ABSTRACT

Computer Vision is a branch of Computer Science and Engineering that aims to develop methods for electronically perceiving and understanding images. Most of the problems related to computer vision could be modeled as optimisation problems. Currently there exist many algorithms and techniques that have been used to solve these problems. An open question is whether these are the best algorithms or not. Genetic Algorithm techniques - randomized search and optimization techniques guided by the principles of evolution and natural genetics- offer an interesting alternative to improve existing algorithms and find solution to problems that are still open. The objective of this work is to use this technique to develop algorithms for rigid body image registration and to prove that it is a versatile algorithm for evolutionary image registration. Genetic Algorithm is used to find procedures to convert a binary image into another containing just a particular characteristic of interest. The analysis of results includes two similarity fitness functions, training sets with different numbers of elements and different sizes of the training images over three different objectives.

The study in this thesis is both theoretical and applied in nature. On the theoretical side, a method for image registration is proposed and the gradient analysis of fitness functions is analysed. In addition, a method is developed to study the mathematical morphology of binary images. On the application side, Genetic Algorithm is applied to generate genetically optimized parameters to consistently yield image results comparable to those of their ideal counterparts.