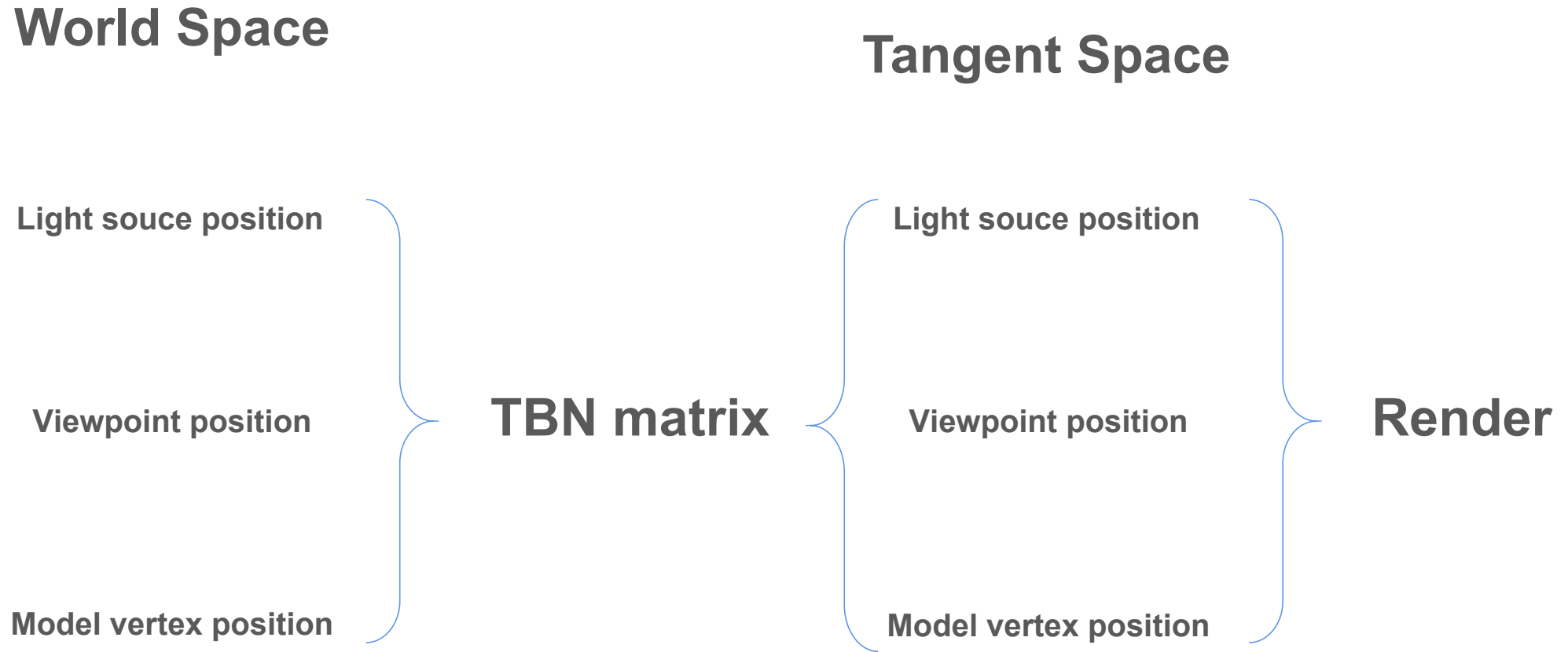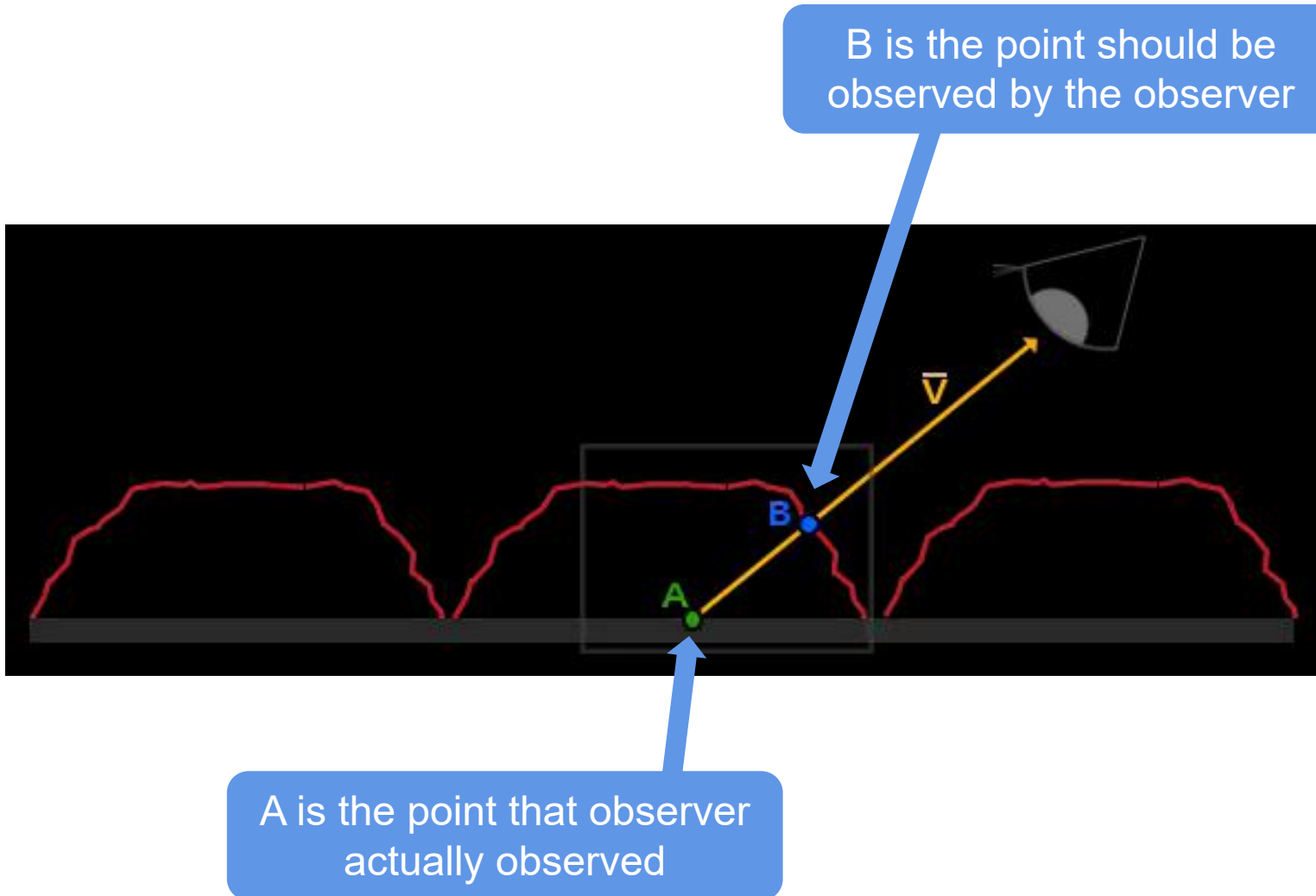
Light souce position

Viewpoint position
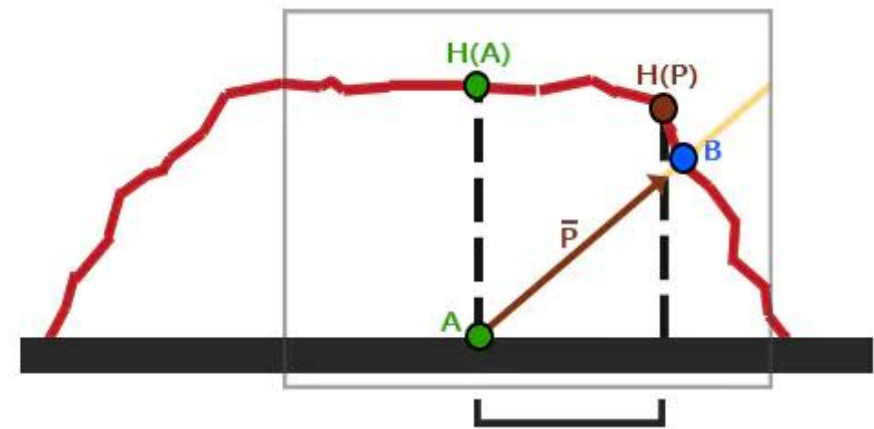
Model vertex position

Render

Parallax mapping

Parallax mapping

Only an approximate method

The position of H(P) may be closer to point B or farther from point B

Texture coordinate offset distance

Because the search for point B is only performed once, the deviation is large. Especially when the angle between the line of sight and the surface is small.
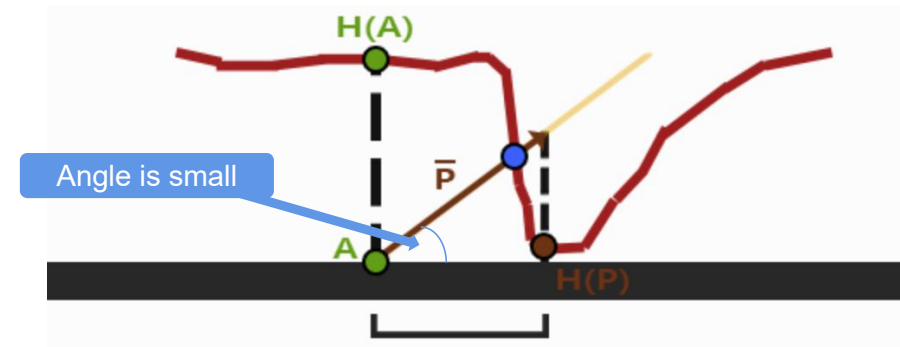

Texture coordinate offset distance

Relief Mapping on Polygonal Surfaces

- Find points A and B

- Use binary search to gradually approach the intersection point.

- If the midpoint is inside the depth (point 1), approach to the right.

- If the midpoint is outside the depth(point 2), approach to the left.

- Find intersection(point 3).

Although this is still an approximate method, as the number of binary search increases, the error can be controlled very small, but at the same time it will increase the computational cost.

So you need to weigh a suitable number of searches.
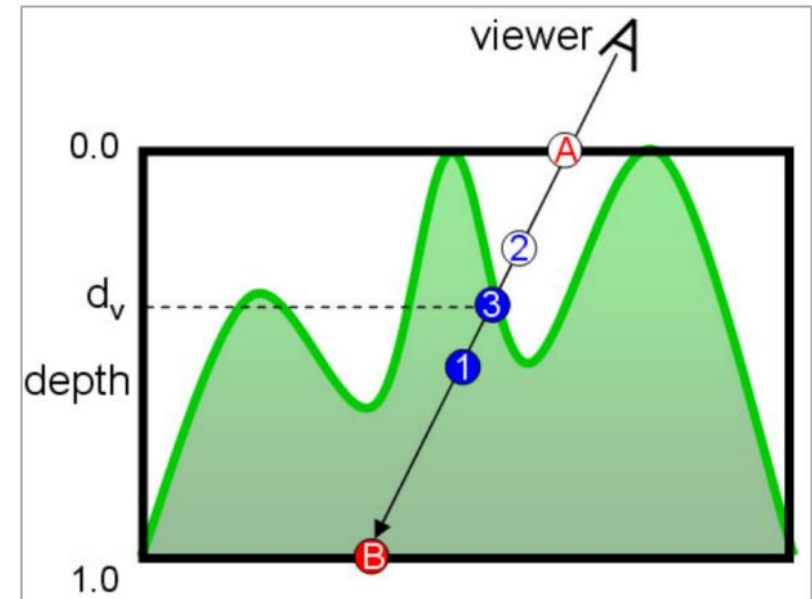
Relief Mapping on Polygonal Surfaces

**But the binary search method can also cause problems.**

- When there are multiple intersections between the view and the surface.

- The first midpoint is point 1, and it's outside the depth. So the search will continue between point B and point 1. The intersection between point A and point 1 will never reach.

- In this case, the binary search is changed to a linear search.

- Each time approaching by δ length until we find a point inside the depth.

- The accuracy depends on the length of δ.

- But reducing the length of δ will also increase the calculation cost.
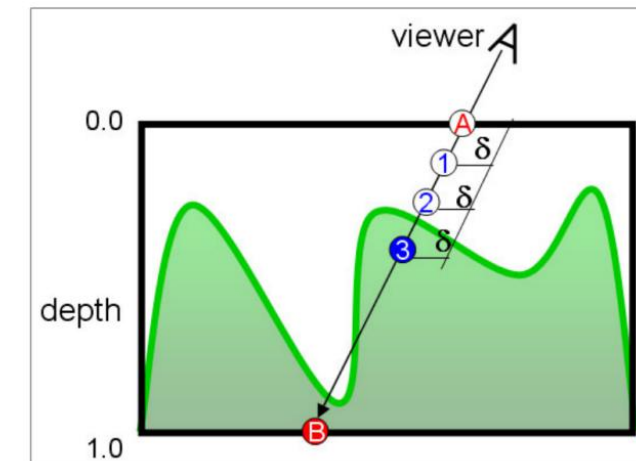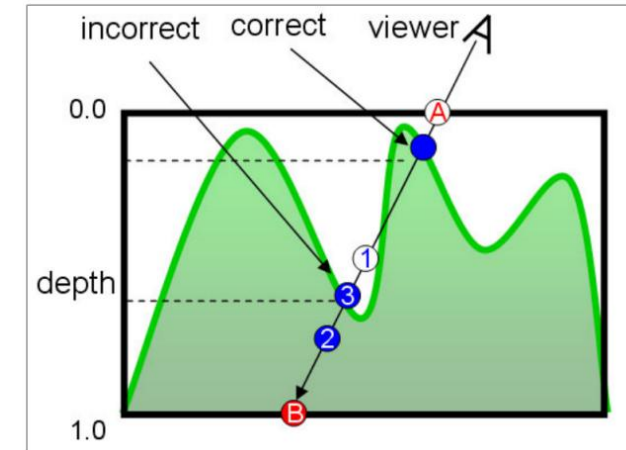
Relief Mapping on Polygonal Surfaces

Surface Self-Shadowing

- Use the binary search to determine the intersection (Point I).

- Calculate whether the light reaching the intersection I has a point in the depth.

- No need to calculate the specific location, just judge whether there has or not.

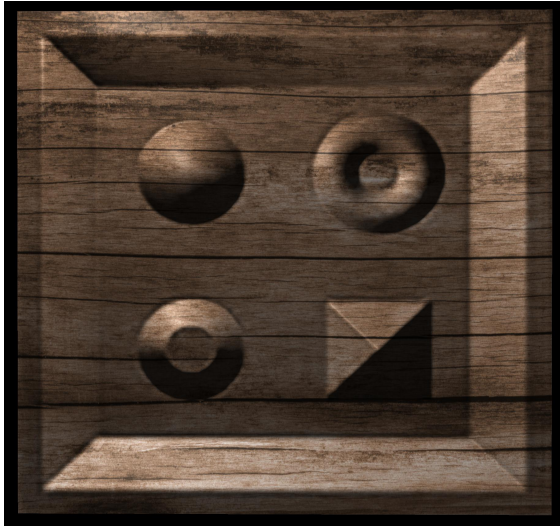- If there is, it means that the intersection I is located in the shadow.
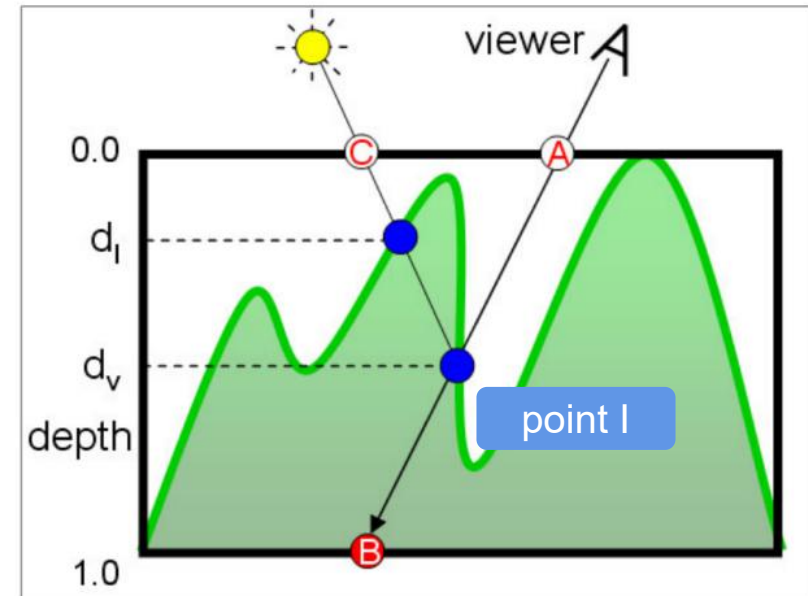
Relief Mapping on Polygonal Surfaces
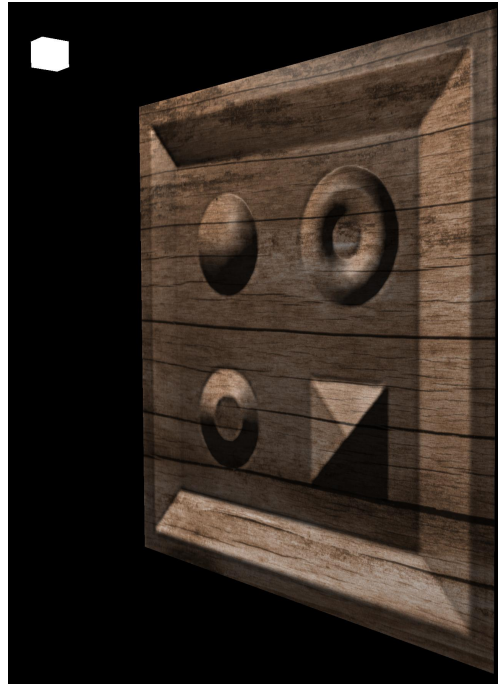
Dual-Depth Relief Textures

- Uses two layers of depth information.

- Add a depth to the back used to eliminate the existence of skins.

(a)   (b)   (c)   (d)
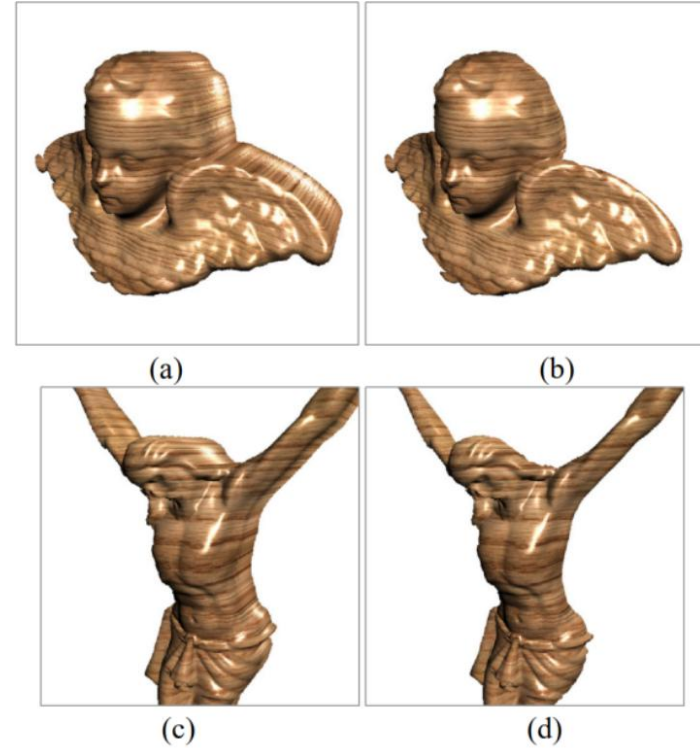
Result (Normal mapping)

Front

Side

Side (large angle)

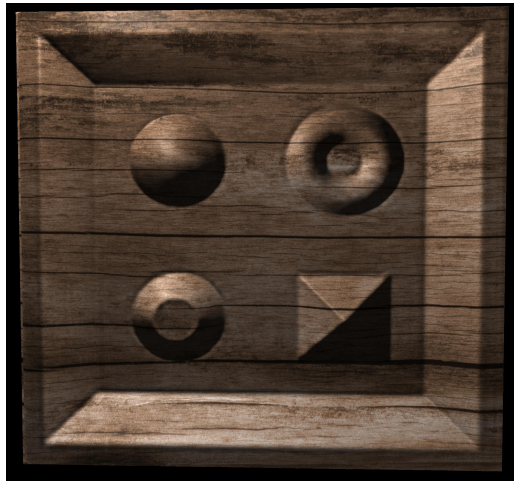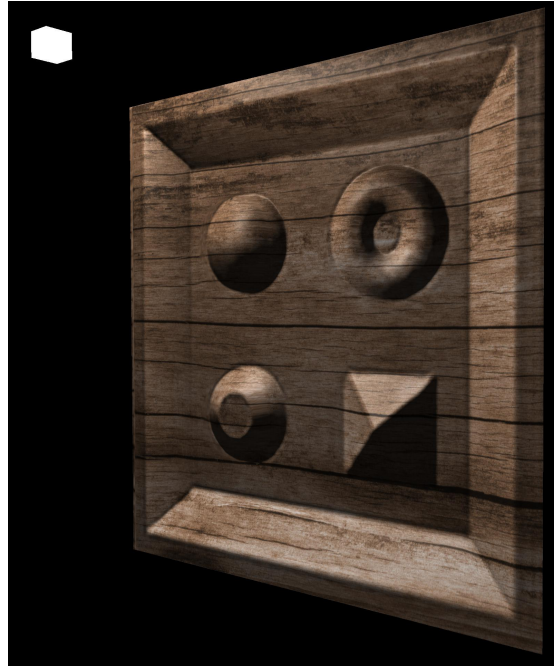# Result (Parallax mapping)

Front

Side

Side (large angle)

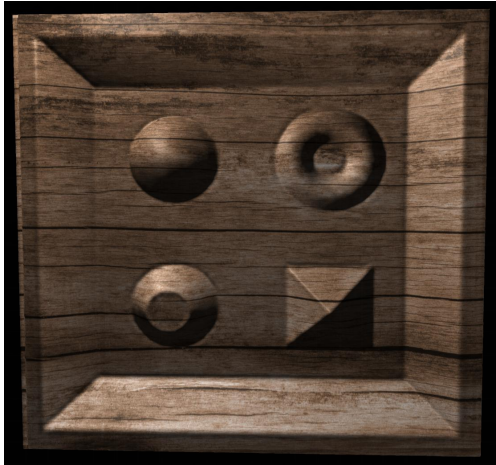# Result (Relief mapping)

Front

Side

Side (large angle)