

# Registration and Matching of Body Parts through 3D Geometric Invariants for Medical Applications

Marinella Cadoni, Andrea Lagorio, Enrico Grosso.

University of Sassari. Department of Political Science, Communication, Engineering  
and Information Technologies.

3D models of body parts and organs, together with appropriate software able to handle, measure and compare them, represent now a valid aid to the medical community to perform several tasks, from diagnosis to surgery and follow ups. In several applications, the accuracy of the registration of different 3D scans of the same body part is a fundamental requisite for the reliability of subsequent qualitative or quantitative analyses, as is the ease and speed of the registration process, especially in the case of shape retrieval. Within this frame, we propose a method to automatically register and compare 3D scans of body parts. According to the characteristics of the body part and of the type of available data (images or scans or both), salient features can be extracted either from the images or from the 3D scans and these can be subsequently fed to a set of 3D invariant functions to establish correspondences between them. From these correspondences we infer the Euclidean transformation that registers the scans, as well as a measure of the similarity of the two shapes. Provided the location of the features is robust, the resulting registration is accurate enough to stand on its own, or if necessary, can be followed by an iterative refinement procedure. Envisaged applications are in the follow ups of reconstructive breast surgery, to monitor the shape variations of the implants with time, and more generally in the comparison of the predicted outcomes of plastic surgery with the real outcomes.