

# From the patient to the surgery. A complete computer vision and graphics process.

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## Abstract

*Generating digital information ready to use on a surgery operation from a patient is a complex process. This process involves computer vision techniques, in order to extract digital information from medical images, and computer graphics techniques in order to generate proper models to interact with the digital information. In this approach a set of techniques covering both fields (computer vision and graphics) have been used to develop a complete process from the medical image to the surgery training.*

Categories and Subject Descriptors (according to ACM CCS): I.3.3 [Computer Graphics]: Picture/Image Generation—Line and curve generation

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## 1. Introduction

Nowadays all the medical surgery process involve medical images. These images are used to determine the surgical procedures and moreover for training before the surgery in order to improve the skills of the medical doctor. In this project a set of techniques have been used in order to deal with all the steps from the medical image acquisition to the surgery training.

For Image enhancement and segmentation: geodesic active region model. The geodesic active region is a well-known model in computer vision field. This model has proved efficiency and specificity on medical image segmentation. The functions have been adapted from the classical approach to the features of the image modality and the target organ. And the off-line step that creates multicomponent probabilistic texture was removed. Our method extends the GAR model [PD05] to deal with medical images [MJ11].

For Mesh generation: reconstruction technique based on a combination of: contour simplification: the Douglas-Peucker algorithm [DP73], then a reconstruction step using an incremental Delaunay approach similar to [AR02] and finally a sculpting process [BFMC05].

Interaction: a novel hierarchical structure, the tetra-tree [JFSO06], has been used in order to achieve real time interaction. To speed up the process, some approaches using the GPU power are under study. The structure and type of algo-

gorithms in all the steps of the process are suitable to speed up using the power of actual GPUs.

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