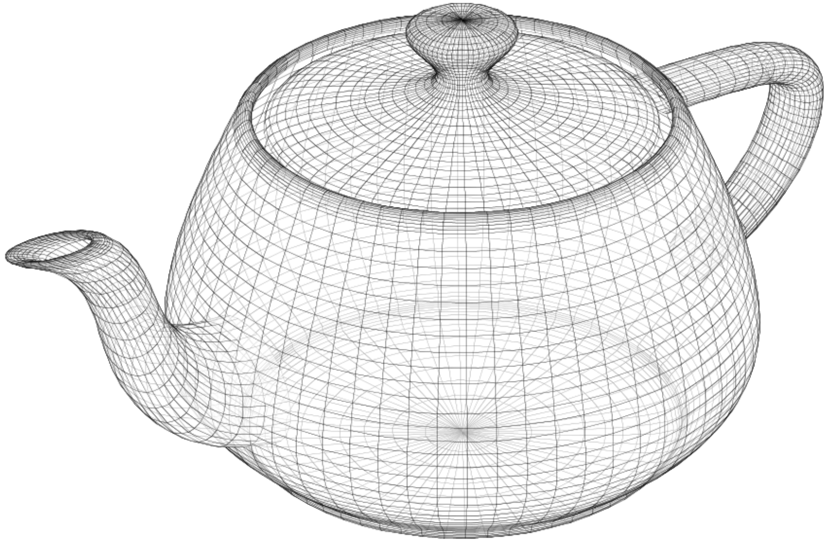
Back Face Culling

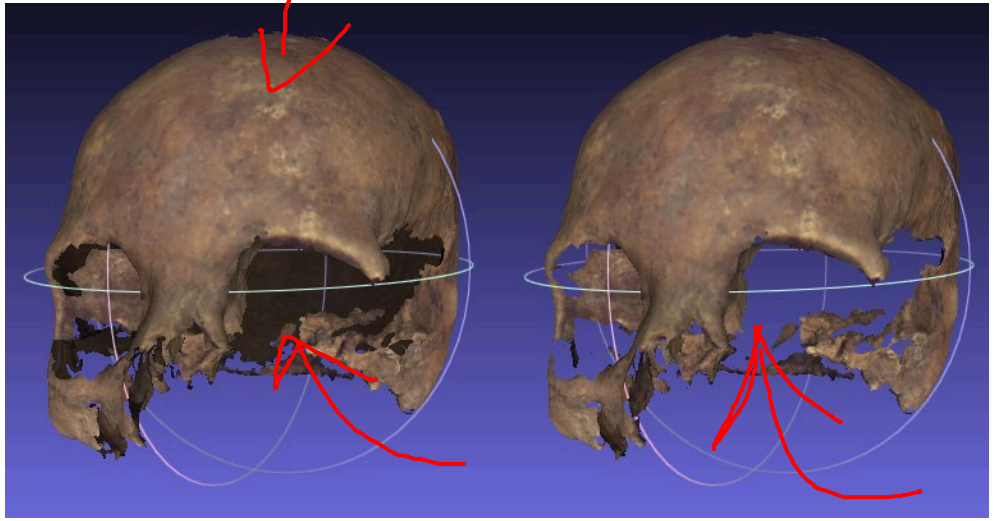


CS 418: Interactive Computer Graphics

Professor Eric Shaffer

Back Face Culling

- Backface culling is an optimization technique
- It drops backfacing polygons from the pipeline.
- Why would backface culling be useful?
- What artifact do you see here?



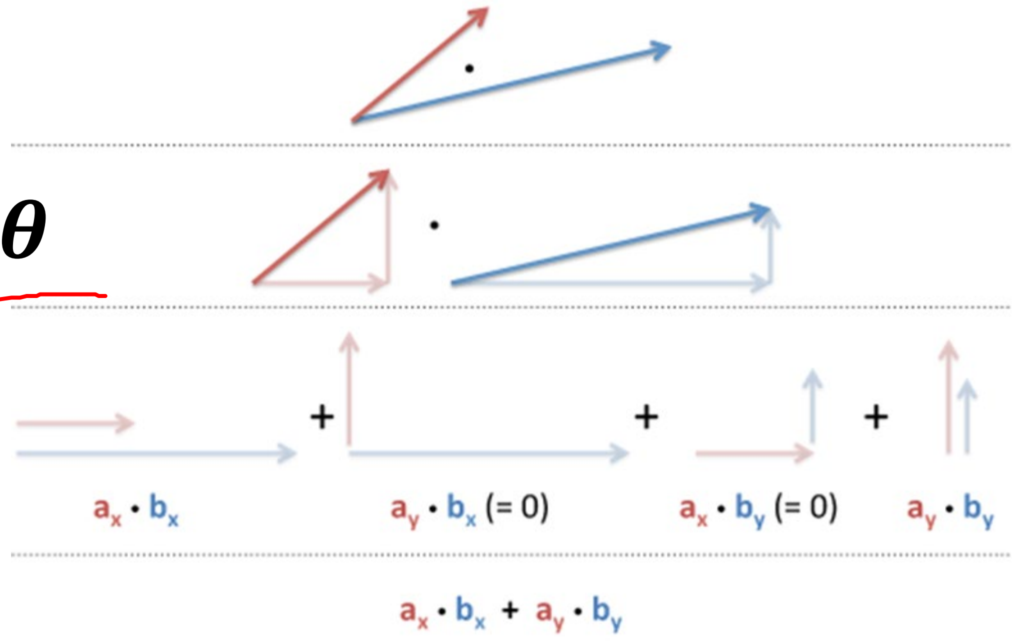
- Backface culling is not hidden surface removal

Vector Dot Product

The ***dot product*** or ***inner product*** of two vectors is

$$\underline{\boldsymbol{u} \cdot \boldsymbol{v}} = \boldsymbol{u}_x \boldsymbol{v}_x + \boldsymbol{u}_y \boldsymbol{v}_y + \cdots = \underline{\|\boldsymbol{u}\| \|\boldsymbol{v}\| \cos \boldsymbol{\theta}}$$

Dot Product: Piece by Piece

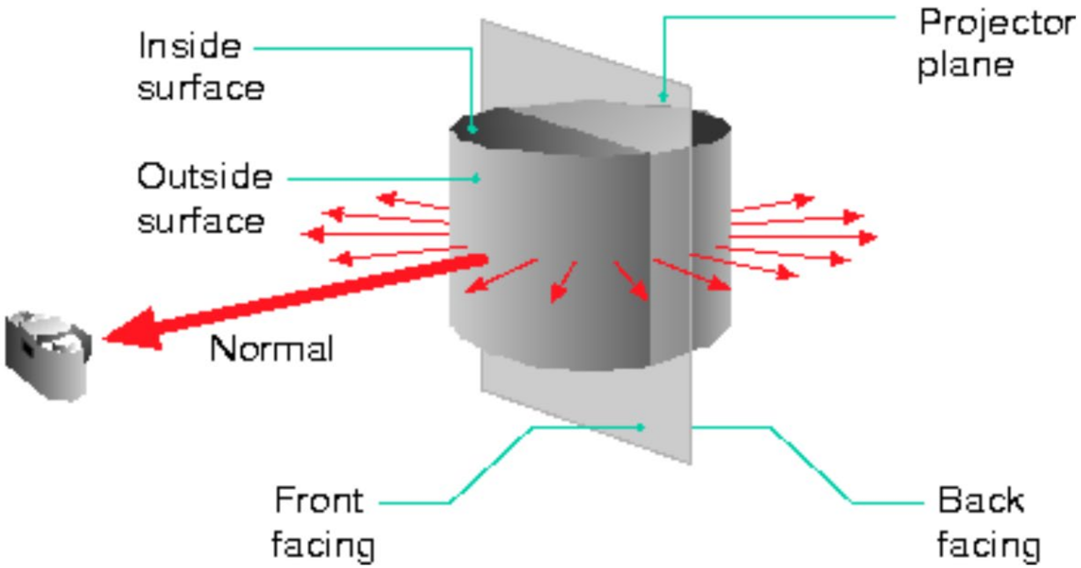


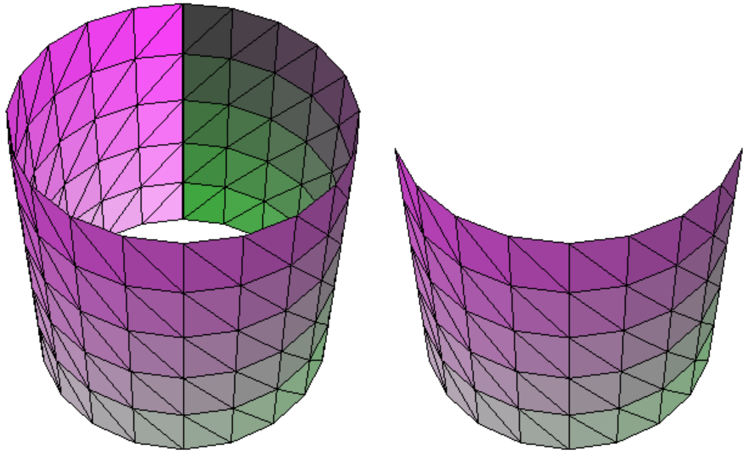
Can think of it as a measure of how aligned the vectors are

Vector Dot Product

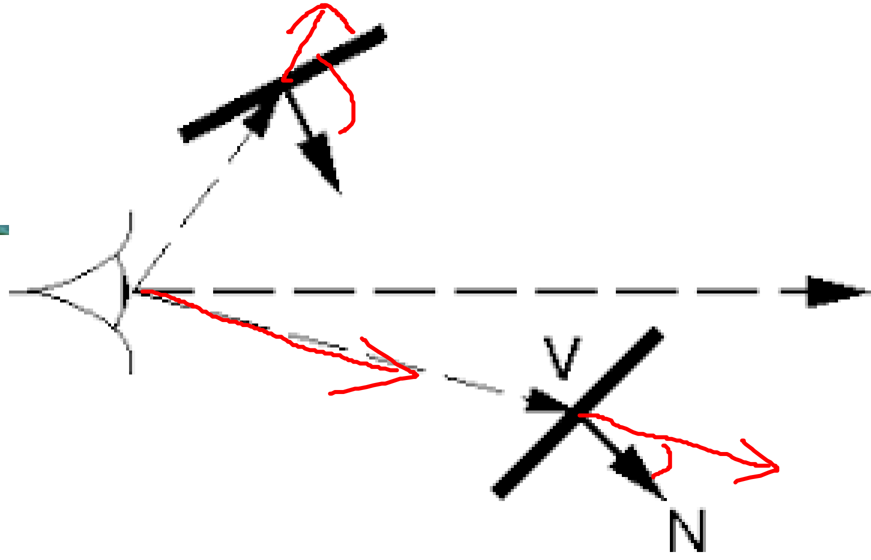
Is a polygon facing away from the viewer?

We can decide by using a dot product test





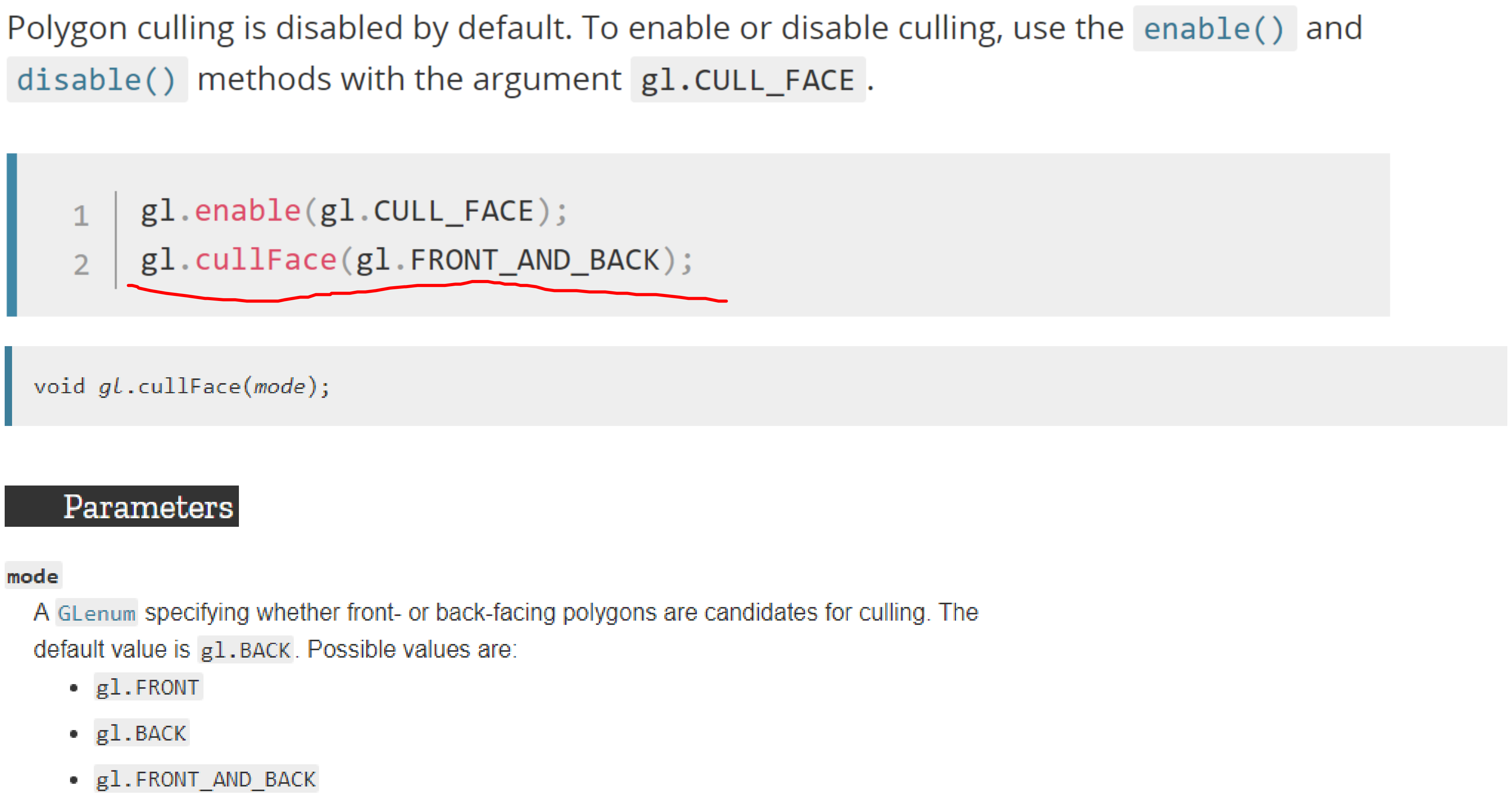
Back Face Culling



- Define the view vector V **from the eyepoint to the surface**
  - **For this test, we'll use eyepoint to surface…shading uses the reversed vector V**
- So, if 90 ≤ θ ≤ 270
  where θ > 0
  then dot product is negative and polygon faces viewer

- IF the dot product is positive ***then polygon does not face viewer***

WebGL Back Face Culling



Polygon culling is disabled by default. To enable or disable culling, use the `enable()` and `disable()` methods with the argument `gl.CULL_FACE`.

```
gl.enable(gl.CULL_FACE);
gl.cullFace(gl.FRONT_AND_BACK);
```

```
void gl.cullFace(mode);
```

Parameters

`mode`

A `GLenum` specifying whether front- or back-facing polygons are candidates for culling. The default value is `gl.BACK`. Possible values are:

- `gl.FRONT`
- `gl.BACK`
- `gl.FRONT_AND_BACK`