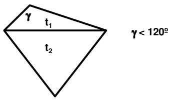
Properties of the Mesh Improvement Algorithm

- Works over Delaunay Meshes
- Performs Delaunay insertion of midpoints of terminal-edges
- Produces triangulations with min angle ≥ 30º
- If (t_1, t_2) are terminal triangles (sharing a terminal-edge) then

  larget angle (t_1) < 120º
  larget angle (t_2) < 120º



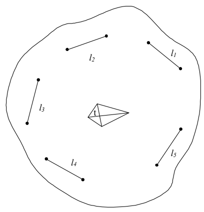
Aplicaciones y pruebas realizadas en Chile

Observación: algoritmos usados ampliamente fuera de Chile

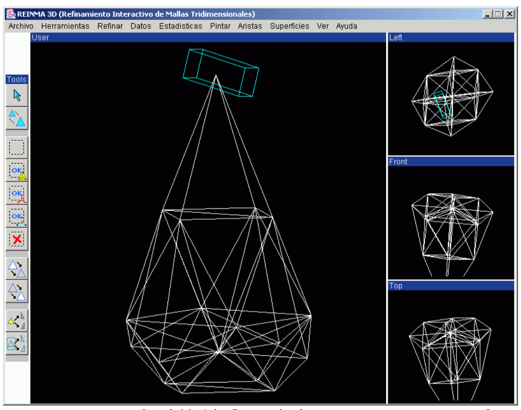
Algoritmo Lepp-Bisección en 3D
Refinamiento de triangulaciones 3D

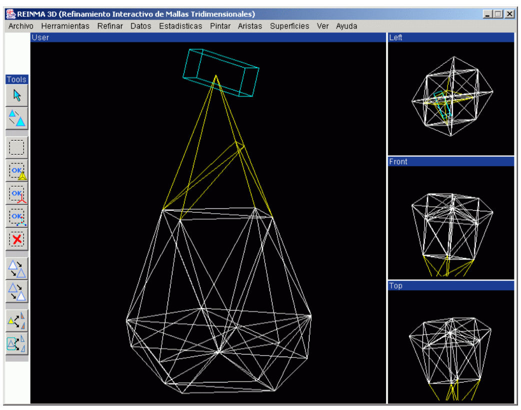
Lepp(t) in 3-dimensions

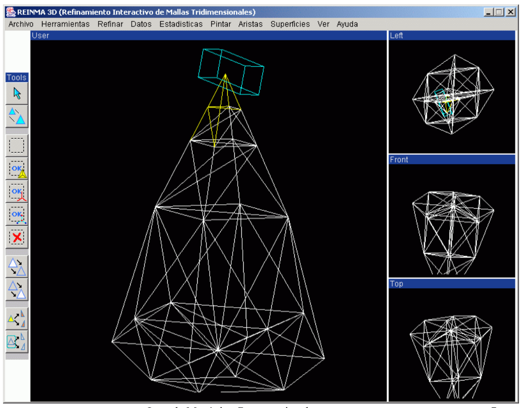
- **A submesh associated to an individual element t**
- **Allows the identification of a set of terminal-edges**



- **Each Terminal-edge is shared by a set of tetrahedra**



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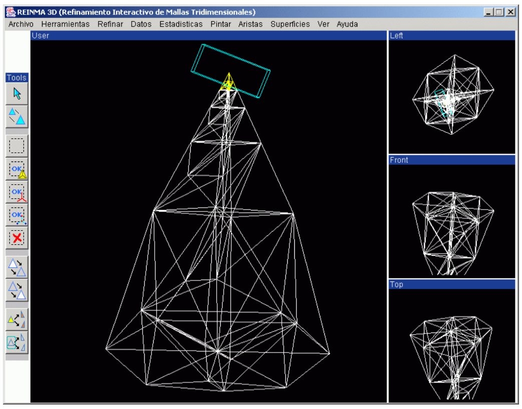
Tools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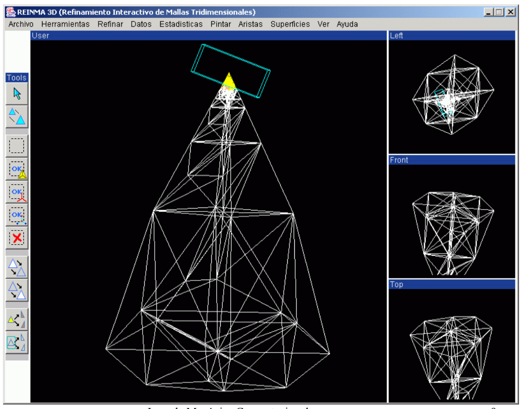
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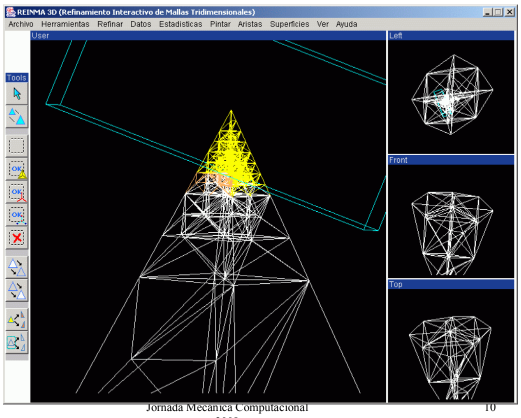
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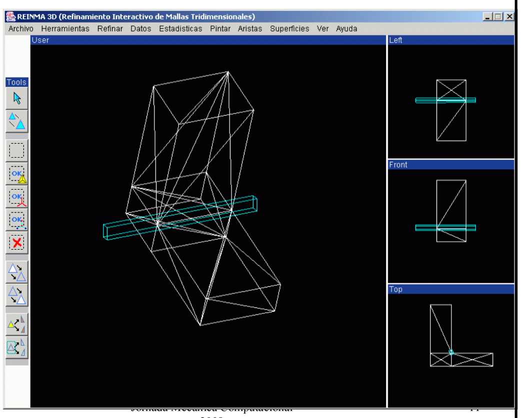
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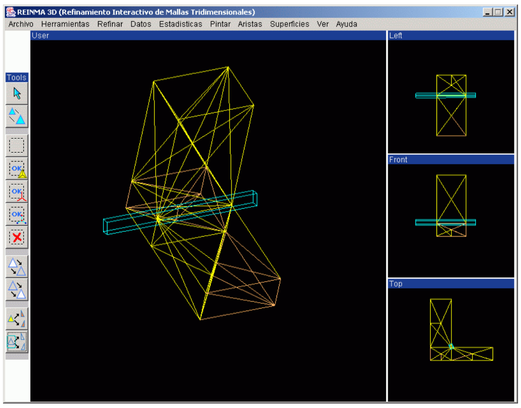
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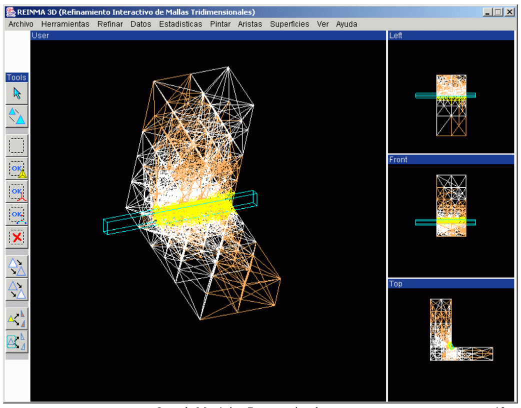
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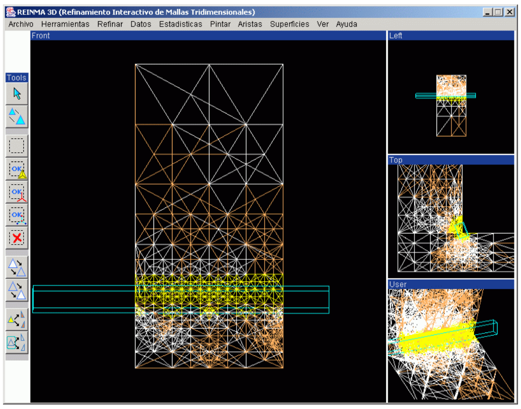
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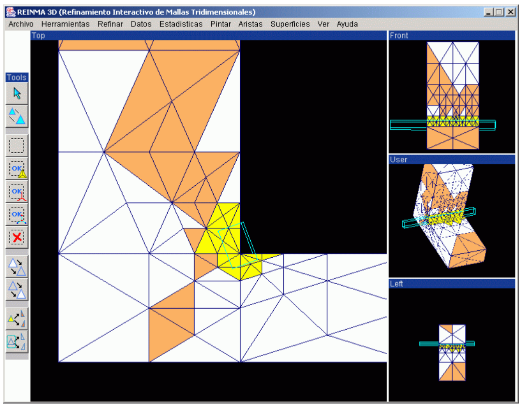
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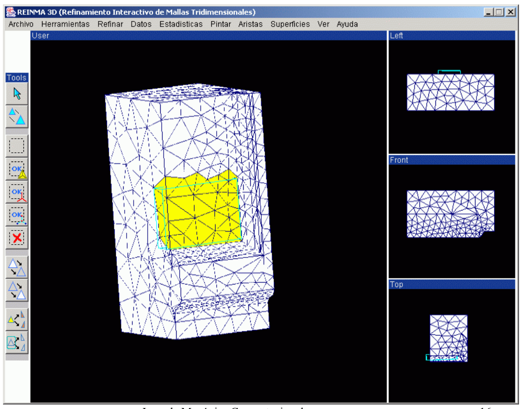
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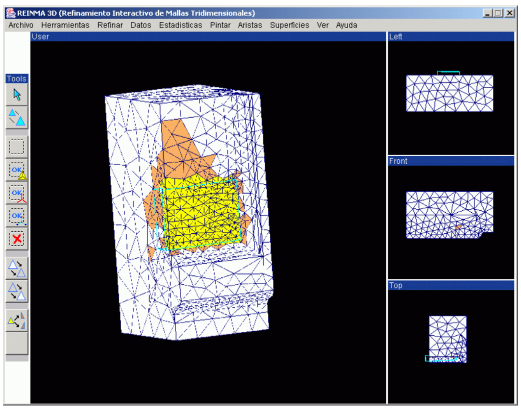
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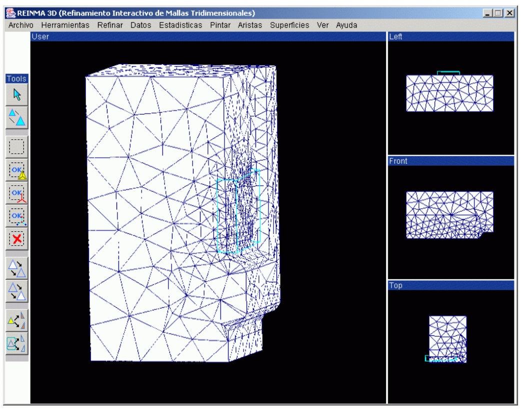
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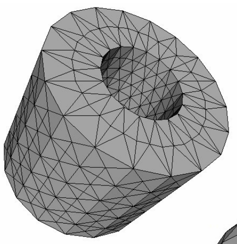
Algoritmos Lepp-Delaunay en 3D
Mejoramiento de triangulaciones 3D

(con Ana Cáceres, Carlos Lillo y Nancy Hitschfeld)

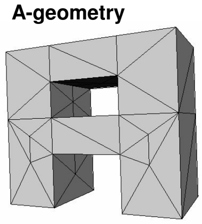
Quality measure

$$Q(t) = C \frac{\text{Volume}(t)}{(\text{longest-edge})^3}$$

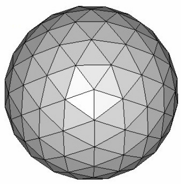
Tube



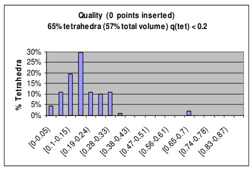
A-geometry

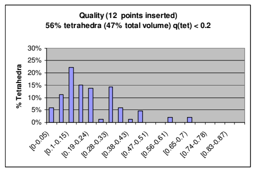


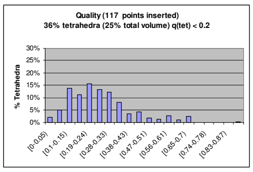
Sphere

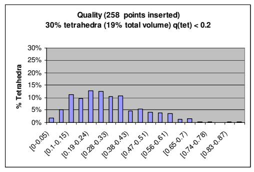


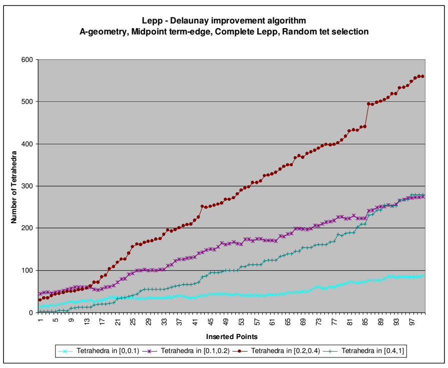
A-geometry, Midpoint term-edge, Complete Lepp, Random tet selection



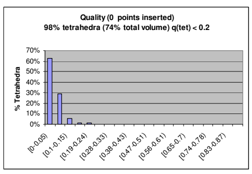


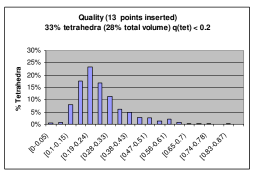


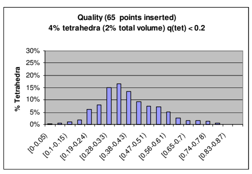


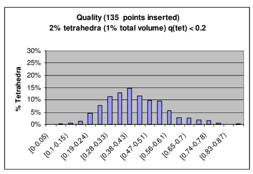


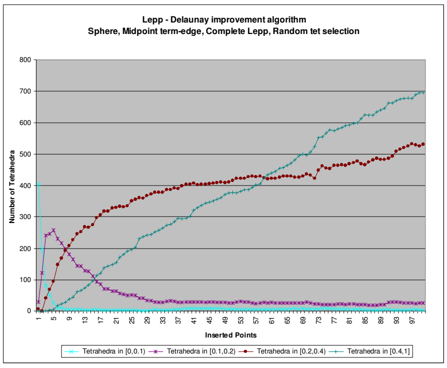
Sphere, Midpoint term-edge, Complete Lepp, Random tet selection











Algoritmo paralelo Lepp-bisección en 3D Refinamiento paralelo

Uncoupled parallel terminal edge refinement algorithm for uniform refinement

1. *Read Input {a mesh M and edge tolerance b(M)},*
2. *Partition the mesh M* in submeshes M_i, i = 1...N,
3. Distribute the submeshes M_i among the processors,
4. *Perform submesh PTE refinement over each M_i.*
5. Output
6. Each submesh $M_i(S_i, V_i)$ is defined by its interface surface S_i and corresponding set of tetrahedra V_i.

Rivara – Chrisochoides – Calderón – Fedorov 2006