Review Article Impact Factor: 0.621 ISSN: 2319-507X
Sagar Tayade, IJPRET, 2014; Volume 2 (9): 687-691 IJPRET

INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

"LOCATION SERVICE IN WIRELESS SENSOR AND ACTOR NETWORKS"

MR. SAGAR A. TAYADE[1], MR. H. R. DESHMUKH[2], S. H. KUCHE[3], MR. N. S. BAND[3]

1. M.E I Year, IBSS COE, Amravati.
2. Prof and Head, CSE, IBSS COE Amravati.
3. Asst. Prof., CSE, IBSS COE Amravati.

Accepted Date: 27/02/2014 ; Published Date: 01/05/2014

Abstract: Location service is an efficient solution to handle actor mobility in wireless sensor and actor networks. In previous works, the information that the actor updates to location servers is its latest location. However, in most applications, the actor knows its own mobility strategy, such as its destination, trajectory and speed. If the actor can share its mobility strategy in the update packet, it will be helpful to improve the performance of location service. In this letter, we propose a mobility strategy sharing location service protocol called MLS, to show the description of mobility strategy in the update packet and its utilization for routing. The theoretical analysis and simulation results show that, sharing mobility strategy greatly reduces the update overhead and improves the scalability of MLS.

Keywords: Location Service, Mobility Strategy, Wireless Sensor And Actor Network.

Corresponding Author: MR. SAGAR A. TAYADE

Access Online On:

www.ijpret.com

How to Cite This Article:

Sagar Tayade, IJPRET, 2014; Volume 2 (9): 687-691

PAPER-QR CODE

INTRODUCTION

WIRELESS sensor and actor networks (WSANs) [1] are composed of a large number of sensor nodes and multiple mobile actors. The actors move in a large area to execute missions, such as survivor rescue or fire surveillance. The sensor nodes monitor the area to support the actors. When a sensor node detects the event of interest, it will actively transmit an event report to the actor. Due to the actor's mobility, its location information is normally unavailable for sensor nodes. Therefore, how to forward the event report to mobile actors is a challenging issue. Location service is an efficient solution to handle mobility in ad-hoc and sensor networks [2]–[6]. In location service, the actor sends update packets, which contains its latest location, to a set of sensor nodes called location servers. The source sends query packets to obtain the actor's location from location servers. Then it can deliver the event report by using geographic routing, such as GFG routing [7] which guarantees reliable delivery.

The major cost of location service is the update overhead which depends on the selection of location servers and the frequency of location updates. Some research works, such as XYLS [3], GLS [4] and GHLS [5], have proposed different ways to select the set of location servers to reduce the overhead in a single location update. In previous works, the information saved in the update packet is the actor's location. Actually, in most applications the actor knows its own mobility strategy, such as its destination, trajectory and speed. If the mobility strategy can be shared in update packets, it may be greatly helpful for sensor nodes to predict the actor's location. In this case, the actor only needs to disseminate update packets when its mobility strategy changes. Thus the frequency of location updates decreases, and so as the update overhead. Based on this observation, we are interested in the potential benefits that can be obtained by sharing mobility strategy. In this letter, we propose a Mobility strategy sharing Location Service protocol called MLS. In MLS, we provide the format of update packets to save the essential information of the actor's mobility strategy, and then explain how to use the mobility strategy to estimate the actor's location with low complexity.

2. WORKING

The existing location service approaches can be divided into three categories: flooding-based, quorum-based and home based approaches [2]. The flooding-based approaches can be further divided into proactive and reactive approaches. In proactive scheme [8], the actor floods its update packets to all or large portion of nodes in the network, such that the source can obtain the actor's location directly. On the other hand, in reactive scheme [9], the source floods a packet in the network to notify the actors. In the quorum-based approaches, such as XYLS [3], the actor updates its location to a subset of sensor nodes, and the source sends its location query to another subset. The intersection of these two subsets becomes the rendezvous area where the query will be responded. In home-based approaches, such as GHLS [5], a home region is selected that is known to all nodes in the network. The actor updates its latest location to the home region, while the sources can query the actor's location from the home region.

3. LOCATION SERVICE PROTOCOL

1. Network Model

We consider a network with N sensor nodes and one actor uniformly deployed in a square area. The network area is virtually divided into H × H grids.

The side length of the grid is l, thus the side length of the whole area is l · H. We assume that a node can communicate with the nodes reside in its neighbouring grids directly; hence the value of l is dependent to the transmission range R. The time is divided into slots, and all nodes in the network have perfect time synchronization.

2. Protocol Design

In this subsection, we provide the details of the MLS protocol. In random waypoint model, after the actor reaches its destination (x0, y0) in one step, it should decide its mobility strategy in the next step including: the location of the next waypoint (x1, y1) and its speed v. Then the actor creates the update packet which includes: initial timestamp t0, the coordinate of its current location (x0, y0), the coordinate of the next waypoint (x1, y1), and the moving time τ as follows, Then the actor disseminates the update packet into the network. In MLS, we adopt the quorum-based approach (XYLS) [3] to disseminate the update packet. The update packet is forwarded to all the nodes located in the grids of the same column. That is, as shown in Fig.1, the actor sends the update packet in both north and south direction to reach the north and south boundaries through geographic routing. The sensor nodes located in the column become location servers and form an update quorum. They save the update packet for a given interval τ, which is calculated by Eqn. (1) and stored in the update packet. After τ slots, it discards the update packet and returns to idle state. When a source needs to transmit an event report to the actor, the event report is firstly transmitted along the east west direction, i.e. the query quorum in the network area. The query quorum is expected to intersect at least one location server in the update quorum.

4. PERFORMANCE

Update Overhead

We compare the update overhead of MLS and XYLS. Considering the impact of the update frequency f, the update overhead E is defined as the number of transmitted update packets in a given time T. In MLS, the actor executes location update whenever it arrives at the waypoint. The average distance between two random points in a unit square is around 0.52. Therefore, the mean distance between two waypoints is 0.52. Given the actor's speed v, the average number of location updates within T is v•T 0.52•l•H. The update packet is transmitted along the update quorum which covers H grids, thus the cost of a single update is H. Then we have the update overhead of MLS, a new update is sent after every movement of distance d, which is called the update threshold.

5. SIMULATION RESULTS

We evaluate the performance of MLS by simulations. Both MLS and XYLS are implemented in OMNeT++ [13]. The following performance metrics are evaluated: (1) Delivery Ratio - the percentage of event report successfully delivered to the actor; (2) Update Overhead - the number of update packet transmissions; (3) Path Length - the total number of hops each successfully-delivered event report takes from source to actor. It represents the latency of event report transmission.

1. Impact of Mobility Uncertainty

Considering the mobility uncertainty in the real world, in simulations, the actor movement follows a modified random waypoint model which combines the random motion vector used in RPGM model. The actor's trajectory from the starting waypoint (x0, y0) to the destination waypoint (x1, y1) is divided by checkpoints. A set of reference points are firstly selected on the straight line between (x0, y0) and (x1, y1). The distance between reference points is a constant value called step length ds.

2. Scalability

We compare the performance of MLS and XYLS with respect to different network area. The side length of the network area ranges from 150m to 600m. Compared with XYLS, MLS reduces the update overhead by 55% – 90% when the network area expands. In XYLS, the update overhead increases with the growth of network area, because the number of location servers grows linearly with the network area. On the other hand, in MLS, the update overhead slightly decreases with the growth of network area. It is because the update frequency of MLS is smaller in a larger network. By sharing mobility strategy, the scalability of location service is greatly improved.

6. CONCLUSION

In this way, we propose a new location service protocol called MLS which disseminates the actor's mobility strategy instead of its location. The theoretical analysis and simulation results show that, MLS can provide reliable data delivery with certain degree of mobility uncertainty. Compared with the well-studied XYLS scheme, MLS has lower update overhead and better scalability.

7. REFERENCES

1. I. F. Akyildiz and I. H. Kasimoglu, "Wireless sensor and actor networks: research challenges," Ad Hoc Networks, vol. 2, no. 4, pp. 351–367, 2004.

2. X. Li, A. Nayak, and I. Stojmenovic, "Location service in sensor and mobile actuator networks," Wireless Sensor and Actuator Networks: Algorithms and Protocols for Scalable Coordination and Data. Wiley. 2010.

3. I. Stojmenovic and B. Vukojevic, "A routing strategy and quorum based location update scheme for ad hoc wireless networks," University of Ottawa, Canada, Tech. Rep. TR-99-10, 1999.

4. J. Li, J. Jannotti, D. S. J. De Couto, D. R. Karger, and R. Morris, "A scalable location service for geographic ad hoc routing," in 2000 ACM MobiCom.

5. S. M. Das, H. Pucha, and Y. C. Hu, "On the scalability of rendezvousbased location services for geographic wireless ad hoc routing," Computer Networks, vol. 51, pp. 3693–3714, Sep. 2007.

6. Z. Chen, M. gyu Cho, and K. Shin, "Design of location service for a hybrid network of mobile actors and static sensors," in 2006 IEEE RTSS.

7. P. Bose, P. Morin, I. Stojmenovi´c, and J. Urrutia, "Routing with guaranteed delivery in ad hoc wireless networks," Wireless Networks, vol. 7, pp. 609–616, Nov. 2001.

8. N. Chang and M. Liu, "Controlled flooding search in a large network," IEEE/ACM Trans. Netw., vol. 15, no. 2, pp. 436–449, 2007.

9. Z. Xu, C. Chen, Y. Guo, and X. Guan, "Ballooning: an agent-based search strategy in wireless sensor and actor networks," IEEE Commun. Lett. vol. 15, no. 9, pp. 944–946, Sep. 2011.

10. C. Bettstetter, H. Hartenstein, and X. P´erez-Costa, "Stochastic properties of the random waypoint mobility model," Wireless Networks, vol. 10, pp. 555–567, Sep. 2004.