

**Approximation Algorithms for Sweep Coverage Problem With Multiple Mobile Sensors**

**Abstract:**

Sweep coverage plays an important role in many applications like data gathering, sensing coverage, and devices control. In this paper, we deal with the sweep coverage problem with multiple mobile sensors to periodically cover *n* targets in the surveillance region. We propose three constant-factor approximations, namely, *CycleSplit*, *HeteroCycleSplit*, and *PathSplit*, to minimize the longest sweep period of mobile sensors under different scenarios, respectively. *CycleSplit* deals with the minperiod sweep coverage problem (MPSC), in which each mobile sensor works independently along a predetermined trajectory cycle. It has an approximation ratio of (5 *−* 2*/*(*n − m* + 1)), which improves the best known approximation ratio of 5. *HeteroCycleSplit* is a 5*\_*-approximation. It computes the sensor routes for heterogeneous velocity min-period sweep coverage problem (HVMPSC), where each mobile sensor has a different velocity. *PathSplit* is a 2-approximation for connected path minperiod sweep coverage problem (CPMPSC). It solves a variant problem of sweep coverage where we need to cover all the given edges. Besides, we also propose an optimal algorithm *DP-MPSC* for min-period sweep coverage problem in 1-D case. Finally, we provide various numerical experiments and comparisons with several previous work to validate the efficiency of our design.

**Existing System:**

Instead of continuous monitoring, many applications only require periodic patrol inspection for a certain set of PoIs. Typical examples include police patrolling, message ferrying, devices control, etc. In such scenario, a mobile sensor can move around to collect data from targets actively, and the objective is usually to minimize the number of detecting sensors under a time constraint or find the minimum sweep period given the number of targets or shorten the trajectory length of mobile sensors. We refer to such problem as *Sweep Coverage*. Similar models have also been studied under the context of autonomous robots, vehicle routing, and data collection.

**Proposed System:**

We mainly focus on sweep coverage problem with multiple mobile sensors. Assume that there are *n* targets in the surveillance region and *m* mobile sensors. Each mobile sensor works as a data ferry to collect information from targets. If a sensor moves to the position of a target, then this target is considered to be detected by the mobile sensor. Imagine that all the mobile sensors move along a set of predefined trajectories continuously to collect data, and a target is said to be *t*-sweep covered if it is detected by a mobile sensor at least once every *t* time units (we call *t* its sweep period). The objective here is to minimize the sweep period for all targets. We consider three variations of this problem.