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THE ROBOT DEPLOYMENT SCHEME FOR WIRELESS SENSOR NETWORKS IN THE CONCAVE REGION

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Abstract. *It is an important issue to deploy sensors on the monitor area for wireless sensor networks. There are many researches about this issue, and they address how to achieve efficient coverage. This paper also provides a sensor deployment scheme, but there are some differences between previous researches. The robot deployment scheme is proposed in this paper, and a single robot deploys sensor one by one according to the decided x and y coordinates; the first deployed sensor and the last deployed sensor are neighbor. The scheme can be applied to the deployed area with concave boundaries. Once entering the concave region, the robot can deploy sensor efficiently with full coverage, and then leave the concave region from the Exit which is next to the Entry.*
Keywords: Wireless sensor network, Deployment, Hole, Hamiltonian cycle

1. **Introduction.** Since the problems of sensor coverage and deployment are fundamentally inter-related [7] in a sensor network, many deployment algorithms were proposed for increasing the coverage of the sensor field.

Some of these related works assume all of the sensors are static [4-8]. Since randomly deploying sensors usually obtains an undesired coverage ratio, the static sensor networks must be deployed according to a predefined shape decided by the different optimal algorithms. More recent works on sensor deployment assume all sensors are mobile [3,12-15]. The key advantage of employing mobile sensors is that sensors can dynamically move to cover uncovered areas for increasing coverage ratio. The sensors may move from a densely deployed area toward a sparse area or move from a k-covered area to a coverage hole.

Most recently, a few papers [9,11] deploy hybrid sensors that mixed with static and mobile sensors for a sensor network. Static sensors estimate coverage holes which are areas not covered by any node, and bid mobile sensors to heal the holes [11]. Mobile sensors choose highest bid and move to the corresponding target location for covering holes. These processes may go into iterations until stable status is achieved. No more sensors will move and desired sensing coverage is achieved in this stable status. In [9], an on-demand deployment is developed, and the process is started by an event-driven request. A mobile sensor will be selected to heal coverage hole, on account of the priority of the Hole and the distance between the mobile sensor and the Hole.

In another different deployment scheme [1,2], static sensors are deployed by the robot in a given region. The robot examines the environment and decides where a sensor can be deployed. In [1], there are four predefined direction priority of South, West, North, and East providing the robot to deploy sensors. Deployed sensors within the communication range of the robot may provide the robot's movement suggestion. Once the robot received some suggestions, it integrates the suggestion and selects the best direction to deploy