Scientific Journal Impact Factor (SJIF): 1.711

e-ISSN: 2349-9745
p-ISSN: 2393-8161

International Journal of Modern Trends in Engineering and Research
www.ijmter.com

Location Update In Mobile Ad Hoc Network Using Markov Model

Ms. Vrushali M. Gaikwad[1], Dr. Deepak V. Patil[2]
[1]Computer Engineering, MET Bhujbal Knowledge City, Nasik
[2]Computer Engineering, MET Bhujbal Knowledge City

***Abstract*—** The location in a mobile ad-hoc network, where each node needs to maintain its location information. which frequently updating its location information within its neighboring region, which is called neighborhood update (NU).and updating its location information to certain distributed location server in the network, which is called location server update (LSU). The operation costs in location updates and the performance losses of the target application due to location application costs which imposes question for nodes to decide the optimal strategy to update the location information, where the optimality is used for minimizing the costs. The location update decision problem is modeled as a Markov Decision Process (MDP). The monotonicity properties of optimal NU and LSU operations with respect to location application cost under a general cost setting. Separable cost structure shows the location update decisions of NU and LSU. Which can be independently carried out without loss of optimality that is a separation property. From the separation property of the problem structure and the monotonicity properties of optimal actions which finds that 1) there always exists a simple optimal update rule for LSU operations 2) for NU operations. If no prior knowledge of the MDP model is available, then also it introduces a model-free learning approach to find a near-optimal solution for the problem.

***Keywords*-** Java markov decision process, Least square policy iteration, Location server update, Location update, Mobile ad hoc network, Markov decision process, Neighborhood update.

I. INTRODUCTION

Mobile ad hoc networks (MANET) are set of wireless mobile node that do not require infrastructure. They act as both router and host. There are some application of MANET like Personal area network (PAN), Military, Commercial sector, and civilian application. The Location update is available in MANET using Global Positioning Services (GPS) and Very large Integrated Circuits (VLSI).

Location services in a mobile ad hoc network (MANET), when each node needs to Maintain its current location information by 1) Neighborhood Update (NU) which Update location information within neighborhood region. 2) Location Server Update (LSU) which Update location information at one or multiple distributed location server. Neighborhood update is implemented by local broadcasting/ flooding of location information message. Location Server Update is implemented by unicast or multicast of the location information message.

A stochastic decision framework is used to analyze the location update problem in MANET. But in this we focused on MDP model. MDP provide a mathematical framework for modeling decision making in situations where outcomes are random and under the control of a decision maker. Markov Decision Processes (MDPs) is usually seen as a means to maximize the total utility for a given problem. Learning the transition model of an MDP independently of the utility function if it exists can be a very useful task in some domains. For example, this can be used for learning the transition model in a batch process, where in a first stage we are choose the good actions for optimizing the information, and after that in a second stage, we are interested in earning rewards function of MDPs, which are useful for wide range of optimization problems solved via dynamic programming and reinforcement learning. a Markov Decision Process is a discrete time stochastic control process.

MDP provide a mathematical framework for modeling decision making in situations where outcomes are random and under the control of a decision maker. Markov Decision Processes (MDPs) is usually seen as a means to maximize the total utility for a given problem. Nevertheless, learning the transition model of an MDP independently of the utility function if it exists can be a very useful task in some domains. For example, this can be used for learning the transition model in a batch process, where in a first stage we are choosing the good actions for optimizing the information gathering process, and afterwards in a second stage, we are interested in earning rewards MDPs are useful for studying a wide range of optimization problems solved via dynamic programming and reinforcement learning. A Markov Decision Process is a discrete time stochastic control process.
Markov chain: It is a mathematical system that transitions from one state to another, between a finite or countable number of possible states.
Markov Property: The next state depends only on the current state and not on the sequence of events that preceded it. This specific kind of "memorylessness" is called the Markov property.
An MDP model is composed of a 4 tuple

MDP = {S, A, P(.|s,a), r(s,a)}

where, S= state space, A= Action set, P(.|s,a)= set of state & action dependent state transition probability, r(s,a)= set of state & action dependent instant cost.

A. State Space

s =(m,d,q) ϵ S

where, m= current location of node,
d= distance between current location & the location last NU operation, q=time elapsed since the last LSU operation.

B. Action State

a=(a_{NU}, a_{LSU}) Є A

where, a_{NU}Є {0,1},

a_{LSU}Є {0,1}

0 stands for “Not update”

1 stands for “update”

C. State Transition Probability

The state transition between consecutive time slots is determined by the current state and action state i.e given current state s_t=(m,d,q) & action state a_t=(a_{NU},a_{LSU}).

D. Cost

NU Cost

$c_{NU}(a_{NU})$

where,

$c_{NU}(1) > 0$ for flooding/ broadcasting cost.

$c_{NU}(0) = 0$ as no NU operation carried out.

LSU Cost

c_{LSU}(m, a_{LSU})

where,

a_{LSU}(m,1) = Transmission between node and LS.

c_{LSU}(m,0)=0.

Application Cost

The tradeoff between the operation costs of location updates and the performance losses of the target application in the presence of the location errors is called as application costs.

- Local Application cost-

The application cost only depends on the node's local location error, it happens when its neighbourhood node is used form location information which is called as *Local Application Cost.*

cl(m,d,a_{NU})

Where,

function of the nodes position m.

d= local location error.

a_{NU}= NU action.

c_l(m,0,a_{NU})=0 when the location error d=0.

c_l(m,d,a_{NU}) is location error at any location m if no NU operation carried out.

- Global Application Cost-

The application cost depends on both the node's local location error and global location ambiguity, when both location information of the node within its neighbourhood and that at its LS are used is called *Global Application Cost.*

C_g(m,d,q,a_{NU},a_{LSU})

where,

m: Function of the nodes current location

d: Local Location error

q: location information at LS

a_{NU}: NU action

a_{LSU}: LSU action

C_g(m,d,q,a_{NU},a_{LSU})=

c_{dq}(m,d,q)	a=(0,0)
c_d(m,d)	a=(0,1)
c_q(m,q)	a=(1,0)
0	a=(1,1)

II. LITERATURE SURVEY

The MER algorithm is focused on the effect of noisy location information by considering the error probability when it making decision [2]. LSPI algorithm is a model-free learning approach or model which does not require the a priori knowledge of the MDP models, and its linear function provides a representation of the values of states which saves the space [4]. In ad hoc routing protocols forwarding decisions is based on the geographical position of packet destination. On position based routing for mobile ad hoc networks, it shown that the task of routing packets from a source to a destination can be separated which Discovering the position of the destination and the forwarding packets are based on the information [6].Geographic routing algorithm that alleviates the effect of location errors on routing in wireless ad hoc networks, Degradation the routing performance which depends on the transmission range of the sender, error characteristics of the sender and its neighbours of nodes. Stochastic model determine the optimal update boundary for the distance based location update in wireless environment [7]. A location aware computing device uses receiver to catch outside signals that uses to analyze and determine its current position [8]. Three natural strategies in which the mobile users make the decisions when and where to update the time-based strategy, the distance-based strategy, and the number of movements-based strategy [12]. But in proposed work Separable cost structure is used which shows the location update decisions of NU and LSU which can be independently carried out without loss of optimality [1].

III. PROPOSED WORK

As shown in fig.1 the functionality of system is divided into four blocks Tracker, Profile swapper, ringtone change and Server utilization. First block tracker is used to track the location of SIM. Second block profile swapper is used for swap the profile to silent mode in restricted area. Ringtone change is used to change the ringtone on appropriate date or day. And last one is Server utilization is for analyzing the performance of server.

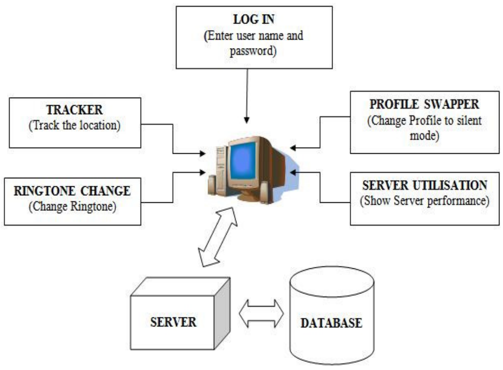

Figure 1: System flow for location update

A. Algorithm

Least Square Policy Iteration Algorithm (LSPI)
The algorithm is as follows:

1. Select basic function
   $\emptyset(s,a) = [\emptyset_1(s,a), \ldots \ldots \emptyset_b(s,a)]^T$
2. Initialize weight vector w_0, sample set D_0, stopping criterion ϵ.
3. K=0
4. Repeat {
5. $\tilde{A} = 0, \tilde{b} = 0$;
6. $Foreachsample\ (s_{i,} a_{i,} r_{e,} i, \acute{s}i) \in D_k$.
7. $update\delta k + 1(\acute{s}$i) with the greedy improvement or monotone improvement
8. $\tilde{A} \leftarrow \tilde{A} + \emptyset(s_{i,} a_i)\ [\emptyset(s_i, a_i) - (1-\lambda)\emptyset(s_i', \delta_{k+1}(s_i'))]^T$
9. $\tilde{b} = \tilde{b} + \emptyset(s_i, a_i) r_{e,} i$
10. End
11. $w_{k+1} = \tilde{A}^{-1}\tilde{b}$
12. Update the sample set with possible new samples
13. Until $||w_{k+1} - w_k|| < \epsilon$
14. Return $w_{k+1}$for learned policy

LSPI algorithm is a model-free learning approach which does not require the a priori knowledge of the MDP models, and its linear function provides a representation of the values of states which saves the space[1].

The LSPI algorithm, samples ($s_i,a_i,s'_i,r_{e,i}$) are the sample set D_k are obtained from actual location update decisions, where $s'_i$is the actual next state for a given current state s_i an action a_i, and $r_{e,I}$ is the actual cost received by the node during the state transition. The policy evaluation procedure is carried out by solving the weight vector $w_k$for the policy under evaluation. With the obtained w_k. the decision rule can then be updated [1]. Monotone optimal policy forms optimal decision rules(δ) for (m,d,q)∈S, Where, m is current location, d is local location error for node and q is nondecresing value.

$$\delta^{NU}(m,d) = \begin{cases} 0, d < d^*(m) \\ 1, d \geq d^*(m) \end{cases}$$

$$\delta^{LSU}(m,q) = \begin{cases} 0, q < q^*(m) \\ 1, q \geq q^*(m) \end{cases}$$

$d^*(m)$ and$q^*(m)$are the location dependent for NU and LSU operation. Thus it holds the optimal policy for NU and LSU.

The new policy $\pi_{k+1}= \{\delta_{k+1}, \delta_{k+1} \ldots..\}$ will be evaluated in the next policy iteration. When the weight vector converges, the decision rule δ of the near-optimal policy is given, where $w=w_{k+1}$ is the converged weight vector obtained in LSPI[1].

IV. IMPLEMENTATION DETAILS

A. Platform

JMDP (Java markov decision process) Java uses different classes, packages, methods, interfaces whichuses jmarkov packageto build this project [14]. JMarkov is a series of packages designed to model and optimize stochastic models which consist of various modules. JMarkov allows the user to create any size Markov Models by defining the rules of the system. It uses different classes like Class State, Class Action, Class Reward etc. each class have different methods and constructor which can be used for this project implementation.

B. Steps for Implementation

The proposed work development approach is as followed:

Ad hoc Demand Distance Vector Routing Protocol

Each node in the network needs to update its location information within a neighboring region and location server in the network. The LS provides a node's location information to other nodes, which are the node's neighboring region. There are multiple nodes. The inaccurate location information of the node by calling global location ambiguity of the node. There are also two types of location related to costs in the network. One is the cost of a location update operation, which could be physically interpreted as the power and bandwidth consumption. Another is the performance loss of the application induced by location inaccuracies of nodes. To reduce the cost we used to calculate the nodes by measuring distance vector routing and also set of protocols.

Markov Decision Process

After calculating nodes by protocols the process turned to Markov decision process which is used for the location update in cellular network. The separation principle discovered the location update problem in MANETs since there are two different location update operations (i.e., Neighborhood server(NU) and Local server Update(LSU) the monotonicity properties of the decision rules location inaccuracies have not been identified and third, the value iteration algorithm used for powerful base stations, which can estimate the parameters of the decision process model, it is model free model and which has a much lower complexity in implementation.

Optimal Decision Rules

After applying markov process it update set of rules the decision rules by specifying the actions on all possible states at the beginning of a time slot t and the policy includes decision rules. A decision rules is choose interval between two consecutive location which request to the node. Then it observing that the beginning of a decision rules is also the ending of the last process. Node minimizes the expected total cost continuously within the current decision rules. Then it specifies what location update action the node performed in this time slot.

Global Application Cost

By all applicable rules and process of nodes it calculates the cost of all applications. This application cost depends on both the node's local location error and global location ambiguity, when both location information of the node within its neighborhood. When communication is done, the node is the destination of the communication and its location is unknown to the remote source node. In this case, the location information of the destination node is used to provide cost of its current location and a location request is sent from the source node to the destination node, based on cost location information. The total cost in searching for the destination node can be determined by the destination nodes. Ambiguity is done by the node's local location error and global location.

Optimal Update Method

In the update model the method least-squares policy iteration is used to solve the location update problem, and it describes the properties developed are used in the algorithm design. The selection of LSPI as the solver for the location update problem is based on two practical. The first is the lack of the a priori knowledge of the MDP model instant costs and state transition probabilities which makes the standard algorithms such as value iteration, policy iteration, In the location update problem a separable cost structure, And the local server of the mobile applications method is updated in all nodes and also to reduce traffic to apply this method.

V. RESULT

A. Data Set

SIM is Subscriber identity module which is used to identify the subscriber. Here IMEI number and SIM number is required input. IMEI number is International Mobile Equipment Identity number which is unique number for every mobile.

B. Result Set

- *Tracker:*

Tracker is used to track the location where the SIM or IMEI number is located.

- *Profile Swapper:*

Profile Swapper is used on restricted area. When user enters into restricted area like school, colleges and hospital then profile is change from general to silent mode.

- *Ringtone Change:*

Ringtone Change is used to change the ringtone automatically on the date which have selected.

- *Server Utilization:*

Server utilization is used to show the server performance that means it shows the average time, performance of the server.

C. Expected Result:

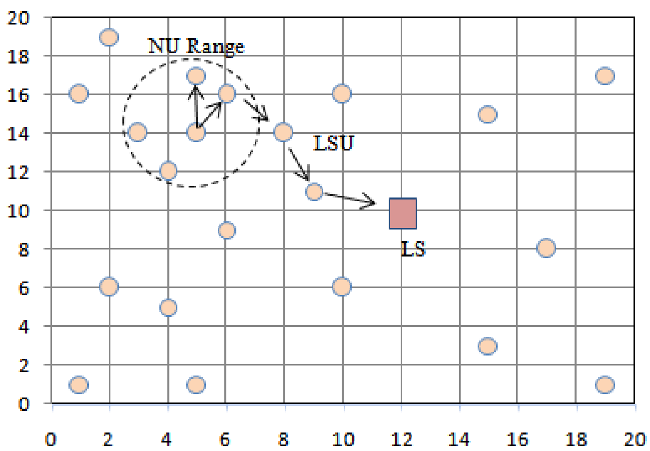

Figure 2 Location update in MANET

The location update model in a MANET, where the network is partitioned into small square cells. LS is the location server of node, node carries out NU operations within its neighborhood and updates its location information to its LS, via LSU operations.

As shown in fig.2 there is only one region server but can do for more than one server. In this region can find the exact location of mobile using NU or LSU.

VI. CONCLUSION

We have proposed stochastic sequential decision framework to analyze the location update problem in MANETs. Mainly this system is used for stochastic location update and for reducing the cost for that it uses NU and LSU separable cost structure. The existence of the monotonicity properties of optimal NU and LSU operation with respect to location inaccuracies have been investigate under a general cost structure. Optimal policy is used to carried out separable cost structure. And it also uses LSPI algorithm for optimal policy.

VII. FUTURE SCOPE

In future we will extend our work for greedy policies which is used to forward the packets.

ACKNOWLEDGMENT

We are very thankful to all authors. We are also thankful to MET BKC IOE for providing all the requirements at each stage.

REFERENCES

[1] Zhenzhen Ye And Alhussein A. Abouzeid "**Optimal Stochastic Location Updates In Mobile Ad Hoc Networks**" Proc. IEEE Transactions On Mobile Computing, Vol. 10, NO. 5, May 2011.

[2] S. Kwon and N.B. Shroff, "**Geographic Routing in the Presence of Location Errors**," Proc. IEEE Int'l Conf. Broadband Comm. Networks and Systems (BROADNETS '05), pp. 622-630, Oct. 2005.

[3] R.C. Shah, A. Wolisz, and J.M. Rabaey, "**On the Performance of Geographic Routing in the Presence of Localization Errors**," Proc. IEEE Int'l Conf. Comm. (ICC '05), pp. 2979-2985, May 2005.

[4] M.G. Lagoudakis and R. Parr, "**Least-Squares Policy Iteration**," J. Machine Learning Research (JMLR '03), vol. 4, pp. 1107-1149, Dec. 2003.

[5] I. Stojmenovic, "**Location Updates for Efficient Routing in Ad Hoc Networks**," Handbook of Wireless Networks and Mobile Computing, pp. 451-471, Wiley, 2002.

[6] M. Mauve, J. Widmer, and H. Hannes, "**A Survey on Position Based Routing in Mobile Ad Hoc Networks**," Proc. IEEE Network, pp. 30-39, Nov./Dec. 2001.

[7] V.W.S. Wong and V.C.M. Leung, "**An Adaptive Distance-Based Location Update Algorithm for Next-Generation PCS Networks**," IEEE J. Selected Areas on Comm., vol. 19, no. 10, pp. 1942-1952, Oct. 2001.

[8] Y.C. Tseng, S.L. Wu, W.H. Liao, and C.M. Chao, "**Location Awareness in Ad Hoc Wireless Mobile Networks,**" Proc. IEEEComputer, pp. 46-52, June 2001.

[9] J. Li et al., "**A Scalable Location Service for Geographic Ad Hoc Routing**," Proc. ACM MobiCom, pp. 120-130, 2000.

[10] Y.B. Ko and N.H. Vaidya, "**Location-Aided Routing (LAR) in Mobile Ad Hoc Networks**," ACM/Baltzer Wireless Networks J., vol. 6, no. 4, pp. 307-321, 2000.

[11] I. Stojmenovic, "**Home Agent Based Location Update and Destination Search Schemes in Ad Hoc Wireless Networks**," Technical Report TR-99-10, Comp. Science, SITE Univ. Ottawa, Sept. 1999.

[12] A. Bar-Noy, I. Kessler, and M. Sidi, "**Mobile Users: To Update or not to Update?**" ACM/Baltzer Wireless Networks J., vol. 1, no. 2, pp. 175-195, July 1995.

[13] M.L. Puterman, **Markov Decision Processes: Discrete Stochastic Dynamic Programming**. Wiley, 1994.

[14]German Riano, Julio Goez, Juan Fernando Perez y Andres Sarmiento "**JMarkov Reference Manual**", October 9, 2006.

