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A Star-Polygon shape Network with High Maintainability

Neelu Gangwar[1] , Vandana[2]

Assistant Professor, Computer Science, S.R.M.S.W.C.E.T., Bareilly, India [1]

Assistant Professor, Computer Science, S.R.M.S.W.C.E.T., Bareilly, India [2]

Abstract: The satellite network, together with the traditional ground network, constitutes the Space–Ground Interconnection Network (SGIN), which can provide global coverage for communications and become an important developing trend of the next generation network. There are many factors and methods in network systems to discover and maintain the routes to the destinations in the wireless environment. A network with star shape architecture has many advantages in the network deployment, According to number of paths available in the network. In this paper we emphasis on the benefits of star shape architecture in path selection, security and manageability of data flow transmission. The star shape network uses the polygon concepts which can provide the better communication in data transferring.

Keywords: polygon, hexagonal clustering, static deployment, topology, overlapped area.

I. INTRODUCTION

Despite their broad applications in graphics and robotics, the star polygon decomposition are highly challenging and have been little explored A star polygon is a non-convex polygon which looks in some way like a star. In geometry, a regular star polygon is a self-intersecting, equilateral equiangular polygon. A star polygon shape layout of the nodes can be used in network deployment due to the many characteristics of polygons as complete connectivity, free space complexity [1], point location, robotics, and visibility and mesh generation. A straight line movement is the main concept in the node traversing, provides the collision free path by covering all the nodes without any reptilian of the node. Data transmission will be allowed to take place on several routes between the source and the destination in parallel. This strategy ensures low error rate and low latency of data transmissions, and also fully utilizes link resources of the satellite. Decomposition is a technique commonly used to break complex models into sub-models that are easier to handle Convex decomposition, which partitions the model into convex components, is interesting because many algorithms perform more efficiently on convex objects than on non-convex objects. Convex decomposition has application in many areas including pattern recognition.[7]

Polygon: A closed plane figure made up of several line segments that are joined together. The sides do not cross each other. Exactly two sides meet at every vertex.

Types of Polygons

Convex:
A straight line drawn through a convex polygon crosses at most two sides. Every interior angle is less than 180^0.

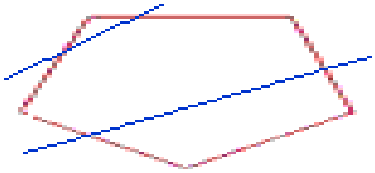

Fig.1

Concave:
We can draw atleast one straight line through a concave polygon that crosses more than two sides atleast one interior angle is more than 180^0.[9]

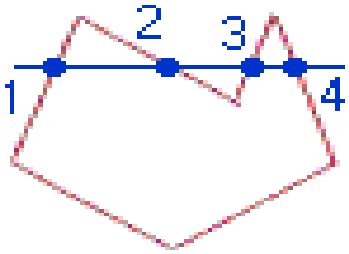

Fig.2

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II. Related work:

Polygons are used to model objects in applications where geometry is important. In polygon decomposition a polygon is represented as the union of a number of simpler component parts. Polygon decomposition has many theoretical and practical applications and has received attention in several previous surveys. Pattern Recognition is one area that uses polygon decomposition as a tool.

Pattern recognition techniques extract information from an object in order to describe, identify or classify it. An established strategy for recognizing a general polygonal object is to decompose it into simpler components, then identify the components and their interrelationships and use this information to determine the shape of the object. Other applications of polygon decomposition include data compression; database systems image processing, computer graphics and computer networks.

III. Properties of star polygon decomposition:

1. Star-shaped decomposition: Star shape decomposition partitions a shape into a set of star-shaped components. A shape is star shaped if and only if there exists at least one point which can see all the points in the shape.

A decomposition is called partition is the component sub polygons do not overlap except at their boundaries. We distinguish between two types of decomposition partitions and coverings. A decomposition is called partition is the object is decomposed in to non-overlapping pieces. If the pieces are allowed to overlap then we call the decomposition is covering.

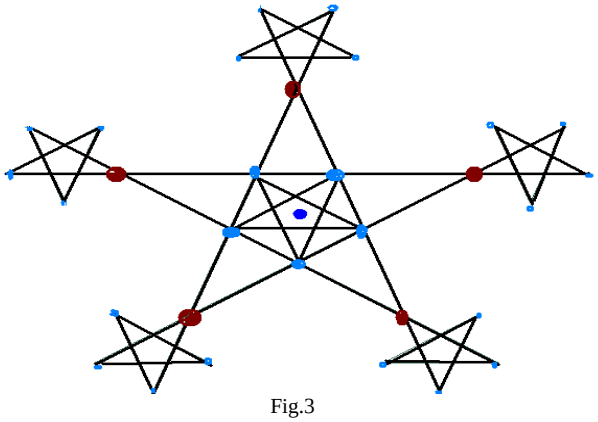

Fig.3

2. Wide coverage: Due to the first property, decomposing a configuration space into star-shaped components can be beneficial, e.g., for solving motion planning problem. A key concept in studying motion planning problems is the idea of configuration space [4]. A configuration space includes free configuration space that is a subset of collision free configuration connects the start configuration to the goal configuration.

The concept of star-shaped decomposition is related to the finding the minimum number of guards that can cover a region. By using star shape polygon decomposition a number of guards can be computed. A single point in star shape network called the guard can see every point in the star shaped region. The advantage of using star shape decomposed network that we required minimum number of guard that can inspect the whole star region.

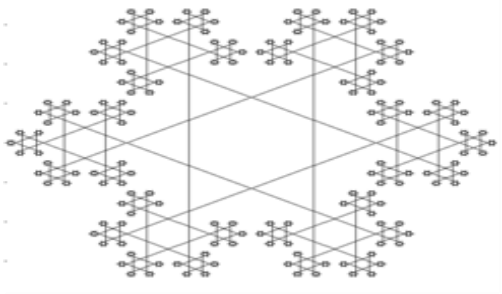

Fig. 4

2. Complete Path Planning:

The star-shapedness property of each region implies that we can connect start and goal configurations respectively by straight line paths. We compute a path between start and goal state based on graph search which enables us to find collision-free path and coverage of every node.

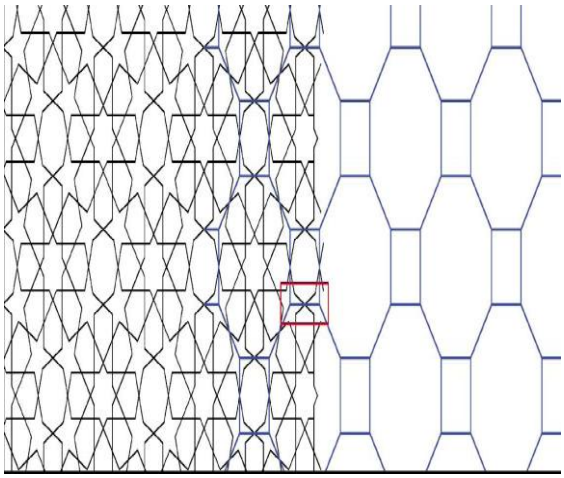

Fig.5

3. Node placement strategies: Node placement schemes prior to network start up usually base their choice of the particular nodes' positions on metrics that are independent of the network state or assume a fixed network operation pattern that stays unchanged throughout the lifetime of the network.

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Static node positioning: - Static network operation models often assume periodic data collection over preset routes. By star shape network deployment methodology, various objectives can be fulfilled such as area coverage, network connectivity, and network longevity and data fidelity.

4. Network connectivity:
The connectivity implies that there are different independent paths. The network can tolerate some node and link failures and guarantee certain communication capacity among nodes by using alternative path strategy.

5. **Motion planning**:
Star shape decomposition partitions a shape into a set of star-shaped components. A shape is star shaped if and only if there exists at least one point which can see all the points in the shape. Due to this interesting property, decomposing a configuration space into star-shaped components can be beneficial, e.g., for solving motion planning problem. A key concept in studying motion planning problems is the idea of configuration space [4]. A configuration space includes free configuration space that is a subset of collision free configuration connects the start configuration to the goal configuration.

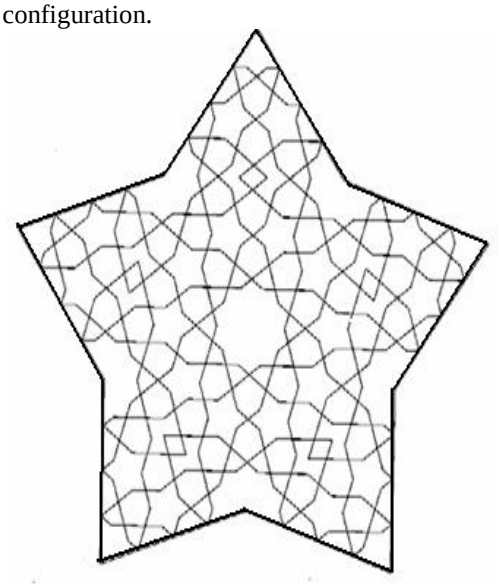

Fig.6

6. Better topological arrangement:
Topological relationships are built from simple elements into complex elements: points (simplest elements) and arcs (sets of connected points) are used to represent more complex features such as areas (sets of connected arcs). Shape files do not explicitly record topology.

Coverages represent geographic features as topological line graphs. Topology can be useful for many GIS modeling operations that do not require coordinates. For example, to find an optimal path between two points requires a list of the arcs that connect to each other and the cost to traverse each arc in each direction. Coordinates are only needed for drawing the path after it is calculated.

7. Finding adjacent features:
The adjacent features can easily be founded by intersecting target polygons with polygons in the same map and identifying the points of intersection of polygons that touch boundaries or overlap. The geometric intersections of adjacent features are calculated by comparing the vertices of adjacent features rather than looking up adjacent features in a table.

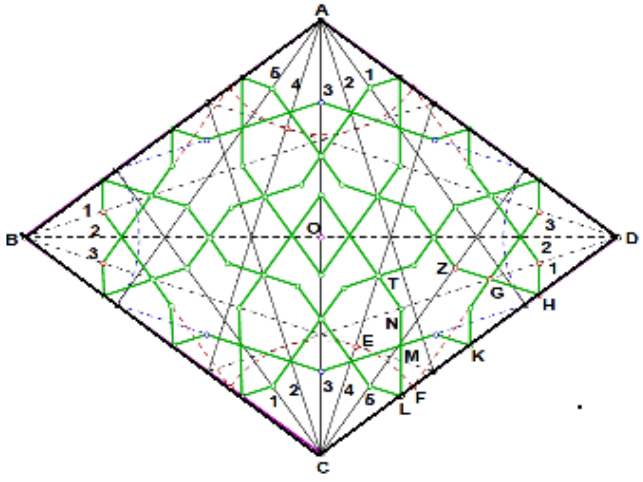

Fig.7

8. Cooperative Communications in WSN:
WSN is deployed with hundred or thousand of structural or randomly placed nodes making it ideal for cooperative communications. Selections of nodes in a cooperative group which are approximately at same distance from the intended receive nodes, results in equal energy consumption per bit in cooperative communications
By selecting closest nodes within a large cooperative group, we can decrease energy consumption per bit in intra-cooperative node communications by using star polygon shape network. In small cooperative group, the adjacent node can be found by complete connectivity, but as the group size increases the full connectivity increase the cost and as well as the energy consumption.

9. Pairing of nodes using hexagonal clustering:
To establish a network node pairing is the main concern in network security using keys. A method for setting a key on a sensor network based on a hexagonal clustering structure is

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provided to improve the probability of setting the key directly by increasing resistance against capturing a node. A method for setting a key on a sensor network based on a hexagonal clustering structure includes the steps of:

1. Distributing data related to the key to a cluster head arranged in a center of each cluster and a node to be arranged by a hexagonal cluster of the sensor network. Grasping a neighboring node among nodes closely arranged in a center of a cluster head setting a pair wise key between the nodes and between the cluster heads.

2.In the step 2 by using the data related to the key distributed in the Step1; demanding the related data for setting the pair wise key and the node included in other clusters among the neighboring nodes .[8]

10. Improved Quality service (QoS): The goal of an optimal sensor deployment strategy is to have a globally connected network, while optimizing coverage at the same time. By optimizing coverage, the deployment strategy would guarantee that optimum area in the sensing field is covered by sensor.[5]. In order to accomplish the designated task successfully, sensors need to actuate, compute and disseminate the acquired information amongst them. Intuitively, coverage denotes the quality of sensing of a sensor node. While a sensor senses, it needs to communicate with its neighboring sensor nodes in order to disseminate the acquired data. That is where connectivity comes in to place. The network which is decomposed into star shape polygon fulfills these two main properties: connectivity and coverage, which provide the improved quality service. [11]

IV. Conclusion

In this paper we emphasis explority research on star shaped polygon decomposition .we are indicating different properties of this magic star shape in network deployment because it can be suited in different types of network due to its properties as covering, complete connectivity, security because of hexagonal clustering, multiple path routing, less energy consumption, an easy to extend the network and improved quality services.

REFERENCES

[**1]** Star-shaped Roadmaps - A Deterministic Sampling Approach for Complete Motion Planning/
[2] Strategies and techniques for node placement in wireless sensor networks: A survey Mohamed Younis a,*, Kemal Akkaya b
[3] SECURE TWO-PARTY PROTOCOLS FOR POINT INCLUSION PROBLEM by Tony Thomas
[4] Planning Motion in Point-Represented Contact Spaces Using Approximate Star-Shaped Decomposition by Jyh-Ming Lien and Yanyan Lu
[5]. Controlling the Coverage of Wireless Sensors Network Using Coverage in Block Algorithm By Rashid Azim
[6] Research on Multi-Path QoS Routing Strategy for the Satellite Network Guanghua Song,Mengyuan Chao, Bowei Yang, Hua Zhong, Yao Zheng
[7] H. Y. F. Feng and T. Pavlidis. Decomposition of polygons into simpler components: feature generation for syntactic pattern recognition. IEEE Trans.
[8] Method for establishing pair wise key based on hexagonal clustering sensor network architecture (29-Jun-2007)
[9] Area Coverage Algorithms for Multiagent Surveillance Tasks Author: Pavichaya Eaungpulswat
[10] Islamic Star Patterns in Absolute Geometry CRAIG S. KAPLAN University of Waterloo and DAVID H. SALESIN University of Washington and Microsoft Corporation
[11] Akyidiz, W. Su, Y. sankarasubramaniam, and E.Cayirci. "Wireless sensor networks: A survey, "Computer Network(Elsevier) Journal, vol. 38, no. 4, pp. 393-422, Mar.
[12] R. Sarhangi, *Regular Polygons and the Geometer's Sketchpad,* Banneker Banner, the Journal of The Maryland Council of Teachers of Mathematics, Volume 20 – Number1, PP. 30-33, Spring .
[13] R. Sarhangi, *Elements of Geometry for Teachers*, Addison-Wesley Publishing, Inc., Boston, Massachusetts.
[14] A. Gray and R. Sarhangi, *Study and Application of African Designs for Use in Secondary Education*, 2001 Bridges Proceedings, *Mathematical Connections in Art, Music, and Science*, R. Sarhangi and Slavik Jablan (Eds.), Central Plain Book Manufacturing, Kansas.