Abstract

The subject of this dissertation is in the computer vision domain and in the area of motion and/or deformation analysis of 2D/3D objects. The determination of correspondences (matching) is an essential part of that analysis, having therefore a great interest in areas like medicine, industry and other research areas.

In the current context, the matching is done between two sets of nodal points, extracted from two different images that can, for example, define contours or surfaces objects type.

From the work previously developed by the coordinator of this dissertation, during his PhD thesis, has resulted a development and test platform, in witch was integrated a methodology for object matching, using physical models and modal analysis. The intent of this project is to incorporate algorithms based on global optimization methods in order to improve the matching phase, of local nature, of the previously developed methodology. The referred platform was used, in the scope of this dissertation, for the implementation and test of the new developed algorithms.

The elaboration of this project started with the study of the platform. The work followed with the study of the deformable objects state of the art, for a better perception of the existing work. It continued with the selection of global optimization algorithms and followed with their implementation/integration in the platform. Finally some experimental tests were done using the selected algorithms in the matching phase step.

During this work, have been detected some situations in which correspondences of "one for several" type or vice-versa could have a high interest. As such correspondences were not considered in the previously developed methodology, nor are usually found in bibliographic references, the search for a solution that could answer satisfactorily to such situations was also one of the objectives of this dissertation. The solution adopted is adequate to cases in which contour objects type are formed by a different number of nodes.

In this dissertation, the methodology previously developed and integrated in the related platform and used for the matching process, is briefly described. This methodology is based in the finite elements method and in modal analysis. The problem in question is also mathematically described, the implemented algorithms are briefly explained and some experimental results are exposed. Finally, are drawn the final conclusions and briefly presented plans for further work.