Online Algorithms for Tree Coverage

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The advent of new technologies in modern networks demands the development of online algorithms that are adaptive to changes of a network. Ideally we want these algorithms to work in a local manner, that is, their decisions depend only on information stored at the current node of the network. An early example of this is Ore's work characterizing arbitrarily traceable graphs [1], that is, Eulerian graphs G which have a vertex v such that any tour starting at v and always traversing a new edge is Eulerian. In this work we propose some online algorithms to approach the following problem: Let T be a tree with windy costs on its edges. How should a drone, or a team of drones, start at a base, cover all edges of T and return to the base at small cost? This problem has been studied before for general graphs from an offline, mixed integer programming point of view [2]. Another offline approach, where drones can enter and leave edges at any point, has also been recently proposed [3]. The experimental cost of the solutions produced by our online approach compares well with the offline solutions.

References

[1] O. Ore, "A problem regarding the tracing of graphs", *Elemente der Mathematik* 6, 49-53, 1951.

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[3] James F. Campbell, Ángel Corberán, Isaac Plana, José M. Sanchis, and Paula Segura, "Solving the length constrained K-drones rural postman problem", *European Journal of Operational Research* 292(1), 60-72, 2021.