Efficiently Testing T-Interval Connectivity in Dynamic Graphs*

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Abstract. Many types of dynamic networks are made up of durable entities whose links evolve over time. When considered from a *global* and *discrete* standpoint, these networks are often modelled as evolving graphs, i.e. a sequence of static graphs $\mathcal{G} = \{G_1, G_2, ..., G_\delta\}$ such that $G_i = (V, E_i)$ represents the network topology at time step i. Such a sequence is said to be T-interval connected if for any $t \in [1, \delta - T + 1]$ all graphs in $\{G_t, G_{t+1}, ..., G_{t+T-1}\}$ share a common connected spanning subgraph. In this paper, we consider the problem of deciding whether a given sequence $\mathcal{G}$ is T-interval connected for a given T. We also consider the related problem of finding the largest T for which a given $\mathcal{G}$ is T-interval connected. We assume that the changes between two consecutive graphs are arbitrary, and that two operations, *binary intersection* and *connectivity testing*, are available to solve the problems. We show that $\Omega(\delta)$ such operations are required to solve both problems, and we present optimal $O(\delta)$ online algorithms for both problems.

Keywords: T-interval connectivity, Dynamic graphs, Time-varying graphs

* This work was presented at the *9th International Conference on Algorithms and Complexity (CIAC 2015)*, volume 9079 of Lecture Notes in Computer Science, pp. 89–100, Springer Verlag, 2015.