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Dual methods for optimal allocation of total network resources

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Abstract

© 2016, North Atlantic University Union NAUN. All rights reserved. We consider a general problem of optimal allocation of a homogeneous resource (bandwidth) in a wireless communication network, which is decomposed into several zones (clusters). The network manager must satisfy different users requirements. However, they may vary essentially from time to time. This makes the fixed allocation rules inefficient and requires certain adjustment procedure for each selected time period. Besides, sometimes users requirements may exceed the local network capacity in some zones, hence the network manager can buy additional volumes of this resource. This approach leads to a constrained convex optimization problem. We discuss several ways to find a solution of this problem, which exploit its special features. We suggest the dual Lagrangian method to be applied to selected constraints. This in particular enables us to replace the initial problem with one-dimensional dual one. We consider the case of the affine cost (utility) functions, when each calculation of the value of the dual function requires solution of a special linear programming problem. We can also utilize the zonal resource decomposition approach, which leads to a sequence of onedimensional optimization problems. The results of the numerical experiments confirm the preferences of the first method.

Keywords

Bandwidth, Dual Lagrange method, Linear programming, Linear search, Resource allocation, Wireless networks, Zonal network partition, Zonal resource decomposition