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A Review on the Object Tracking in WSN using Spatial Resolution

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***Abstract*-Wireless sensor networks have the potential to great significant subsystems of networks applications. Tracking remote targets is an important wireless network application in both military and non-military fields for applications like finding objects or humans or guiding wireless robots in hard to reach areas e.g. nuclear-power plants etc. Tracking mobile targets involves detection and localization of the object of interest by processing the information provided by the remote nodes along with their location and route. Actually Target tracking is main problem in sensor network. Where it's detect and how accurate position can measured. i studies the target tracking problem in a MSN, where it is believed that mobility tracking can be exploited to improve the tracking resolution. This problem becomes more challenging when target and sensor are not at same position. I find out the correlations and sensitivity from a set of system parameters and the minimum number of mobile sensors that is required to Maintain the resolution for target tracking. The simulation results demonstrate that the tracking enhancement.**

***Index Term* - Target Tracking, Spatial Resolution, Mobile Sensor Network.**

I. INTRODUCTION

The targeting of sensor network technology has enabled the detection of target and tracking the target in a huge scale conditions. So this paper, we are making the concentrate on target tracking by remote targets and mobile sensors. Also interested in the concrete resolution. The concrete resolution means how accurate a remote target's position can be detected by sensors, and defined the difference between the estimated and the current paths in WSN[18]. Our main approach are to establish the framework for tracking the target in remote mobile sensor networks, and demonstrate how the mobility can be improve the sensors tracking performance. Given an initial sensor deployment over a regional area and a sensor mobility pattern according to target, targets are consider to cross from one boundary of the regional area to another area. We define the spatial resolution is nothing but the deviation between the estimated and the actual current target travelling path, which can also be explained as the distance that a target is not covered by any remote sensors[15]. Given the mobility of both targets and sensors mobility, it is very challenging to model such as problem for multiple moving objects/targets. Furthermore, we are also interested in determining the minimum number of mobile sensors that needs to provide the concrete resolution in mobile sensor networks. So our problem is near about similar to the collision problem which is available in kinetic theory of the gas molecules used in physics, This theory allows us to maintain the dynamic relationship between mobility of targets and sensors.

The binary sensing model normally for tracking which is used for wireless sensor networks has been studied in several priories' works. In binary sensor network model, each sensor node consists of sensor that each sensor is allow to supply only one bit of information. We consider that each sensor nodes have only one binary sensor that can detect whether the object in approaching or moving away, nothing but plus sensor and minus sensor. The work which in showed that a network of binary sensors has some geometric properties and this properties can be used to develop a solution for tracking the object with binary sensors. Another work also considered a binary sensing model. It obtain piecewise linear path approximations Calculated using variants of a weighted centroid Algorithm, and also calculated good tracking performance if the trajectory is smooth enough. And also define fundamental performance limits of tracking a target or any object in a two-dimensional field of binary proximity sensors, and also designed algorithms that attained those limits which is used in WSN. Particular works in wireless sensor networks have

studied the limits of tracking performance in term of spatial resolution.
We concentrate on the something new which is completely different from all prior works.

There are two different features of our work:

1) We try to identify dynamic aspects of the tracking a target which if depend on sensor as well as target mobility.

2) Also we concentrate on spatial resolution in a mobile sensor network. Our model has dynamic problem, and examine its sensitivity under various parameters and configurations[18]. We know this is a totally new study of tracking a target in mobile sensor networks. And also Describes the wireless network and mobile model, as well as target tracking problem in a MSN.

II. LITERATURE SURVEY

The survey of other explores fundamental or basic performances limits of tracking a target in a two-dimensional field of binary proximity remote sensors, and defines the algorithms that maintain those limits. In particular, using geometric analysis of an ideal sensor model, we prove that the spatial resolution in localizing a target's trajectory is the order of 1 /ρR, R means sensing radius and ρ is a sensor density per unit area. Using an Occam's razor approach, we then design a geometric algorithm for computing an economical piecewise linear as well as actual path that approximates the trajectory within this fundamental limit of accuracy. [1]
We propose a binary sensor network model, where each sensor's value is translated to one bit of information, whether the target is moving toward the sensor or away from the sensor. We show that a network of binary sensors has geometric properties and this property can be used to make a solution for tracking object with binary sensors and define resulting algorithms. Here we develop a particle filtering style algorithm for object tracking using such minimum remote sensors. [2]
The sensing capabilities of network remote sensors are affected by some factors in real deployment and it is have some practical considerations at the design level stage in order to achieve this sensing behaviour. Here we investigate the coverage issue in wireless networks which is based on probabilistic coverage and propose a distributed Probabilistic Coverage Algorithm. (PCA) are used to evaluate the degree of confidence in detection and provided by a randomly deployed sensor network. Simulation results show that area coverage and calculated by using the following algorithm like PCA is more accurate than the idealistic binary detection model. [5]

III. IMPLIMENTATION

MODULES

Sensing and Mobility Model

Measurement SWN for Tracking

3.1. NETWORK AND MOBILITY MODEL

We consider a MSN to consist of N (A) mobile sensors which is placed inside a two dimensional region. And this is shown in Figure 3.1. The region can be in any shapes under the proposed calculation. To keep it properly and try to mathematically tractable, we consider that A is a rectangular region, which has four boundaries. We assume the width of the area to be W and the length to be |A|/W, where |A| represents the area. For the partial configuration when t is equal to zero we assume sensors are deployed at a random uniform distribution. Under this consideration, the sensor location can be defined by a stationary two-dimensional Poisson process. Density of the Poisson process as nA. The number of sensors located in the region A, it will defined as a N(A), follows a Poisson distribution of parameter nA ·|A|.

$$pr(N(A) = K = e^{-n}A|A|(nA|A|)k/k!$$

Where k is a non-negative integer. We define Pr(Y) to be the probability that event Y occurs, and Pr(Y) =1−Pr(Y). The two-dimensional Poisson process results random uniform distribution sensor deployment at time t =0. Our emphasis is on discovering the tracking performance in an MSN, and therefore we abstract away lower layer networking issues, such as the communication overhead and the network architecture of the sensors.

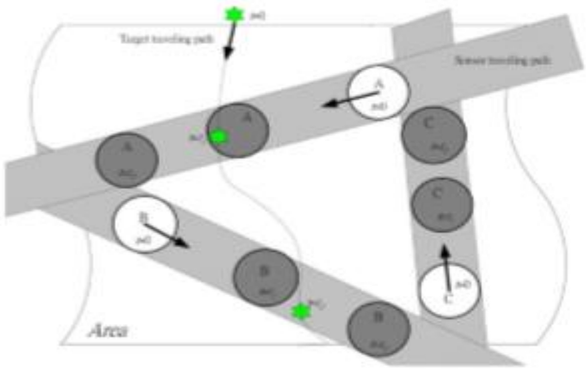

Fig 3.1 Example of Target Tracking in Mobile Sensor Network.

3.2 SENSING AND MOBILITY MODEL

We assume that in Mobile Sensor Network each sensor has a sensing region and that can only sense the environment and try to detect events within that region. A target is nothing but any object which is used to sensor detection and tracking as it travels in the particular region. It is said to be detected by a sensor if it has been available in the sensing region of the particular sensor. We consider the sensing region to be radius R which is centre at the sensor. Above definition is usually referred to as a binary sensing model or also called as disc based sensing model. In the target tracking calculation in this paper, we try to define probabilistic tracking. Ideally, a probabilistic sensing model such as the one in would be more appropriate result is given. For simplification we use the disc based sensing model in this work.

In an Mobile sensor network, depending on the mobile platform and Mobile scenario, sensors can selected from or depends on a variety of mobility strategies, from passive movements to highly coordinated and complicated motion of the sensor. Consider the one scenario like Sensors placed in the air, ocean or on wild animals which is move according to external forces such as air, ocean currents or animal movement patterns. And this movement patterns are consider as the uncontrolled sensor mobility model; menas that or we know simple robots may have a some limited set of mobility patterns, we can't use all patterns. Whereas advanced robots can navigate in a more complicated itinerary and move into very complicated pattern. In our work, we assume the following uncontrolled sensor mobility model which is used in MSNs. In this work we consider that sensors move independently and they don't have any co-ordination between them. The movement of a sensor is calculated by its speed and direction. And that time sensor randomly chooses a direction $\theta \in [0,2\pi)$ according to the distribution with probability density function $P\Theta$ (θ). The speed of the particular sensor is randomly chosen or measure from a range vm $\in$ [0, vmax m]; according to a probability density function of PVm (vm) and vmax m is defined the maximum sensor speed. In MSNs a sensor travels to the boundary of area A at a depends on its speed and direction. Once its reach to particular boundary, the sensor is return back, to choosing another angular direction and continue the process. We refer this model which shown in the above model as the random direction mobility model.

In MSNs, Target movement is considering to follow a crossing path, which is referred as a path or line segment which is crossing from one boundary to another boundary. And that time we consider the velocity of a target which is denoted by a constant vi. In our work For the mathematical tractability, we consider that the movement of target is independent of the sensor mobility. But in reality, however, there could be spatial and temporal correlations on the mobility pattern.

ADVANTAGES OF PROPOSED SYSTEM

1. To improve the good tracking performance.
2. Required minimum sensor

3.3 TRACKING MEASUREMENT

We define the spatial resolution in Mobile Sensor Network is nothing but the average deviation between the estimated and the actual target travel paths, which is the extension WSNs. But in our network model, the deviation between the estimated and the actual paths can be defined as the distance that a target is not covered by any sensors in MSNs which is shown in our model. From Figure 3.2, the target is covered by sensors under the time periods (t1 to t2) and another time periods (t3 to t4), while it cannot be localized by any sensors in MSNs.

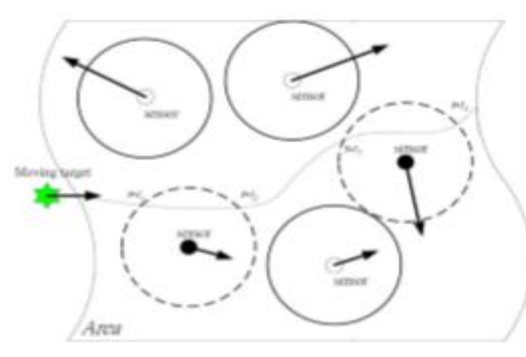

Fig 3.2 the Spatial Resolution of Sensor Network

Before t1, after t4 and between t2 to t3. In this fig show that the average deviation can then be calculated by the average travel distance during those time periods. After that we then define the uncovered distances as a referred the travel distances of a target between successive sensor coverage. In this work, or our work we say that we use the term average deviation instead of the maximum deviation for the detailed study of the spatial resolution.

3.4. TARGET TRACKING IN A MOBILE WIRELESS SENSOR NETWORK

In Target tracking in MSNs, we try to calculate the target tracking problem in an MSN. And the problem is similar to problem in classical kinetic theory of gas molecules which is used in physics, nothing but the mean free path theory. When we make the comparison, we can consider a mobile sensor as a gas molecule, and a target as a electron[19].

3.5 SPATIAL RESOLUTION

Our main objective is to calculate the spatial resolution in Mobile sensor network. This objective can be calculated by modelling -the average deviation between the estimated path and the actual target travel paths, which is the average travel distance of a target between successive coverage by mobile sensors in the MSNs. We use the notation λ to represent or denote the average travel distance of a target between successive sensor coverage. We first try to assume sensors are stationary and relax then extend our formulation to consider sensor mobility in MSNs. After Recall that the sensing range is R, (R is nothing but sensing range) when time=0, a cross section of coverage can be defined by using a circle with the diameter 2R. The concept of cross section is used to define the coverage between a target and the sensors. After the some period of time Δt, the circle swept out an area (which is shown in Figure 3) and the amount of sensor coverage be calculated from the density of mobile sensors (nA = N (A)/|A|) inside the area.
Theorem 1: The spatial resolution nothing but average of uncovered distance in the static sensor case can be written as

$$\lambda = \frac{1}{(n_A)\cdot(2R+\pi R^2/v_i\Delta t)},$$

Proof: The average of uncovered distance which is used to as the travel distance of a particular target which is divided by the number of sensor coverage, or it is equal to the target speed which is denoted by vi divided by the coverage rate (Θs).

$$\lambda = \frac{v_i}{\Theta_s} = \frac{v_i}{n_A \cdot S \cdot v_i}$$

In above equation S is equal to or S = (2R+πR2/viΔt) is the cross section of coverage for static sensors.
Then we try to calculate the average uncovered distance in a Mobile sensor network, it is needed to assess the average relative velocity of sensors with respect to moving targets or mobility of target. The relative velocity can be measured in terms of the targets' and mobile sensors' velocity vectors. In this paper, for simplification, we try to use the random direction mobility model to describe mobile sensor movement or Mobility of Sensor. After that we consider the case with homogeneous velocity of mobile sensors and try to calculate the coverage rate.

Theorem 2: The coverage rate in MSNs can be calculated by following equation:

$$\Theta_v = n_A \cdot S \cdot \overline{v}_{rel}$$

Proof: Consider a target which is denoted by i has a certain probability of being which is covered by some mobile sensors j for j ∈∀ N (A) a with corresponding cross section Sj and sensor density nj. Then we got following equation:

$$\Theta_v = \overline{v}_{rel} \cdot \sum_{j\in\forall N(A)} (n_j \cdot S_j) = n_A \cdot S \cdot \overline{v}_{rel}$$

The inverse of the coverage rate is the uncovered time duration

IV. CONCLUSIONS AND FUTURE WORK

We have studied the target tracking problem in mobile sensor networks. By modelling the dynamic aspects of the target tracking that depend on both sensor and target mobility. The results demonstrated that mobility can be exploited to obtain better spatial resolution.
1. Reduce the detection error of mobile sensors under varying sensor speeds.
2. To refine the sensor mobility model. For example, a practical distributed target tracking and sensing information exchange protocol becomes an interesting future research topic when sensors are required to trace the target paths. It will be determine a accurate path from source to destination in a minimum time duration

and also design new strategy for tracking a moving object with a Binary Sensor Network.

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REFERENCES

[1] N. Shrivastava, R. Mudumbai, U. Madhow, and S. Suri. Target tracking with binary proximity sensors: Fundamental limits, minimal descriptions, and algorithms. In Proc. of SenSys. ACM, October 2006.
[2] J. Aslam, Z. Butler, F. Constantin, V. Crespi, G. Cybenko, and D. Rus.Tracking a moving object with a binary sensor network. In Proc. Of SenSys. ACM, November 2003.
[3] W. Kim, K. Mechitov, J.-Y. Choi and S. Ham. On target tracking with binary proximity sensors. In Proc. of IPSN. IEEE, April 2005.
[4] J. Singh, U. Madhow, R. Kumar, S. Suri, and R. Cagley. Tracking multiple targets using binary proximity sensors. In Proc. of IPSN. ACM, April 2007
[5]M. Hefeeda and H. Ahmadi. Probabilistic coverage in wireless sensor networks. In Conference on Local Computer Networks (LCN). IEEE, November 2005
[6] H. Zhang and J. C. Hou. Maintaining sensing coverage and connectivity in large sensor networks. Ad Hoc and Sensor Wireless Networks, 1(1- 2):89–124, March 2005
[7]R. R. Brooks, P. Ramanathan, and A. Sayeed, Distributed Target Tracking and Classification in Sensor Networks, Proceedings of the IEEE, September 2002
[8] B. Krishnamachari, Energy-Quality Tradeoff s for Target Tracking in Wireless Sensor Networks, IPSN 2003, 32-46.
[9] H. Yang and B. Sikdar, A Protocol for Tracking Mobile Targets using Sensor Networks, Proceedings of IEEE Workshop on Sensor Network Protocols and Applications, 2003.
[10]F. Zhao, J. Shin, and J. Reich. Information-driven dynamic sensor collaboration for tracking applications. IEEE Signal processing magazine.19(2):61-72 march 2002.
[11]Z. Khan, T. Balch, and F. Dellaert. Efficient particle filter-based tracking of multiple interacting targets using an MRF-based motion model. In Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems, volume 1, pages 254–259, 2003.
[12] Z. Khan, T. Balch, and F. Dellaert. MCMC-based par- ticle filtering for tracking a variable number of interact- ing targets. IEEE Transactions on Pattern Analysis and Machine Intelligence, 27(11):1805–1819, 2005.
[13]B. S. Y. Rao, H. F. Durrant-Whyte, and J. A. Sheen. A fully decentralized multi-sensor system for tracking and surveillance. Int. J. Rob. Res., 12(1):20–44, 1993.
[14]C.-F. Huang and Y.-C. Tseng, "The coverage problem in a wireless sensor network," in Proceedings of the 2nd ACM WSNA'03, Sep 2003.
[15] H. Zhang and J. C. Hou, "Maintaining sensing coverage and connectivity in large sensor networks," Tech. Rep. UIUDCS-R-2003-2351, Depart- ment of Computer Science, University of Illinois at Urbana Champaign, 2003.
[16]A. Howard, M. J. Mataric, and G. S. Sukhatme, "Mobile sensor network deployment using potential fields:A distributed, scalable solution to the area coverage problem," in 6th International Symposium on Distributed Autonomous Robotics Systems (DARS02), June 2002.
[17]A. Howard, M. J. Mataric, and G. S. Sukhatme, "An incremental self-deployment algorithm for mobile sensor networks," Autonomous Robots,Special Issue on Intelligent Embedded Systems, vol. 13(2), pp. 113–126, Sep 2002.
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