



Projects

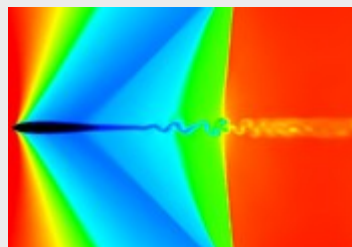
Properties



# Quadrilateral Mesh Generation Using Background Triangular Mesh

GOSTAF Pichon

EADS: ROBERT Jerome, BARBIER Denis



CEMRACS 2007



Projects

Properties

**Project Definition**

Existing Techniques

Current Work

Quad quality

Best neighbor

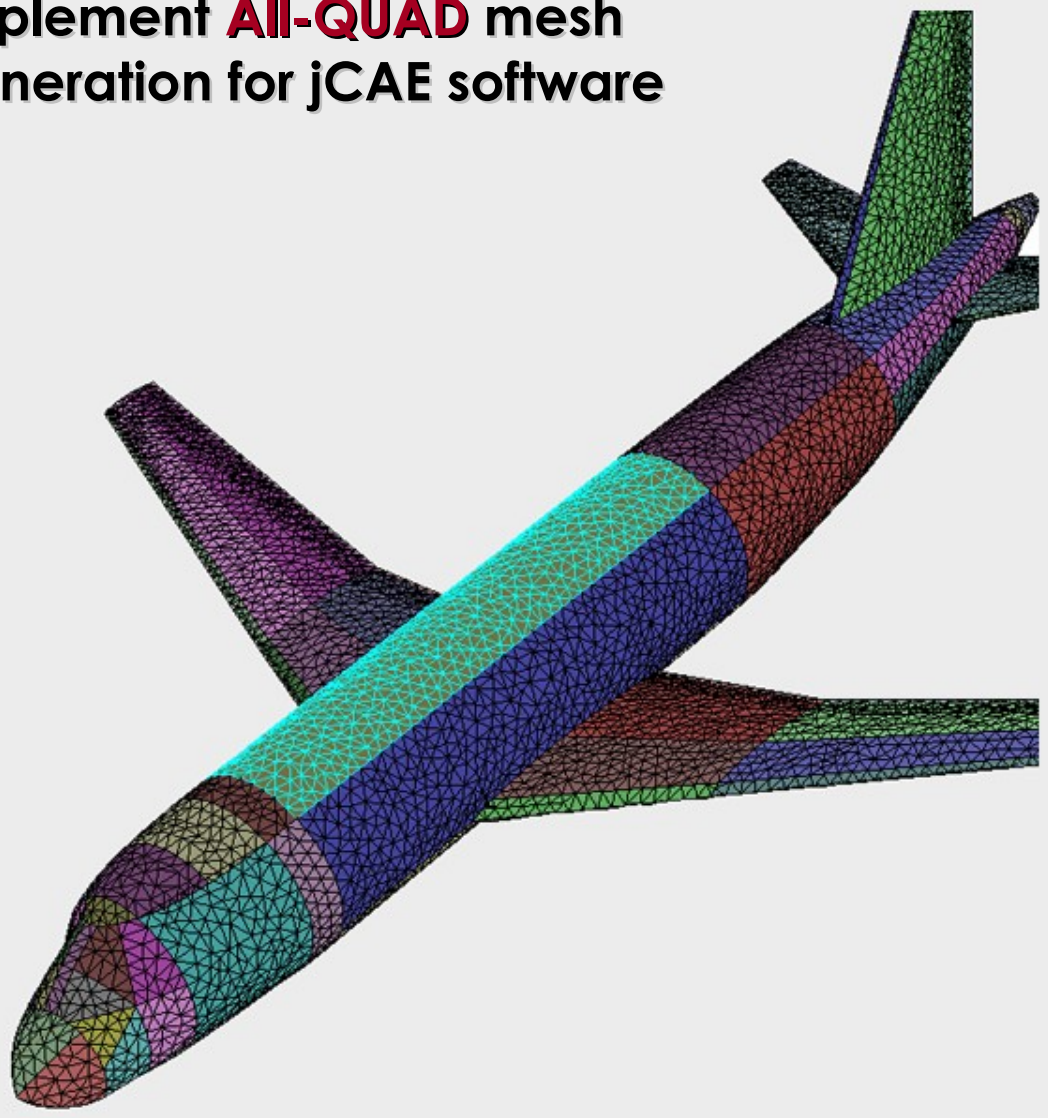
Chain generation

Split & Smooth

Prospects

Domain partitioning

# Implement **All-QUAD** mesh generation for jCAE software



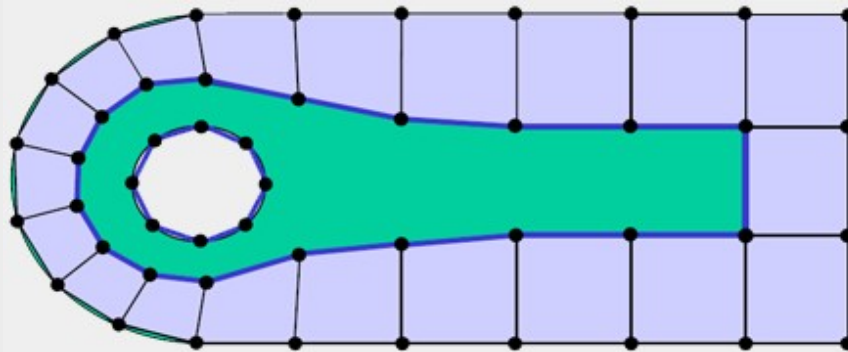
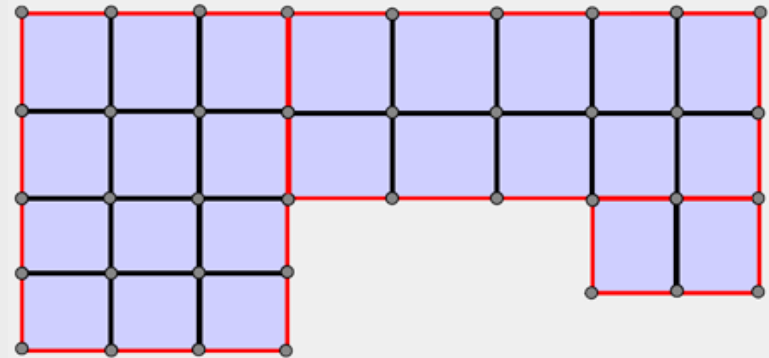


## Direct Methods

- decomposition of the domain into regions
- advancing front [Lo '85]

### -Paving

[Blacker & Stephenson '91]



Project Definition

**Existing Techniques**

Current Work

Quad quality

Best neighbor

Chain generation

Split & Smooth

Prospects

Domain partitioning



## Indirect Methods

- simple triangle splitting
- Q-MORPH [Owen et al.'98]

Project Definition

**Existing Techniques**

Current Work

Quad quality

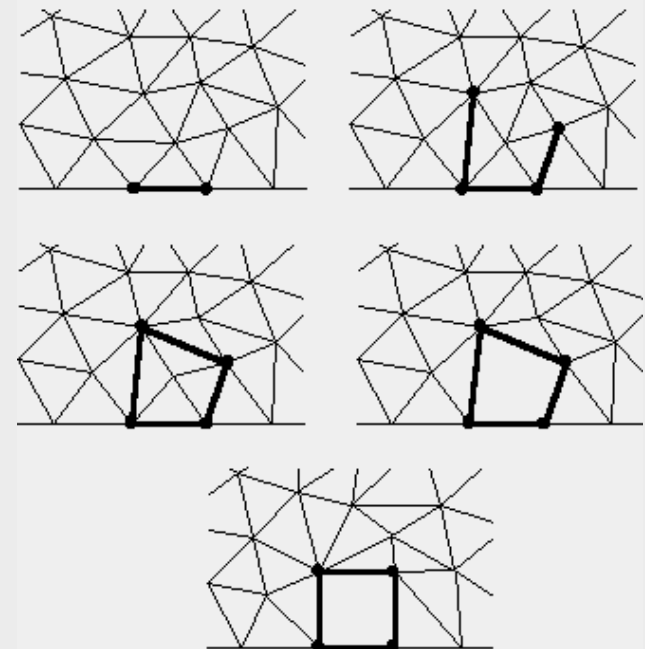
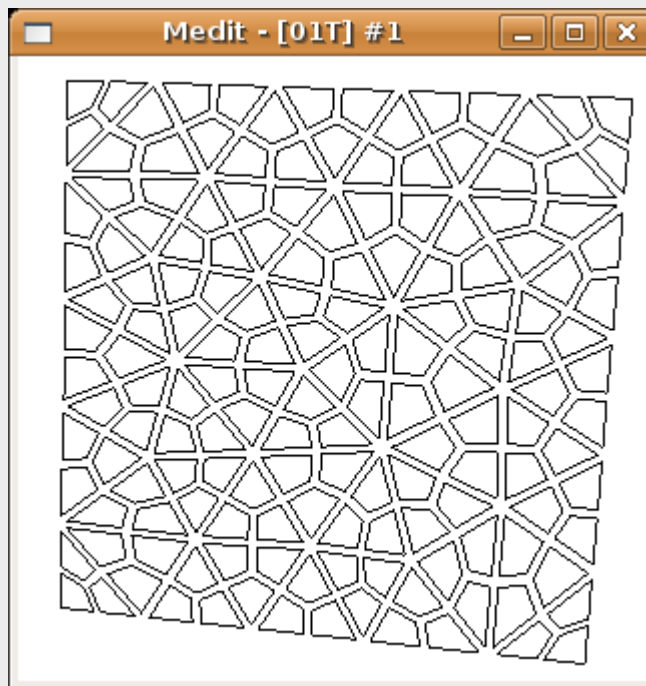
Best neighbor

Chain generation

Split & Smooth

Prospects

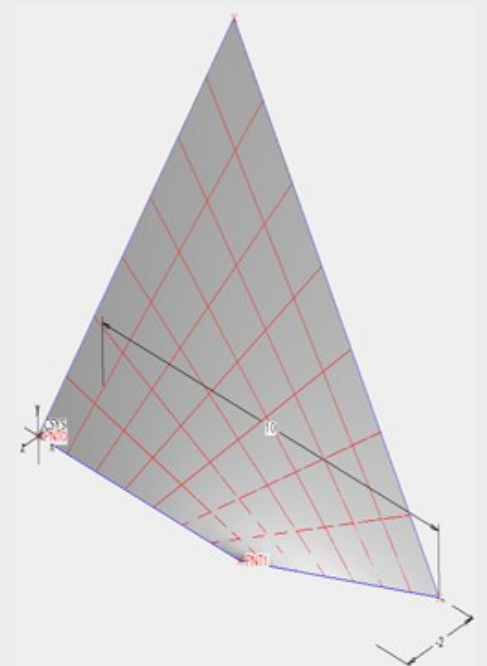
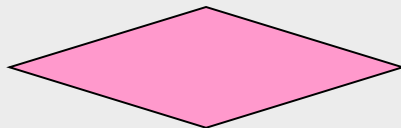
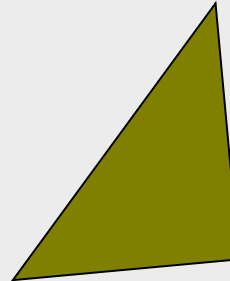
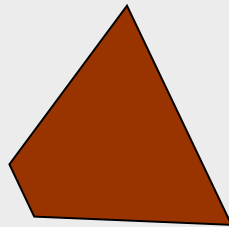
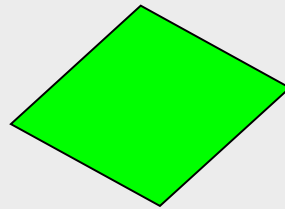
Domain partitioning





## Quadrilateral Quality

- two dimensional validation [Bar-Yosef, Borouchaki, George, Frey, Lo, Owen, Staten ]
- three dimensional quality estimates



Project Definition

Existing Techniques

**Current Work**

**Quad quality**

Best neighbor

Chain generation

Split & Smooth

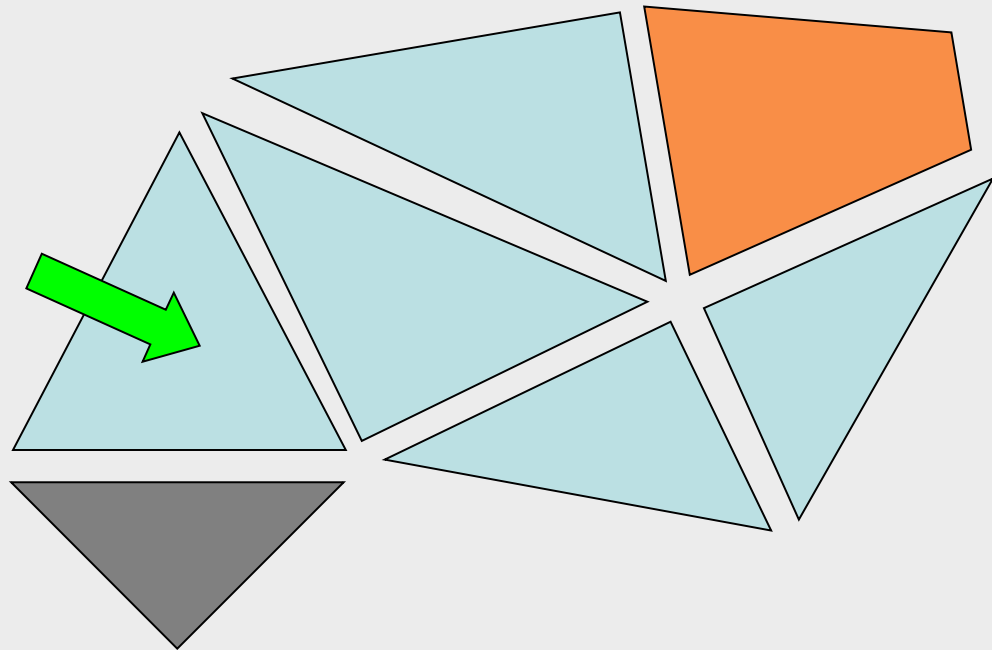
Prospects

Domain partitioning



## Best Neighbor

- each triangle has three neighbors
- only two neighbors are unvisited



Project Definition

Existing Techniques

### Current Work

Quad quality

### Best neighbor

Chain generation

Split & Smooth

Prospects

Domain partitioning



Project Definition

Existing Techniques

## Current Work

Quad quality

Best neighbor

## Chain generation

Split & Smooth

Prospects

Domain partitioning

## Best Neighbor Best Chain Algorithm - BNBC

- collect chains of desired depth
- minimize number of not merged triangles
- chains keep borders or front
- corner triangles close the odd chain





## Best Neighbor Best Chain Algorithm - BNBC

Project Definition

Existing Techniques

**Current Work**

Quad quality

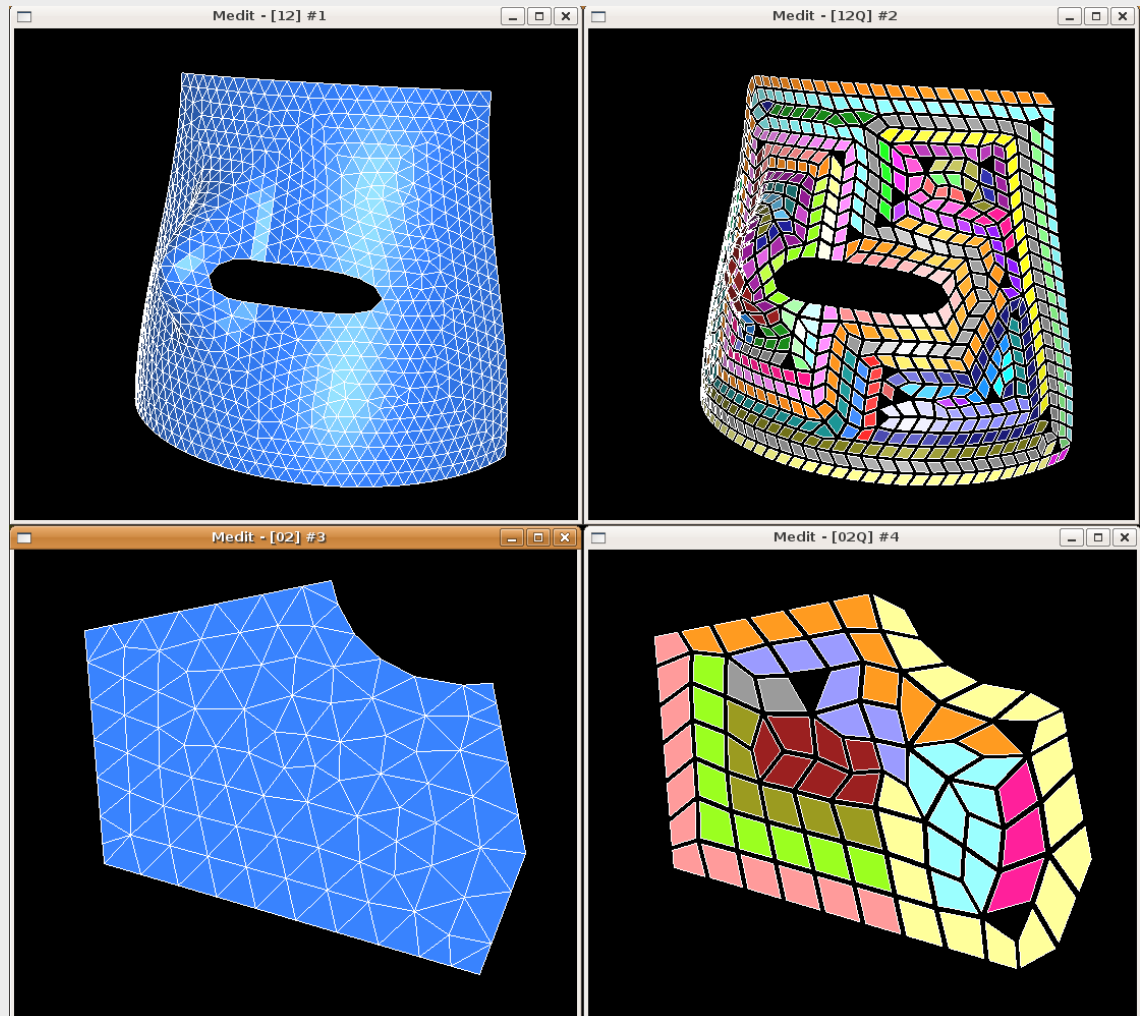
Best neighbor

**Chain generation**

Split & Smooth

Prospects

Domain partitioning





## Split & Smooth

- split non merged triangles and all quads.
- mesh smoothing with a node-base measure of quality [Calvo; Knupp; Shashkov; Zhang]

Project Definition

Existing Techniques

### Current Work

Quad quality

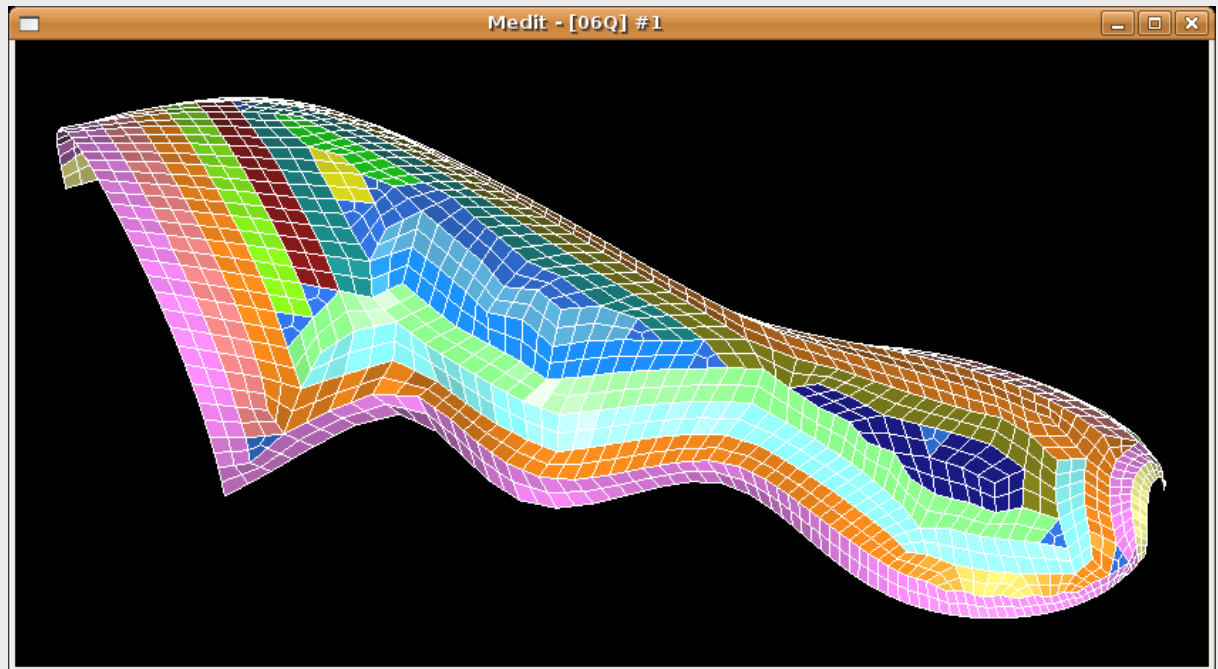
Best neighbor

Chain generation

### Split & Smooth

Prospects

Domain partitioning





## Initial Domain Partitioning

- Lanczos algorithm to find the second smallest eigenvalue : Kabelikova P. software
- multi – threaded implementation in jCAE

Project Definition

Existing Techniques

Current Work

Quad quality

Best neighbor

Chain generation

Split & Smooth

**Prospects**

**Domain partitioning**

