

## **A monotone gradient method via weak secant equation for unconstrained optimization**

### **Abstract**

In this paper we present a new algorithm of steepest descent type. A new technique for steplength computation and a monotone strategy are provided in the framework of the Barzilai and Borwein method. In contrast with Barzilai and Borwein approach's in which the steplength is computed by means of a simple approximation of the Hessian in the form of scalar multiple of identity and an interpretation of the secant equation, the new proposed algorithm considers another approximation of the Hessian based on the weak secant equation. By incorporating a simple monotone strategy, the resulting algorithm belongs to the class of monotone gradient methods with linearly convergence. Numerical results suggest that for non-quadratic minimization problem, the new method clearly outperforms the Barzilai-Borwein method.

**Keyword:** Unconstrained optimization; Monotone gradient methods; Weak secant equation; Barzilai-Borwein method