Cutting planes for a robust electricity distribution network problems, and column generation for a wireless sensor network with camera sensors

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Abstract:

Part One: On Designing a Robust Electricity Distribution Network

The first part of this presentation addresses the problem of designing the configuration of an interconnected electricity distribution network, so as to maximize the minimum power margin over the feeders. In addition to the limitation of feeder power capacity, the distance (as hop count) between any customer and its allocated feeder is also limited for preventing power losses and voltage drops. Feasibility conditions are studied and a complexity analysis is performed before introducing a heuristic algorithm and two integer linear programming formulations for addressing the problem. A cutting-plane algorithm relying on the generation of two classes of cuts for enforcing connectivity and distance requirements respectively is proposed for solving the second integer linear programming formulation.

Part Two: Lifetime Maximization for Wireless Sensor Networks Using Video Cameras

In the second part of this presentation, we consider the problem of maximizing the lifetime of a wireless sensor network which uses video cameras to monitor targets. These video cameras can rotate and have a fixed monitoring angle. For a target to be covered by a video camera mounted on a sensor node, three conditions must be satisfied. First, the distance between the sensor and the target should be less than the sensing range. Second, the direction of the camera sensor should face the target, and third, the focus of the video camera should be such that the picture of the target is sharp. Basic elements on optics are recalled, then some properties are shown to efficiently address the problem of setting the direction and focal distance of a video camera for target coverage. Then, a column generation algorithm based on these properties is proposed for solving three lifetime maximization problems.