Connectivity-Guaranteed and Obstacle-Adaptive Deployment Schemes for Mobile Sensor Networks

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Outline

- Introduction
- Assumptions
- Connectivity-Preserved Virtual Force(CPVF)
- The floor-based scheme
- Performance evaluation
- Conclusions

Introduction

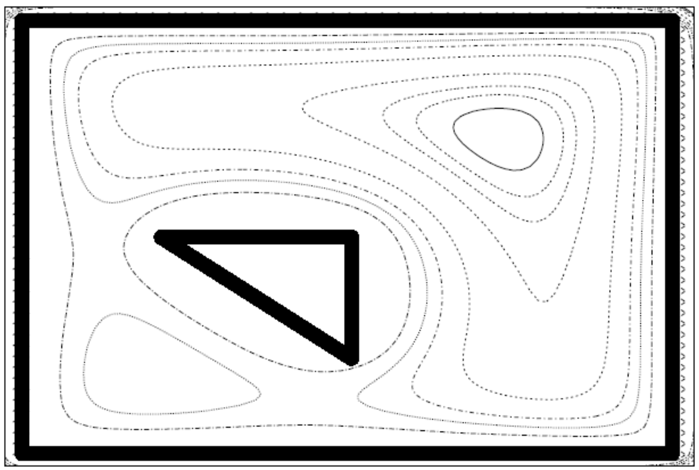
- The mobility and self-organize of sensors are desirable for many application scenarios such as disaster areas, or toxic regions.
- How to maintain a connected network that has the maximum coverage at the cost of the minimum moving distance is the issue in this paper.

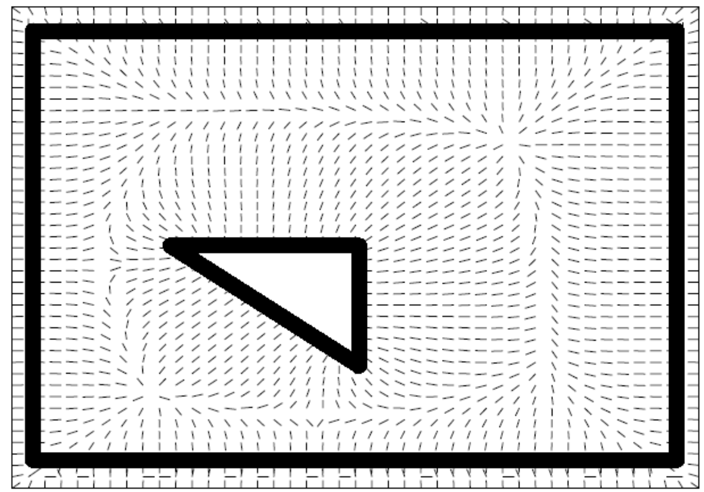
Introduction

- There have been a number of proposals for this problem. But they have several problems in practice.
  - Assume that a sensor can easily detect all (or most) of its Voronoi neighbors through local communication.
  - Assume that the sensing field is obstacle-free.

Related work

- In [5], they employ the potential field method in sensor deployment.

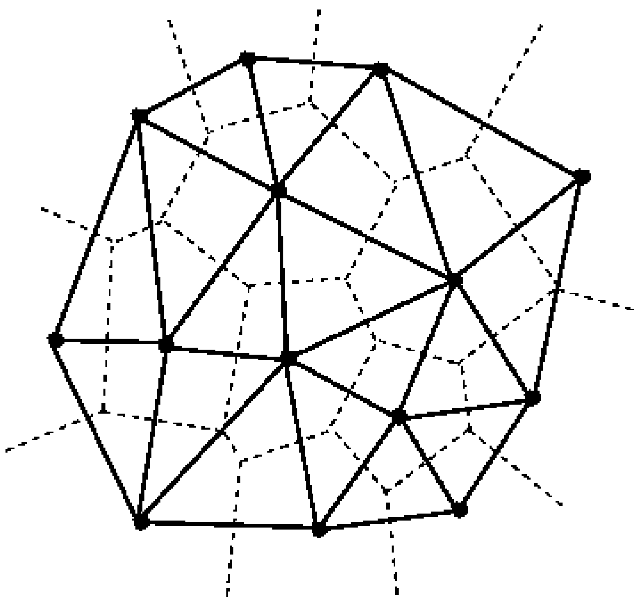


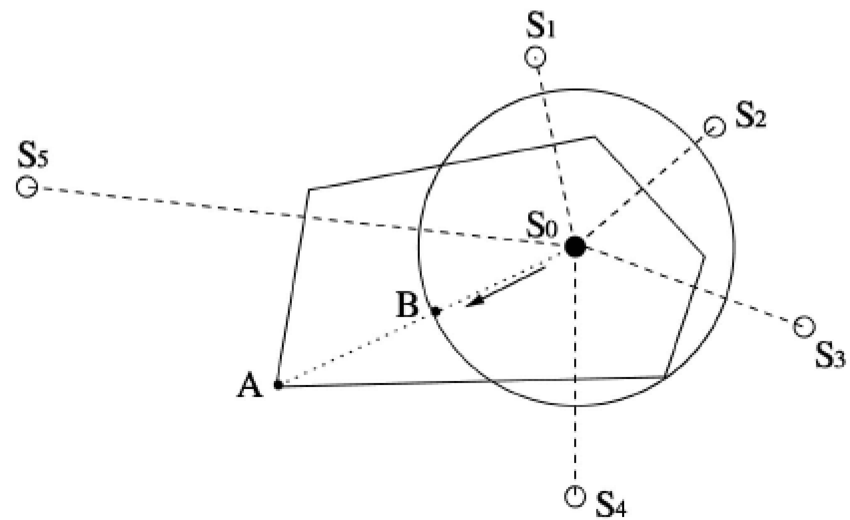


- Assuming that a sensor is always able to determine the locations of nearby nodes.

Related work

- In [9], authors present a set of VD-based schemes to maximize coverage.





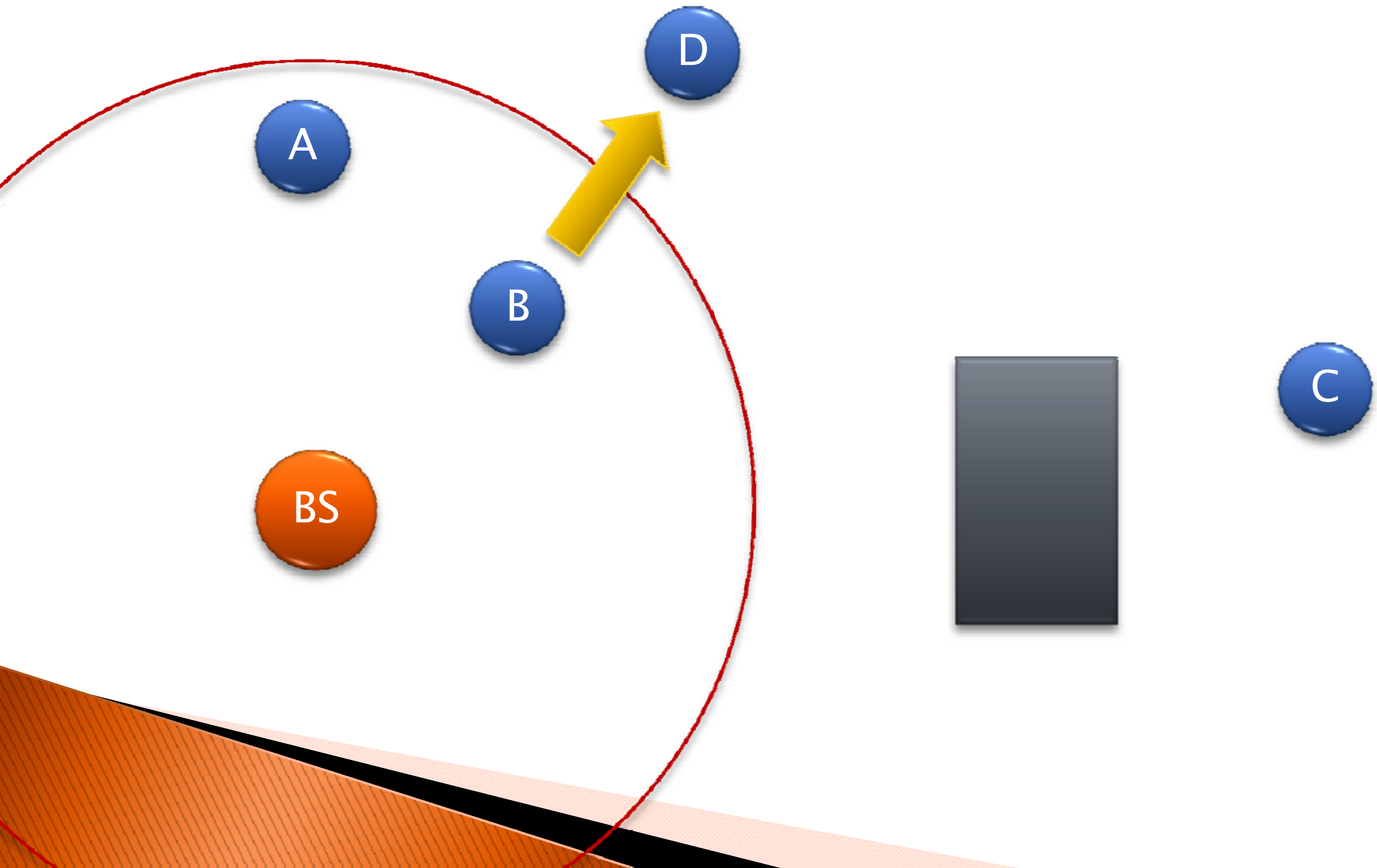
- It requires an obstacle-free field.

Assumptions

- All sensors have the same communication range and sensing range.
- A sensor knows its own position and can recognize the boundary of the obstacles within its sensing range.
- The field is on a 2-D coordinate plane.
- There is a reference point (BS) known to all sensors.

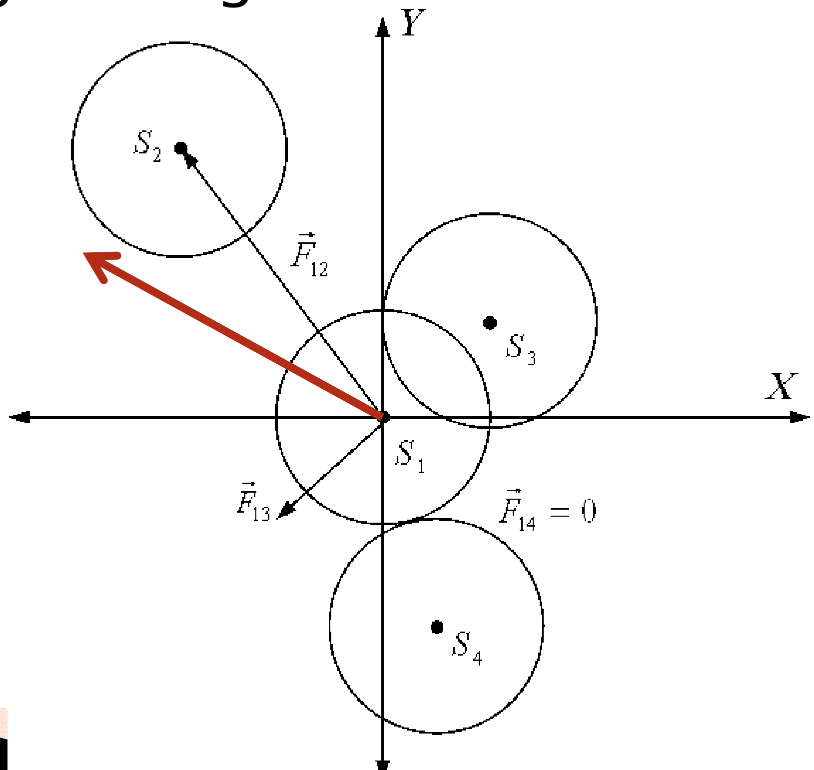
Connectivity-Preserved Virtual Force(CPVF)

- Achieving connectivity



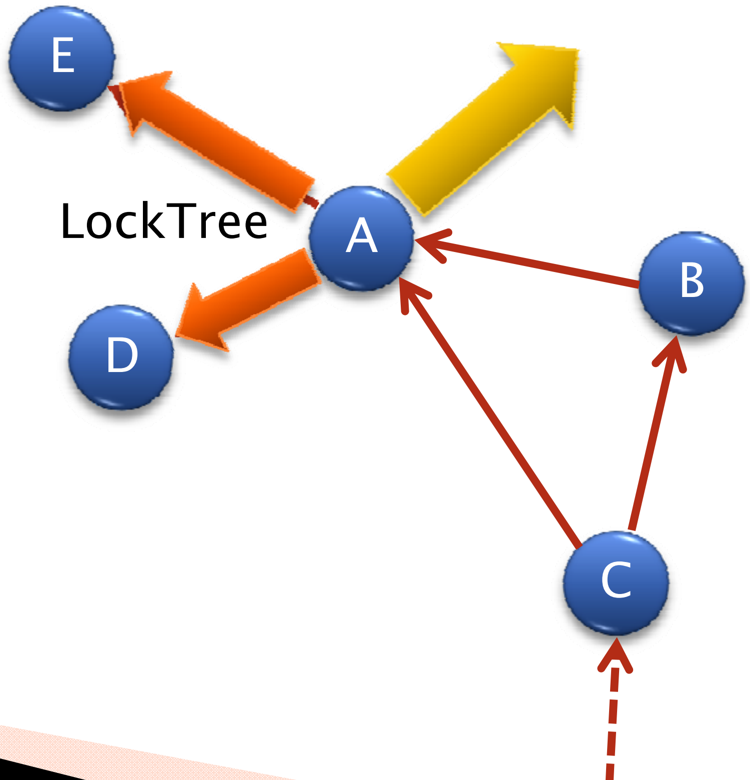
Connectivity-Preserved Virtual Force(CPVF)

- Maximizing sensing coverage using virtual forces
  - The VF method is used in this scheme only for determining moving directions.

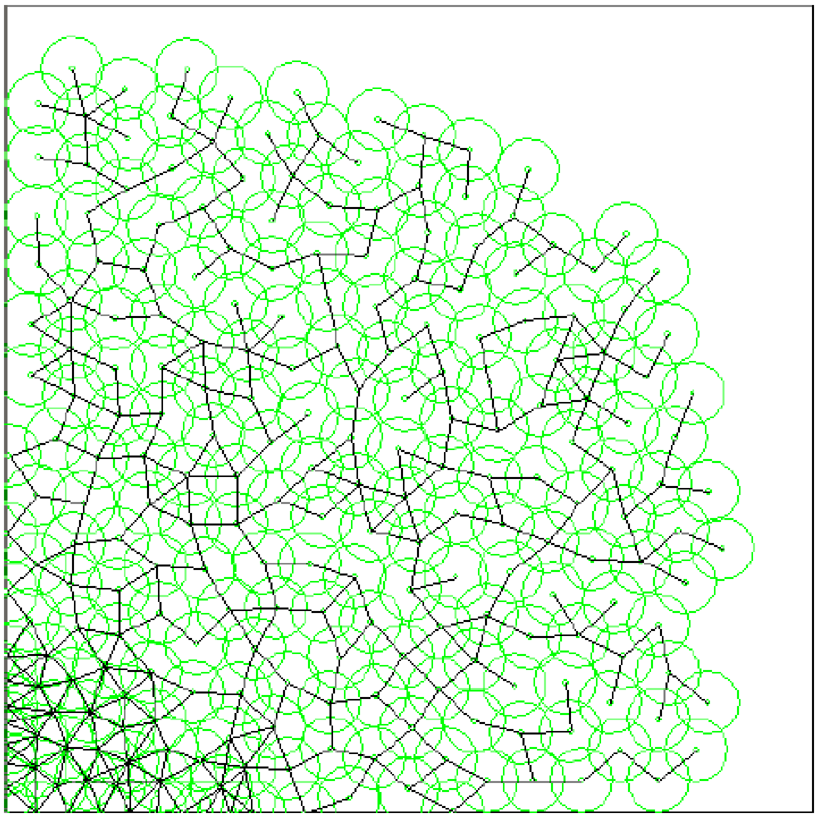


Connectivity-Preserved Virtual Force(CPVF)

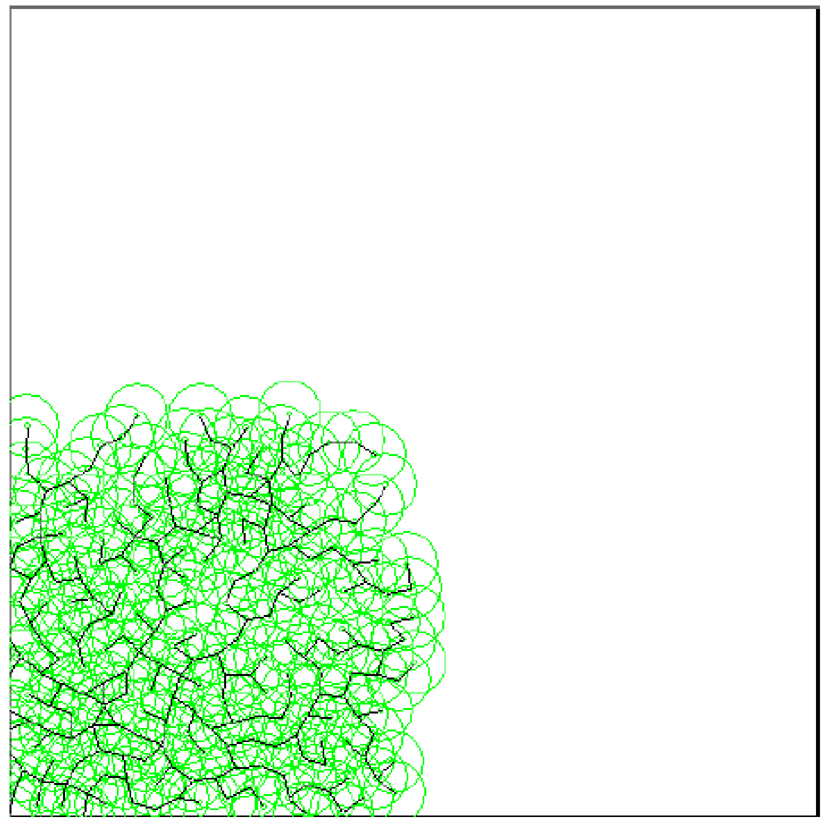
- Maximizing sensing coverage using virtual forces
  - Allow a sensor to connect to a new parent.



Connectivity-Preserved Virtual Force(CPVF)



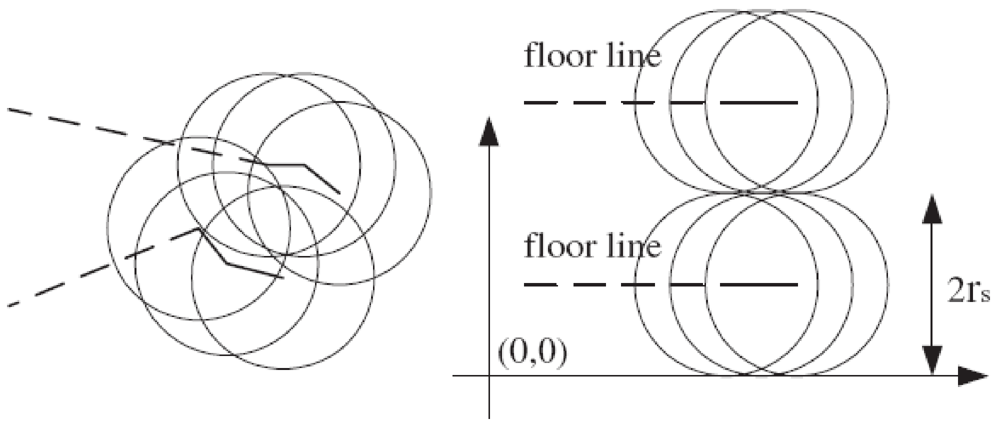
(a) $r_c = 60\text{m}$, $r_s = 40\text{m}$, coverage = 74.5%



(b) $r_c = 30\text{m}$, $r_s = 40\text{m}$, coverage = 26.4%

The floor-based scheme

- Achieving connectivity



(a) CPVF (b) FLOOR