MECH 577 Optimum Design

Fall Term 2010

Basic Procedure of the Powell Method of Conjugate Directions

The material below is taken from:

Powell, M.J.D., 1964,An efficient method for finding the minimum of a function of several variables without calculating derivatives," *Computer Journal*, Vol. 7, No. 4, pp. 155-162.

One iteration of the basic procedure of the Powell method is summarized below:

1. For $i = 1, 2, \ldots, n$, calculate λ_i that minimizes $f(\mathbf{x}_{i-1} + \lambda_i \boldsymbol{\xi}_i)$; then $\mathbf{x}_i \leftarrow \mathbf{x}_{i-1} + \lambda_i \boldsymbol{\xi}_i$.
2. For $i = 1, 2, \ldots, n-1$, replace $\boldsymbol{\xi_i}$ by $\boldsymbol{\xi}_{i+1}$.
3. Replace $\boldsymbol{\xi}_n$ by $\mathbf{x}_n - \mathbf{x}_0$.
4. Find λ that minimizes $f(\mathbf{x}_n + \lambda(\mathbf{x}_n - \mathbf{x}_0))$, and replace $\mathbf{x}_0$ by $\mathbf{x}_0 + \lambda(\mathbf{x}_n - \mathbf{x}_0)$.

Powell includes, in the same paper, an improvement of this method to accelerate its convergence. The improved algorithm is included in p. 83 of the 2010 edition of the course Lecture Notes.