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Disseminate Region Coverage By Mobile Sensor Node Using Hexagonal Scheme

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Abstract

Mobile sensor nodes are useful in many environments because they can move to increase the coverage area. After a sensor node failure creates a coverage hole, a mobile sensor node is impelled to cover the hole in a timely and energy efficient way. In this approach, we are using random uniform organization of N mobile sensor nodes. Such that each node has equal prospect of falling at any location in region of interest (i.e. Center of hexagon). A rectangular region of interest divided in regular hexagon in tessellation patterns. Mobile sensor nodes are randomly placed in the region of interest and coverage should be uniform. Purpose of this work is using Mobile sensor nodes with optimum travelling distance and less coverage overlap.

Introduction

Mobile sensor nodes have received much attention since network performance can be greatly improved by using just a few number of mobile sensor nodes. Mobile sensor nodes have movement capability to collaboratively reinstall the region. Coverage in this approach becomes very useful in situations where static nodes organization mechanisms fail or are not possible. Optimal placement of static sensor nodes might not be possible in disaster areas and urban toxic regions. Mobile sensor nodes might be better option and a significantly fewer number of nodes are required than their static counterparts.

A point is said to be k-covered if it falls into at least k sensor's sensing range. The term k can be referred as degree of coverage. The overall sensing coverage of a sensor network is just the aggregation of the areas covered by all the sensor node.

Coverage is usually interpreted as how well a sensor network will monitor a field of interest. It can be thought of as a measure of quality of service (QoS). Coverage can be measured in different ways depending on the application, Depending on the sensing range; an individual node will be able to sense a part of the sensing field. Degree of coverage at a particular point in the sensing field can be related to the number of sensors whose sensing range covers that point. It has been observed and assumed that different applications would require different degrees of coverage in the sensing field. It may be low degree of coverage; it may be dynamically degree of coverage. A network that has a high degree of coverage will clearly be more resilient to node failures.

Literature Review

This work is concerned with the sensor network is the coverage problem. Typical tasks of sensor nodes in a sensor network are to collect and transmit the data. Monitoring requires much more energy. Sensor nodes are equipped with limited power source. In many cases it is not possible to replace the power sources.

In triangulation based coverage MSNs are used. MSNs are useful in disaster areas and urban toxic region in this areas placement of static sensor nodes are not possible. A triangulation based coverage where group of three MSNs position themselves to form equilateral triangle and several mobile traversal algorithm are used. In order to cover a rectangular ROI, divided it into equilateral triangles. This forms a lattice of equilateral triangles. Area under each triangle is covered by the three sensors which are placed at the vertices of the equilateral triangle.

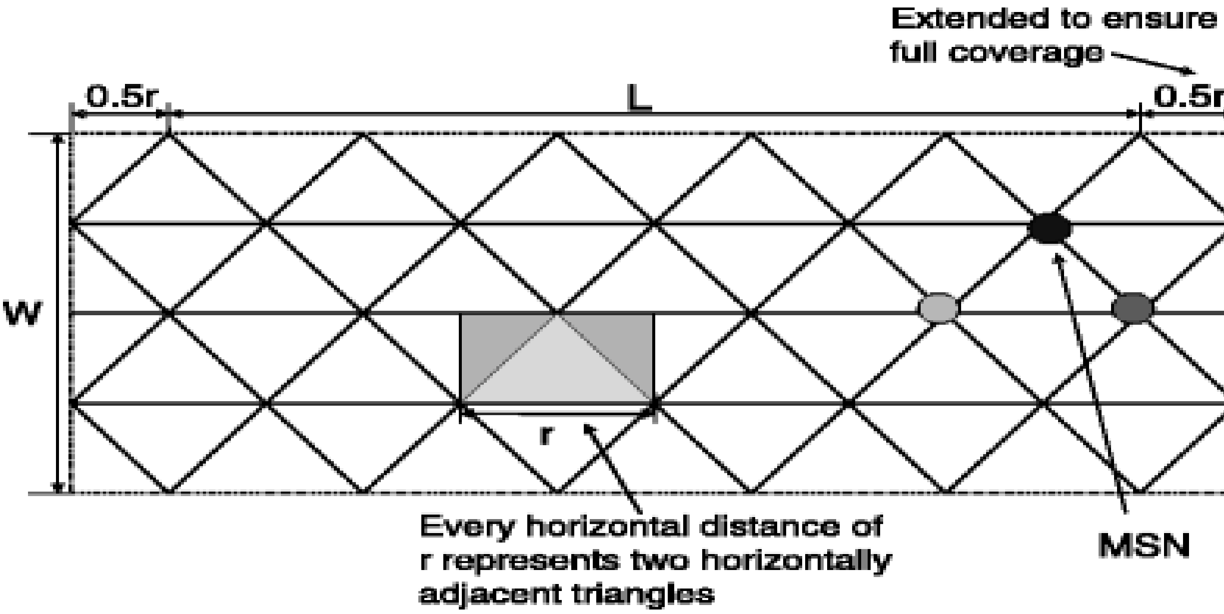

Figure : Segmentation of the field in Equilateral triangle

Proposed Work

A rectangular ROI of length L and breadth B for the sake of convenience we consider the origin (0, 0) to be at the bottom left of ROI. X and Y axes originate from here. The ROI is divided in to regular hexagons of side R in tessellation patterns.

The distance between two center points of adjacent regular hexagon is √3R. There are N no. of hexagons arranged along the length L and M no. of rows arranged along the breadth of B.

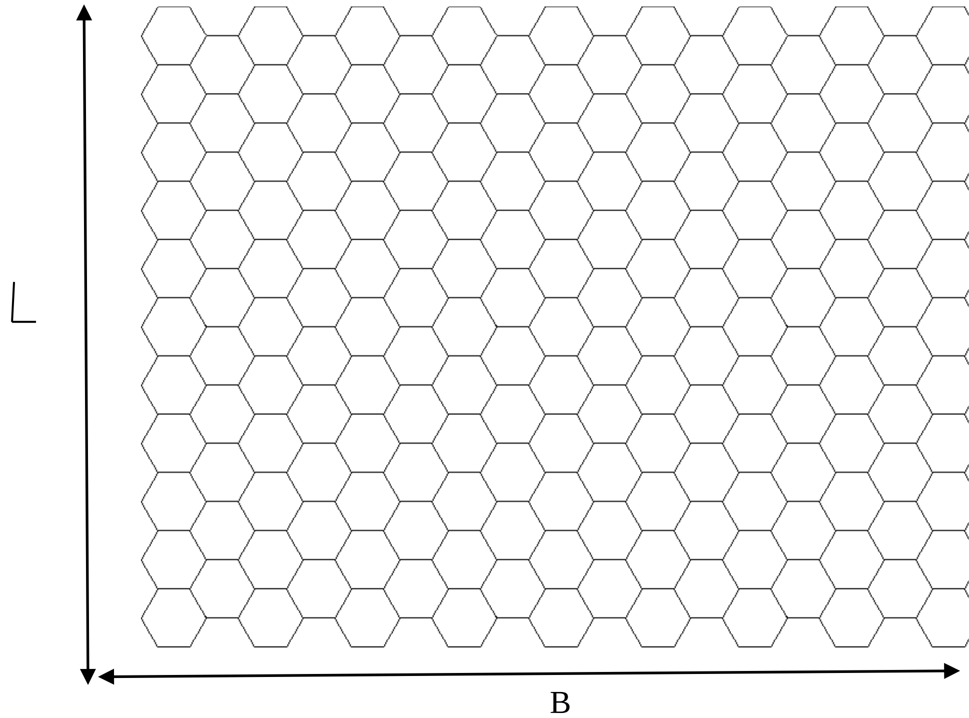

Fig 4.1 partition of ROI

Following mathematical relations can be established to find out the value of M and N. Distance between two parallel sides of hexagon is √3R.

$$N = \frac{L}{R\sqrt{3}}$$

$$B = (M - 1) * \frac{3R}{2} + 2R$$

Then

$$M = \frac{2B - R}{3R}$$

Where: L= length of ROI
B= Breadth of ROI
M= number of rows
N= number of regular hexagon in one row
R= side of regular hexagon

Therefore, Total no. of regular hexagons present in ROI after tessellation is M×N;

Conclusion

This approach is suitable in areas where manual organization of nodes is not possible. By performing the experiments using MSNs for ROI we have observed that mobile sensor nodes cover the whole region without any coverage hole and MSNs travel the optimum distance without coverage overlap. MSNs are disconnected and their travelling distances are minimized.

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