A new mathematical model for the Data MULE's Scheduling Problem

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Résumé

In a wireless sensor network,the sensors cooperate in order to establish the connection between all other sensors in the network.The implementation of this kind of network is done quickly and can be applied in various critical areas,such as disaster relief and military communications.Data Mules Systems,proposed by Shah (2003) has mobile agents called Data Mules (DM),which are used to facilitate the connection between other sensors.The role of these agents is to visit the sensors and perform the delivery and pickup of data between them.Thus,the sensors of the network are classified in 2 ways,simply sensors and special sensors (DM).The sensors not only transmit data in the form of messages to the others or to a base station,but also have an interest in receiving messages from other sensors.The DM are responsible for performing data communication between the sensors using a route that must be defined within the area where sensors are located.The Data Mules Scheduling Problem (DMSP) is divided in 3 phases.The phase of Path Selection consists on defining a route to collect and delivery information from each sensor.In Speed Control phase,the management of speed of the Data Mule through the route is defined.And finally,the Job Scheduling phase is important when the mule is in contact with more than one sensor at the same time,so since the DM can change data with only one sensor at a time,this phase is responsible for the scheduling of communications.The goal of DMSP is serve the demand of all sensors by minimizing the time spend in the route.In many works in the literature,the DMSP is divided into two stages,the first one being the definition of the path of DM and the second stage deal with speed and scheduling problems.The second stage is only started when the first stage is complete.This approach isn't advantageous because the decision of a stage can influence the other one,so in this work we propose a mathematical formulation to represent the problem in a unified way,using adapted instances for the Close-Enough TSP to validate the model

Mots-Clés: wireless sensor network, data mules, integer programming

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