ISSN: 2349- 5197
Impact Factor (PIF): 2.138

INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

TRACKING MOVING TARGET LOCATION OF MOBILE SENSOR NAVIGATION USING ANT COLONY OPTIMIZATION IN WIRELESS SENSOR NETWORK

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Keywords: Ant Colony Optimization, Target Tracking, Mobile Sensor Navigation, Min-Max Approach, Time Of Arrival.

Abstract
Now a days Tracking mobile target is an big problem in wireless sensor network. This work is about the difficulties involved to track the target which emits the signal using the mobile sensor based on reception of signal. As the mobile target plan is unknown, time of arrival (TOA) measurements from the mobile sensor network is used by the mobile sensor controller. Mobile sensor controller collect TOA is obtained from both the mobile target and mobile sensor to direct mobile sensor to follow the target and also to estimate location. To estimate the location we used min max approach. System also proposes Ant colony optimization (ACO) to estimate location efficiently and for managing sensor mobility aiming at improving the tracking of a single target. This enlightens the approximation of the position of the nodes to guess the location of the nodes. Once the entity is managed, mobile sensor nodes concentrate in that entity and the location of the mobile sensor and target jointly to improve the tracking accuracy.

Introduction
Now a days, wireless sensor networks have found rapidly growing applications in areas such as environmental monitoring, automated data collection and surveillance. One of the significant uses of sensor networks is the tracking of a mobile target by the network. Mobile target tracking has a number of sensible applications, including search-rescue, wildlife monitoring, robotic navigation and autonomous surveillance. To keep check on movement of suspicious people and activities monitored using surveillance, tracking system and video monitoring. Usually, target tracking involves two steps. At first, it needs to estimate or predict target positions from noisy sensor data measurements. Then, it needs to control mobile sensor tracker to follow or capture the moving target. As a result the problem of mobile target positioning in a sensor network consists of stationary sensors and a mobile sensor. The aim is to estimate the target position and to control the mobile sensor for tracking the moving target.

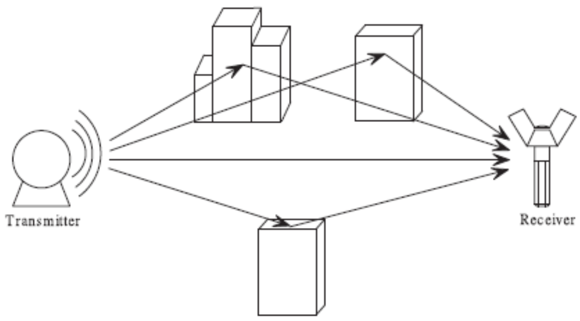

Figure 1.1 Abstract view of System

Literature survey
Element filtering has also been applied with RSS measurement model under interrelated noise to achieve high accuracy [1]. Kalman filter was proposed in [2], where a geometric-assisted predictive location tracking algorithm can be effective even without sufficient signal sources. To the use of stationary sensors, several other works focused on mobility management and control of sensors for better target tracking and location estimation. Zou and Chakrabarty [3] proposed a distributed mobility management scheme for target tracking, where sensor node movement decisions were made by considering the tradeoff among target tracking quality improvement, energy consumption, loss of connectivity, and coverage. In [4], a continuous nonlinear periodically time-varying algorithm was proposed for adaptively estimating target positions and for navigating the mobile sensor in a trajectory that encircles the target. Xu et al [5] have shown that direct TOA localization offers some performance gain over TDOA localization. Since the mobile sensor navigation control depends on the estimated location results, more accurate localization algorithm from TOA measurements leads to better navigation control

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Ant Colony optimization

A) ACO Algorithm

♦ Initialization:

a). Set initial parameters that are system: variable, states, function, input, output, input trajectory, output trajectory.

b). Set initial pheromone trails value.

c). Each ant is individually placed on initial state with empty memory.

♦ While termination conditions not meet do

a). Construct Ant Solution:

Each ant constructs a path by successively applying the transition function the probability of moving from state to state depend on: as the attractiveness of the move, and the trail level of the move.

b). Apply Local Search

c). Best Tour check:

If there is an improvement, update it.

d). Update Trails:

1. Evaporate a fixed proportion of the pheromone on each road.
2. For each ant perform the "ant-cycle" pheromone update.
3. Reinforce the best tour with a set number of "elitist ants" performing the "ant-cycle"

e). Create a new population by applying the following operation, based on pheromone trails. The operations are applied to individual(s) selected from the population with a probability based on fitness.

- Darwinian Reproduction
- Structure-Preserving Crossover
- Structure-Preserving Mutation

End While

B) Pseudo-code for Ant Colony Optimization

1). Create construction graph
2). Initialize pheromone values
3). While not stop-condition do
4). Create all ants solutions
5). Perform local search
6). Update pheromone values
7). End while

Mathematical model

Graph (N,E): where N = nodes, E = edges

d_{ij} = the tour cost from node i to node j (edge weight)

Ant move from one node i to the next j with some transition probability.

Where ,

$\tau_{i,j}$ - is the amount of pheromone on edge i , j

α - is a parameter to control the influence of $\tau_{i,j}$

$\eta_{i,j}$ - is the desirability of edge i , j (typically $1/d_{i,j}$)

β - is a parameter to control the influence of $\eta_{i,j}$

$$p_{i,j} = \frac{(\tau_{i,j}^{\alpha})(\eta_{i,j}^{\beta})}{\sum(\tau_{i,j}^{\alpha})(\eta_{i,j}^{\beta})}$$

Amount of pheromone is updated according to the equation

$$\tau_{i,j} = (1-\rho)\tau_{i,j} + \Delta\tau_{i,j}$$

Where

ρ - is the rate of pheromone evaporation

$\Delta\tau_{i,j}$ - is the amount of pheromone deposited.

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Conclusion

Proposed system Ant colony optimization (ACO) to estimate location efficiently and for managing sensor mobility aiming at improving the tracking of a single target. Proposed system also overcomes the drawback of existing system that is time delay. The Network simulation results show the performance analysis of the mobile sensor nodes compared with coverage range, time delay, remaining energy respectively. Hence a sequential algorithm and a joint weighted localization algorithm are used before controlling the mobile sensor movement to follow the target. In support of the identification of mobile sensors, the cubic law is applied to improve efficiency. Simulation results illustrate successful tracking and navigation performance for the proposed algorithms under different trajectories and noises.

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