CCIT Report #392 July 2002

Energy Efficient Routing in Ad Hoc Disaster Recovery Networks

Gil Zussman and Adrian Segall
Department of Electrical Engineering
Technion – Israel Institute of Technology
Haifa 32000, Israel
{gilz@tx, segall@ee}.technion.ac.il
http://www.comnet.technion.ac.il/{~gilz, segall}

Abstract. The terrorist attacks on September 11, 2001 have drawn attention to the use of wireless technology in order to locate survivors of structural collapse. We propose to construct an ad hoc network of wireless smart badges in order to acquire information from trapped survivors. We investigate the energy efficient routing problem that arises in such a network and show that since smart badges have very limited power sources and very low data rates, which may be inadequate in an emergency situation, the solution of the routing problem requires new protocols. The problem is formulated as an anycast routing problem in which the objective is to maximize the time until the first battery drains-out. We present iterative algorithms for obtaining the optimal solution of the problem. Then, we derive an upper bound on the network lifetime for specific topologies and describe a polynomial algorithm for obtaining the optimal solution in such topologies. Finally, numerical results regarding the upper bound and the algorithms are presented.

Keywords: Routing, Energy efficient, Energy conserving, Power aware, Disaster recovery networks, Ad hoc networks, Smart badges