THE q-GRADIENT GLOBAL OPTIMIZATION METHOD: APPLICATION TO THE DESIGN OF SATELLITE CONSTELLATIONS FOR REGIONAL NAVIGATION

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Resumo/Abstract:
Recently, based on Jackon's derivative, a generalization of the classical steepest descent method, called the q-gradient (q-G) method, has been proposed for solving global optimization problems. The main idea behind this new method is the use of the negative of the q-gradient of the objective function as the search direction. The use of the q-derivative provides the optimization algorithm with an effective mechanism for escaping from local minima. The algorithm is implemented in such a way that the search process gradually shifts from global sampling in the beginning to almost local search in the end. Here we present an application of the q-gradient method to the design of satellite constellations for two regional navigation satellite systems, one for South America and the other covering the Brazilian territory. Overall, our results support the basic design assumption of using four satellites in geosynchronous orbits for covering both Brazil and South America, although for this latter region the use of an additional satellite would probably be necessary for ensuring better operational conditions.