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## An autonomous redeployment algorithm for line barrier coverage of mobile sensor networks

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**Abstract:** Redistributing mobile sensor nodes to provide guaranteed barrier coverage is critical for many sensor networks applications, such as intrusion detection and border surveillance. In this paper, we study the problem of sensor redistribution in mobile sensor networks. We first give the formulation of the theoretical analysis on what is optimal sensor layout with the given random deployment. Then, we propose a fully distributed sensor redistribution algorithm to achieve line-based barrier coverage for mobile sensor networks. We formally prove that our algorithm can reach a final stable deployment and achieve barrier coverage in a finite time. Extensive simulations are conducted to verify the validity of our analysis for mobile sensor networks.

**Keywords:** mobile sensor networks; autonomous redeployment; barrier coverage; optimal sensor layout.

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### 1 Introduction

A wireless sensor network (WSN) usually consists of a large number of static sensor nodes that organise themselves into multi-hop networks (Akyildiz et al., 2002). Sensor nodes are able to measure various parameters of the environment and transmit collected data to the sink node through multi-hop communication. Once the sink node

received sensed data, it processes and forwards it to the users. The network can be embedded in our physical environment and have many potential applications, such as battlefield surveillance, environment monitoring and fire detection. Barrier coverage guarantees to monitor any movement crossing the barrier of sensor networks (Liu and Towsley, 2004). A wide range of practical applications of