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Global convergence properties of conjugate gradient methods for optimization. (English)

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This paper studies the convergence properties of nonlinear conjugate gradient methods without restarts, and with practical line searches for the problem $min_{x\in\mathbb{R}^n} f(x)$. Iterations of the search directions and new points under study are chosen as:

$$x_{k+1} = x_k + \alpha_k d_k, \text{ where } d_k = \begin{cases} -g_k, & \text{for } k = 1, \\ -g_k + \beta_k d_{k-1} & \text{for } k \geq 2, \end{cases}$$

Various choices of β_k and inexact line searches that result in global convergence are considered. The analysis is closely related to the methods of Fletcher-Reeves and Polak-Ribière. Numerical experiments are presented.

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MSC:

90C52	Methods of reduced gradient type
90C30	Nonlinear programming
90-08	Computational methods for problems pertaining to operations research and mathematical programming
65K05	Numerical mathematical programming methods

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global convergence; unconstrained optimization; convergence properties; nonlinear conjugate gradient methods

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