인공면역시스템을 이용한 설계 패턴의 인식 및 진화

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Design Recognition and Evolution Using Artificial Immune System

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Key Words: Artificial Immune System(인공 면역계), Evolution Algorithm(진화 알고리즘), Optimization(최적화), Pattern Recognition(패턴 인식)

Abstract : The paper discusses artificial immune system(AIS) and its application to engineering design optimization. AIS has an ability of recognizing pattern affinities between antigens and antibodies based on the clonal selection principle. Evolving target designs are assumed to be antibodies while premature solutions are considered as antigens. Genetic algorithm based evolution is conducted between antigens and antibodies to obtain improved designs from immunized antigens. The paper suggests an algorithm of AIS for constrained optimization problems. A number of affinity measures between antigens and antibodies are simulated to see their performance on finding optimal designs when a typical structural optimization problem is implemented.

부드러운 경계 위상 설계법을 이용한 인공 고관절의 개념 설계

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Smooth boundary topology optimization and its application to hip prosthesis design

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Key Words: smooth boundary(부드러운 경계), topology optimization(위상 최적화), selection criterion(선택 지수), sensitivity analysis(민감도 해석), hip prosthesis(인공고관절).

Abstract : An optimization methodology named "smooth boundary topology optimization" is proposed as a new method which will overcome the shortcomings of existing topology optimization. The domain boundary is represented using a geometric function, B-spline curves composed of several control points. At each iteration, a newly proposed selection criterion, SC, is calculated to determine whether to create a new hole. The B-spline boundaries are then optimized for shape. SC for an element is the ratio of two sensitivities calculated for the element and the maximum of neighboring elements and effectively represents the influence of a hole creation. This methodology is applied to the design of a hip prosthesis and produces good results with uniform density and smooth boundaries without additional processes needed before.