RANDOMIZED ALGORITHMS FOR THE HANDOVER MINIMIZATION PROBLEM IN WIRELESS NETWORK DESIGN

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Mobile wireless devices connect to an antenna tower to which it has a strong signal. As the device moves it may connect to a sequence of towers. The process that takes place when a device changes the tower to which it is connected to is called handover (or handoff). Handovers are not done by the tower itself but rather by the radio network controller (RNC) to which the tower is connected. Each tower has associated with it a traffic level which depends, for example, on where it is located. One or more towers can connect to an RNC but each RNC can handle a maximum amount of traffic thus limiting the subsets of towers that can connect to it. Handovers between towers connected to different RNCs tend to fail more often than those between towers connected to the same RNC. Handover failure causes a dropped call which one would prefer to avoid. Therefore minimizing the number of handovers between towers connected to different RNCs may lead to a more reliable level of wireless service. Given a set of towers, each with a given amount of traffic, a set of RNCs, each with a given capacity, and a matrix specifying the number of handovers between pairs of towers, the HANDOVER MINIMIZATION PROBLEM (HMP) seeks an assignment of towers to RNCs such that the RNC capacity is not violated and the number of handovers between towers connected to different RNCs is minimized.

We describe three randomized heuristics for solving the HMP. The first is a GRASP with path-relinking for the generalized quadratic assignment problem. The other two are specially tailored for the HMP. One is is a GRASP with evolutionary path-relinking and the other is a biased random-key genetic algorithm. We compare these heuristics on a set of randomly generated instances as well as on real-world networks from a large wireless provider.