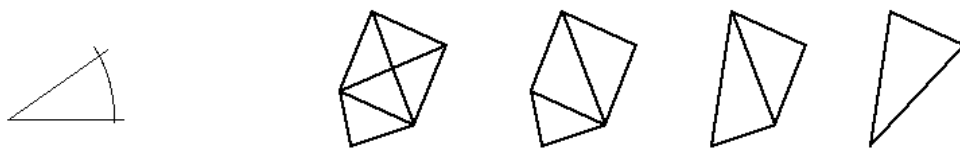




Level-of-detail LOD

**Multiresolution representations
Reducing the polygon count for distant
objects**



Level-of-detail LOD for models

1. Pre-generate in different detail

Risk for noticeable “popping” when switching model

2. Progressive mesh

Continuous deformation, no “popping”

Non-trivial to select the polygons to reduce

**At very low resolutions, we may switch to impostors
(billboards)**



Reduction methods

Collapse edges

Insert new vertex, remove neighbors, re-triangulate (similar to collapse edges)

Remove vertices

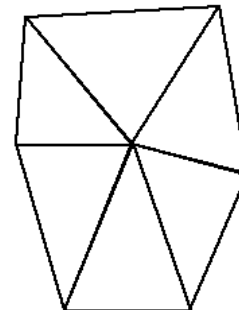
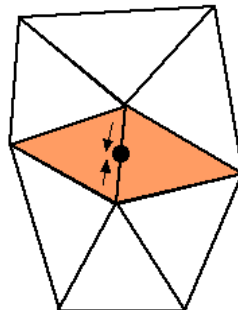
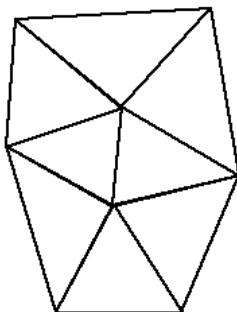
Remove vertices, re-triangulate (similar)

Find neighbor polygons in the same plane (or near), and merge them.

Note that only some can be progressive!



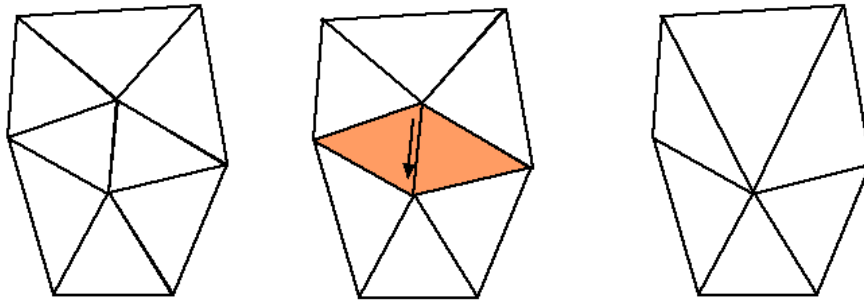
Edge collapsing



Simple - but vertex attributes (normals, texture coords) must be recalculated



Vertex removal



Simple - no recalculation of vertex attributes



Problem in LOD: volume reduction

The mesh is a sampling of a continuous surface

Careless removal or interpolation will cause errors





Level-of-detail LOD for terrains

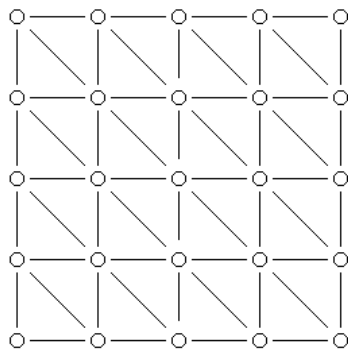
Geometrical mip-mapping

Produces a polygon terrain with approximately constant polygon size in screen coordinates

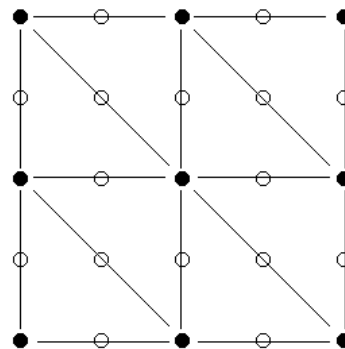
Reduces the polygon count effectively to what is actually needed.



Geometrical mip-mapping



Level 0 - full resolution

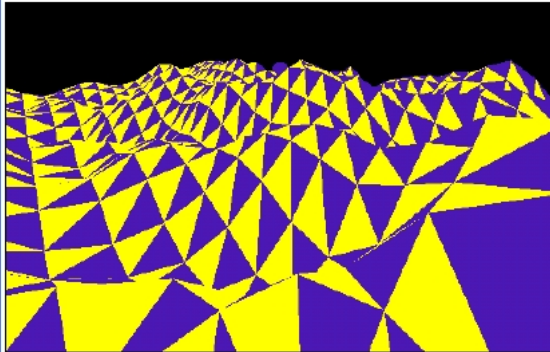


Level 1

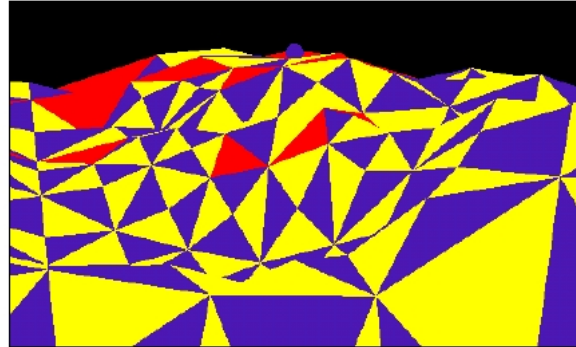


Geometrical mip-mapping

No geomipmapping - polygon density grows with distance

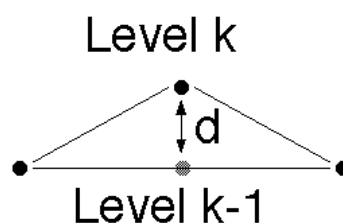


With geomipmapping - polygon density similar on all distances



Decide resolution level

- distance
- screen-space error measures



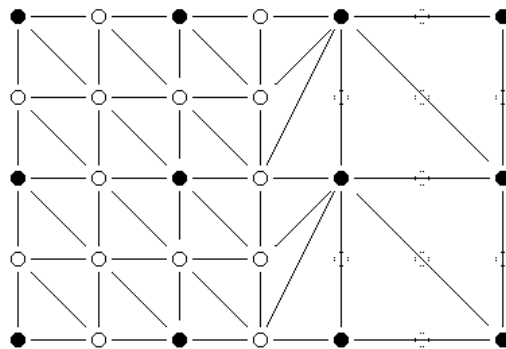


Problems to solve in geomipmapping

- Popping
- Gaps
- Sliding textures bug



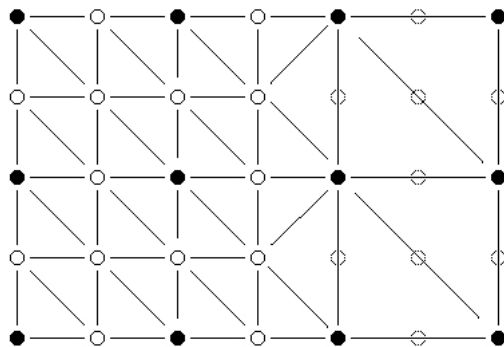
Patching edges between different levels





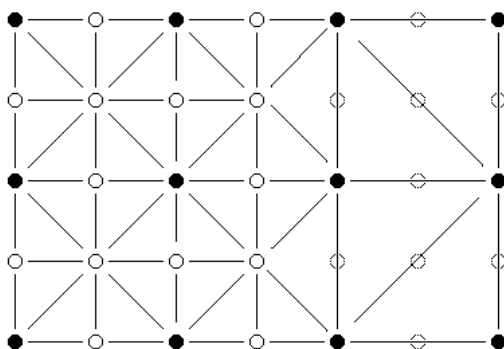
Patching edges between different levels

Second approach



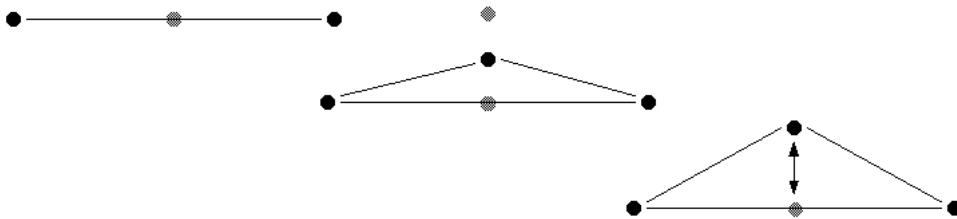
Patching edges between different levels

Ingemar's favourite





Popping is solved by “morphing” between levels.
Interpolate vertices that are close to removal with
the average between neighbors



Geomipmapping

- should produce polygons with roughly the same size on all distances
- will greatly reduce polygon count on very large terrains with large “far” distance