

Makina Mühendisliğinde Optimizasyon Uygulamaları

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ÖZET

Mühendislerin küresel rekabete dayanmak için üretim maliyetlerini düşürme konusundaki artan talebi, mühendislerin hem ekonomik hem de verimli bir şekilde ürün ve sistemler tasarlamak ve üretmek için en iyi karar verme yöntemleri gibi karar vericilere başvurmalarını zorunlu kılmıştır. Son yıllarda iyice gelişmiş olan optimizasyon teknikleri, havacılık, otomotiv, kimya, elektrik, inşaat ve imalat sanayileri gibi geniş bir endüstri yelpazesinde kullanılmaktadır. Hızla gelişen bilgisayar teknolojisi ile bilgisayarlar daha güçlü hale gelmiş ve buna paralel olarak optimizasyon teknikleri kullanılarak çözülebilecek problemlerin büyüklüğü ve karmaşıklığı da artmıştır. Optimizasyon yöntemleri, bilgisayar destekli tasarımın modern araçları ile birleştiğinde, mühendislik sistemlerinin kavramsal ve ayrıntılı tasarım sürecini geliştirmek için de kullanılmaktadır. Optimizasyon, verilen koşullar altında en iyi sonucu elde etme eylemidir. Herhangi bir mühendislik sisteminin tasarımında, yapımında ve bakımında, mühendisler çeşitli aşamalarda birçok teknolojik ve yönetsel karar almak zorundadır. Tüm bu kararların nihai hedefi ya gerekli çabayı en aza indirmek ya da istenen faydayı en üst düzeye çıkarmaktır. Herhangi bir pratik durumda gerekli olan çaba veya fayda istenen karar değişkenlerinin bir fonksiyonu olarak ifade edilebildiğinden, optimizasyon, bir fonksiyonun maksimum veya minimum değerini veren koşulları belirleme süreci olarak tanımlanabilir. Seminerimizde genel olarak klasik ve meta sezgisel optimizasyon algoritmalarından bahsedilecek ve özellikle Arı Algoritması üzerinde durulacaktır. Daha sonra Makina Mühendisliği disiplini kapsamında sanayide gerçekleştirilmiş çeşitli uygulamalar ve buradaki optimizasyon çalışmaları anlatılacaktır.

Anahtar Kelimeler: Optimizasyon, Makina Mühendisliği, Makina Tasarımı, İmalat Sanayi, Arı Algoritması

ABSTRACT

The ever-increasing demand on engineers to lower production costs to withstand global competition has prompted engineers to look for rigorous methods of decision making, such as optimization methods, to design and produce products and systems both economically and efficiently. Optimization techniques, having reached a degree of maturity in recent years, are being used in a wide spectrum of industries, including aerospace, automotive, chemical, electrical, construction, and manufacturing industries. With rapidly advancing computer technology, computers are becoming more powerful, and correspondingly, the size and the complexity of the problems that can be solved using optimization techniques are also increasing. Optimization methods, coupled with modern tools of computer-aided design, are also being used to enhance the creative process of conceptual and detailed design of engineering systems. Optimization is the act of obtaining the best result under given circumstances. In design, construction, and maintenance of any engineering system, engineers have to take many technological and managerial decisions at several stages. The ultimate goal of all such decisions is either to minimize the effort required or to maximize the desired benefit. Since the effort required or the benefit desired in any practical situation can be expressed as a function of certain decision variables, optimization can be defined as the process of finding the conditions that give the maximum or minimum value of a function. In this talk, classical and metaheuristic optimization algorithms will be mentioned and especially The Bees Algorithm will be discussed. Then, various applications and optimization studies carried out in industry within the scope of Mechanical Engineering discipline will be explained.

Key Words: Optimization, Mechanical Engineering, Machine Design, Manufacturing Industry, The Bees Algorithm.

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