Collecting big data from wireless sensor networks with drones

Starting literature


The paper covers a scheduling problem, where a set of customers must be delivered by a drone. The drone can only carry one package at a time, and can visit a customer either in a direct drone flight from the depot or take a ride in the public transportation network with fixed route and timetables in order to perform the delivery task. The objective of the problem is to find an optimal schedule, involving the permutation of the to-be-served customers, the times for recharging of the drone, and the delivery scheme for each customer.

Task and research questions for the thesis

Please note that all suggested tasks and research questions are negotiable and should serve to propose a direction in which the thesis can go. If during the work on the thesis, different, new and innovative ideas and research directions come up, they can most gladly be discussed with the supervisor and integrated in the thesis.

1. Introduction
   Provide some technical details about the wireless sensor network, the mobile collections, give examples about applications and explain the relevance of the considered problem.

2. Literature research
   Provide a literature overview about data collection from (WSN) by the usage of a mobile collector in form of a table and accompanying text. The table and text should summarize the recent developments and publication in the mentioned problem field from the operations research perspective. Answer a.o. the questions: Which assumptions have been taken about the collector(s) (one or several, limited battery, ...) , the data collection (big or small data, where and when can the data be received,...)? Which solution approach was used? Take especially into account articles from highly ranked Operations Research journals.

3. Understand and document the problem
Include a summary and extend some details about the base problem and the solution algorithm from the starting paper.

4. **Reconstruct the exact Dynamic Programming (DP) formulation of the starting literature.**
   Steps you may include.
   3.1 Create test instances.
   3.2 Find a good way to store and import the input data (e.g. csv files of coordinates, flighttimes)
   3.3 Implement and run the algorithm from the article.

5. **Main part – own contribution:**
   1. Develop an extension of the proposed algorithm for the proposed problem formulation. Document the development of the new parts with pseudocode, examples, ... and explain why your ideas are good.
   2. Implement the extensions

   The *extensions* can be:
   - An improvement of the existing algorithm for the existing problem formulation (e.g. by embedding it to metaheuristic)
   OR/AND
   - Add some additional assumption or aspects to the problem (e.g. multiple drones, recharging, restricted set of points allowed for hovering, ...)

   3. Make computational experiments or plots to proof the quality of your implementation.