Multi-Sources Simultaneous Communication in the Wireless Mobility Model is NP-complete

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Abstract

Mobile wireless communication has become prevalent in todays world and allowed us to do things we could not imagine a decade ago. Several applications of mobile wireless communication have mushroomed. One of such applications is related to a situation where users want to communicate with their counterparts while they are moving and only have limited battery powers. In this talk we want to explore the computational complexity of this situation using a model. The model we use is extended from the existing model proposed by Greenlaw and Kantabutra. The situation is formalized as a decision problem as follows. Given a mobility model $M = (S, D, U, L, R, V, C, O)$, k pairs of distinct sources $\{s_1, s_1'\}, \{s_2, s_2'\}, \ldots, \{s_k, s_k'\}$, and a time $t \in \mathbb{N}$, can all k pairs of sources simultaneously communicate throughout the duration t of the model without sharing a source? We show that the complexity of this problem is at least as hard as the One-In-Three 3-Satisfiability unless P = NP. In the end we discuss results, implications, and future research in the model. – This is joint work with Raymond Greenlaw and Sanpawat Kantabutra.

Keywords: wireless communication, decision problem, complexity, NP-complete.