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TARGET TRACKING IN WIRELESS SENSOR NETWORK

[1]Manikanthan S.V, [2]Mr. S. Suganraj , [3]Ms. C. Jenitha
[1]ECE, Affiliated to Anna University
[2] M.E Communication Systems, Student
[3] Department of ECE, Assistant Professor,Mailam Engineering College,Tamil Nadu,India.
[1]Prof.manikanthan@gmail.com, [2]jssugansekar@gmail.com, [3]jenichander2013@gmail.com

ABSTRACT

Target Tracking is an important problem in sensor networks, where it dictates how accurate a targets position can be measured. In response to the recent surge of interest in mobile sensor applications, this project studies the target tracking problem in a mobile sensor network (MSN), where it is believed that mobility can be exploited to improve the tracking resolution. This problem becomes particularly challenging given the mobility of both sensors and targets, in which the trajectories of sensors and targets need to be captured. Derive the inherent relationship between the tracking resolution and a set of crucial system parameters including sensor density, sensing range, sensor and target mobility. Investigate the correlations and sensitivity from a set of system parameters and we derive the minimum number of mobile sensors that are required to maintain the resolution for target tracking in an MSN. The simulation results demonstrate that the tracking performance can be improved by an order of magnitude with the same number of sensors when compared with that of the static sensor environment.

KEYWORDS: Mobile Sensor Network, Sensing Range, Sensor Density, Sensor, Target Mobility.

I.INTRODUCTION

Wireless communication and MEMS- the two technologies which have revolutionalized the way we live have also resulted in the development of wireless sensor networks. These comprise of relatively inexpensive sensor nodes capable of collecting, processing, storing and transferring information from one node to another. These no desirable to autonomously for MANET work through which sensor readings can be propagated. Since the sensor nodes have some intelligence, data can be processed sit flows through the network. The latter is beings one wirelessly these day susing networking principles. The flexibility of installation and configuration has greatly improved resulting in a flurry of research activities commencing in the field of sensor networks owing to the already acceptance in various industries such as security, telecommunications and automobile to name a few.

II.RELATED WORK

WSNs are rapidly gaining importance in many fields, especially in the healthcare and industrial domains [1], [2]. They are also being deployed to track enemy vehicles in military applications [3], and to follow the movement of wild animals in environmental monitoring [4].In all applications, awareness of location information is fundamental, since collected data are meaningless without any geographical context. Typically, stationary sensors broadcast signals in the network, while targets collect these signals for location estimation. Many localization algorithms using stationary sensors have been proposed. They are mainly based on estimating the distances between the stationary sensors and the targets to be localized. Estimating these distances can be based on several types of measurements, such as received signal strength indicators (RSSIs) [5],

III. EXISTING WORK

However, these existing solutions can only be used to deal with adversaries who have only a local view of network traffic. A highly motivated adversary can easily eavesdrop on the entire network and defeat all these solutions. For example, the adversary may decide to deploy his own set of sensor nodes to monitor the communication in the target network. However, all these existing methods assume that the adversary is a local eavesdropper. If an adversary has the global knowledge of the network traffic, it can easily defeat these schemes. For example, the adversary only needs to identify the sensor node that makes the first move during the communication with the base station. Intuitively, this sensor node should be close to the location of adversaries' interest.

IV. PROPOSED WORK

We are primarily interested in target tracking by considering both moving targets and mobile sensors as shown in Figure 1. Specifically, we are interested in the spatial resolution for localizing a target's trajectory. The spatial resolution refers to how accurate a target's position can be measured by sensors, and defined as the worst-case deviation between the estimated and the actual paths in wireless sensor networks.

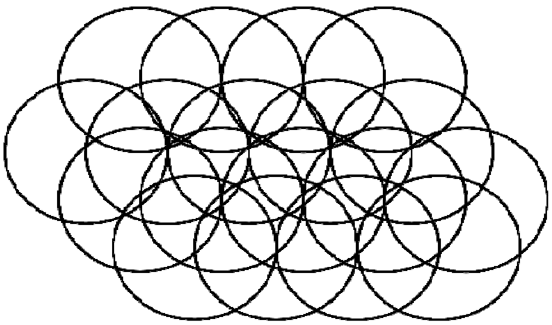

Fig (a)

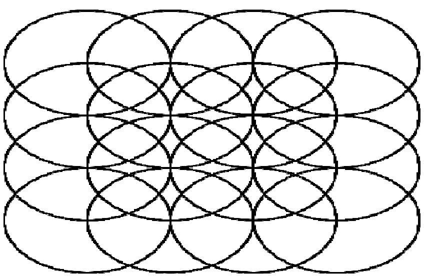

Fig (b)

Figure 1.

Our main objectives are to establish the theoretical framework for target tracking in mobile sensor networks, and quantitatively demonstrate how the mobility can be exploited to improve the tracking performance. Given an initial sensor deployment over a region and a sensor mobility pattern, targets are assumed to cross from one boundary of the region to another. We define the spatial resolution as the deviation between the estimated and the actual target travelling path, which can also be explained as the distance that a target is not covered by any mobile sensors.

V. EXPERIMENTAL RESULTS

The tracking results and error plots shown in the following pages have been obtained after simulating in MATLAB, the technique proposed in the previous chapter. Straight line, zero displacement, circular and random motion tracking results for speeds up to30~33m/sec have been shown. These illustrate the capabilities of the technique, its robustness and suitability to the various situations encountered in the real world. Referring to the system model described above, using the trilateration technique for detection and the estimation technique for the fourth sensor, these results have been obtained which lie within the acceptable error limits~ -5% to +5%.

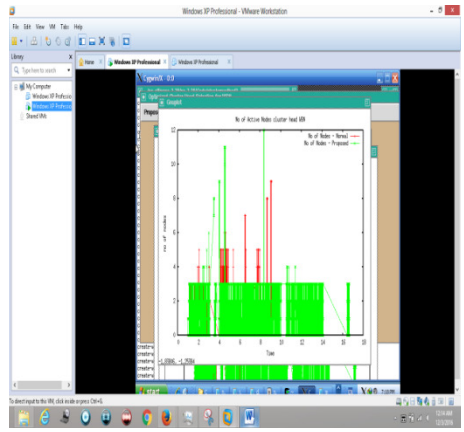

Figure 2.

Figure 2.shows the error in tracking the above circular motion of the object. The error ranges from+6%to -4% for the y-axis. The mean error for the above case is less than +.5% and the median is also close to it. The standard deviation in this case is close to2%.

VI. CONCLUSION

In this paper, we proposed two original regression models that relate the received signal strength indicators (RSSIs) to the distances separating sensors in a wireless sensor network. Then, we solved the tracking problem using the estimated distances and two new methods that take into account the target's motion. We provided a fully comprehensive study of the proposed distance models and their performances. Simulation results show that our models yield accurate distance estimation. Results also show that our tracking methods allow accurate position estimation, and are proved to be robust in the case of noisy data. Both proposed tracking methods outperform tracking using recently developed methods based on the WKNN method and the Kalman filter or some other learning strategy. Future work will handle further improvements of this work, such as wisely choosing a group of sensors instead of using all the available distance information. Solutions to cases where zones of the surveillance area are not covered by all sensors could also be provided.

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AUTHOR BIOGRAPHY

Mr. S. Sugan Raj pursued him B.E. in Electronics and Communication Engineering at Mailam Engineering college at Villupuram in the year of 2015. He is doing him M.E in Communication systems at Mailam Engineering college, Mailam. Her area of interest is Wireless sensor networks .