Realize Node Localization Based on OLSR Protocol in Ad Hoc Networks

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In wireless Ad Hoc network's many applications, learning accurately the position of the node is one of its important conditions. Node walks randomly in wireless Ad Hoc network, thus it causes the position of the nodes are stochastic; Therefore, the node localization technology is one of the difficult and important technologies in the research of the wireless Ad Hoc network. In this paper, we propose that the wireless Ad Hoc network node knows its position (three-dimensional coordinates, through the node equipped with a GPS or other positioning devices), based on the OLSR routing protocol in wireless networks, we try to let the node to achieve the precise positions of its surrounding nodes or the entire wireless Ad Hoc network nodes, in addition, the OLSR routing protocol which has localization function is analyzed.

Keywords: Node Localization, L-OLSR, Routing, Ad hoc Networks, OLSR.

1 Introduction

It is very valuable for many applications to get the position of nodes in mobile Ad Hoc network, in other words, many applications has the strong dependence regarding the node position. [1] It arouses people's interest more and more in the research of the mobile Ad Hoc network in recent years. [2] It can reduce the complexity for the application algorithm greatly and might enhance the overall performance for the network if getting the positions of the nodes. However, many extant network protocols cannot provide the satisfactory node localization technologies, so it brings the limit and reduces its application scope for some applications in Ad Hoc network. [3]

In wireless Ad Hoc network's many applications, learning accurately the position of the node is one of its important conditions, node walks randomly in wireless Ad Hoc network, the positions of the nodes are stochastic. Therefore, the node localization technology is one of the hard and important technologies in the research of the wireless Ad Hoc network.

For example, the Cluster Based Location-Aware Routing Protocol for Large Scale Heterogeneous Mobile Ad Hoc Networks (CBLARHM) is developed and analyzed. [4] Coded route diversity technique is proposed to improve the packet delivery ratio for MANET. [5] This algorithm uses multiple routes to transmit the data and code packet to all the members of the multicasting group. An overview of forward mechanism and surveyed the currently available techniques for geographical routing was presented. [6] Cover angle-based broadcasting techniques are proposed for Mobile Ad Hoc Networks (MANETs) to minimize redundancy, contention and collision known as broadcast storm problem. [7]

An improved OHLAR (one-hop location-aided routing) algorithm is proposed [8], and it is designed for the hybrid environment consisting of MANET and WiMAX networks. The problems of OLSR that are due to mobility of nodes is discussed by Sachin, integrated solutions to OLSR protocol is provided and called it as Position-based OLSR (P-OLSR), thought of the position of the nodes can be inferred from positioning techniques like Global Positioning System (GPS), and used the information of the node's position to optimize the routing computing and packets delivering. [9]

The node localization technology is one of the important technical in applied researches for the wireless Ad Hoc network. [10] In this paper, we propose that the wireless Ad Hoc network node knows its position (three-dimensional coordinates, through the node equipped with a GPS or other positioning devices), based on the OLSR routing protocol in wireless networks, we try to let the node to achieve the precise positions of its surrounding nodes or the entire wireless Ad Hoc network nodes, in addition, the OLSR routing protocol which has positioning function is analyzed.

2 The Localization for the Neighbor Nodes

As for the OLSR protocol, Node periodically sends HELLO messages to its neighbors to achieve broadcast information about their own existence. It may realize the functions of link detection and the neighbor discovery by using the HELLO messages, and thus create the node's local link information table. HELLO messages are also used to broadcast the neighbor node MPR (Multipoint Relay) nodes information. The life cycle of HELLO message only has one hop, in order to pass the location information of their own to its neighbors, the format of the head in HELLO messages should be changed, three fields are added in the header which is the three dimensional coordinate (xpos, ypos and zpos) of the current node, which is showed in Table 1.

Table 1. The HELLO message format after revision.

0	1	2	3
Reserved		Htime	Willingness
xpos			
ypos			
zpos			
Link Code	Reserved	Link Message Size	
Neighbor Interface Address			
Neighbor Interface Address			
…			
Link Code	Reserved	Link Message Size	
Neighbor Interface Address			
Neighbor Interface Address			
…			

The HELLO message should broadcast not only its own relevant information, but also some information about its neighbors, one of which is the location information of its neighbors. Nodes periodically send HELLO control messages, and other nodes can obtain one or 2-hop neighbor information through the HELLO message, and calculates the MPR set for this node according to the information obtained above. Table 1 also has related information about the neighbor node. In order to enable the node to get the location information of its 2-hop neighbors, the format for the HELLO message is modified, three fields are added in Table 2, that is the three dimensional coordinate (xpos, ypos and zpos) for its 2-hop neighbor nodes.

Table 2. The HELLO message format with neighbor's location information.

Link Code	Reserved	Link Message Size
Neighbor Interface Address		
Neighbor Interface Address		
xpos		
ypos		
zpos		
…		

A node records a set of "neighbor tuples" describing neighbors. In order to save the three dimensional location information of its neighbor nodes, the storage structure for NeighborSet is changed, which is shown in the following code. xpos, ypos and zpos specifies the neighbor node's position expressed in three dimensional coordinates, neighborMainAddr is the main address of a neighbors, status specifies if the node is NOT_SYM or SYM. Willingness in an integer between 0 and 7, and specifies the node's willingness to carry traffic on behalf of other nodes.

```
struct NeighborTuple
{
  uint32_t xpos;
  uint32_t ypos;
  uint32_t zpos;
  Ipv4Address neighborMainAddr;
  enum Status {
    STATUS_NOT_SYM = 0,
    STATUS_SYM = 1,
  } status;
  uint8_t willingness;
};
```

A node records a set of "link tuples" describing the link between the current node and its neighbors. Similar to NeighborSet, in order to save the three dimensional location information for the links between different interfaces of current node and its neighbor nodes (these information can be used to calculate the collection of one or 2-hop neighbor nodes and other set of data), the storage structure for LinkSet is changed, which is shown in the following code. xpos, ypos and zpos specifies the neighbor node's position expressed in three dimensional coordinates. localIfaceAddr is the interface address of the local node (i.e., one endpoint of the link), neighborIfaceAddr is the interface address of the neighbor node (i.e., the other endpoint of the link), symTime is the time until which the link is considered symmetric, asymTime is the time until which the neighbor interface is considered heard, and time specifies the time at which this record expires and must be removed. When asymTime and symTime are expired, the link is considered lost. [11]

```
struct LinkTuple
{
  uint32_t xpos;
  uint32_t ypos;
  uint32_t zpos;
  Ipv4Address localIfaceAddr;
  Ipv4Address neighborIfaceAddr;
  Time symTime;
  Time asymTime;
  Time time;
};
```

A common mechanism is employed for populating the local link information base which stores information about links to neighbors and the neighborhood information base which stores information about neighbors, 2-hop neighbors, MPRs and MPR selectors, namely periodic exchange of HELLO messages. Thus the general HELLO message mechanism is described in this section, followed by a description of link sensing and neighborhood computation, respectively. The local link information base and the neighborhood information base are closely linked, the neighborhood information base dynamically changed along with the local link information base.

After receiving the HELLO message from the neighbor nodes, link sensing is carried out by the node on its every network interfaces which can reach its neighbor nodes, and the local link information base is created and saved. As for link sensing, the primary purpose is to ensure that communication channel between the node and its neighbor is bi-directional. In the following, the creation and modification for the local link information base and the neighborhood information base are introduced.

During the process of the link sensing, the node firstly find out whether the link information about its neighbors has already existed, if the records has not been created before, then the new link record is inserted in the local link information base, the 'LinkTuple' is the record structure which include the location information for the neighbors. Given that such record has been created already, the node should update the record, the location and other information should be modified so as to reflect the current position of the neighbor nodes. [11]

After the link sensing, a local link set is modified or created which described the links between "local interfaces" and "remote interfaces". The neighbor information base should be updated correspondingly, and one of the information that should be modified is the location information for the neighbor nodes. Given a network with only single interface nodes, a node can work out the neighbor set directly from the information exchanged as part of link sensing. If a network with multiple interface nodes, additional information (mainly from the MID messages) is required in order to map interface addresses to main addresses. [11]

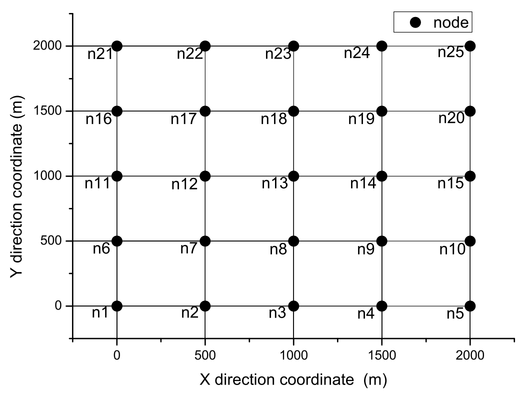

Fig. 1. The nodes Topological map.

In order to verify the node localization accuracy for one hop neighbors, the following experimental environment is created. Within a 2000m * 2000m area, there are 25 nodes, and the horizontal and vertical distances between two nodes are both 500m. The node's propagation radius approximately is about 650m, and the IP address for node n_1 is 10.1.1.1, the IP addresses of other nodes are set correspondingly as well. Fig.1 is the nodes topological map.

Table3 is the local link information table (LinkSet) when nodes remain stationary, and the simulation is carried out under the same conditions above. In OLSR protocol, a node may have several OLSR interfaces, each interface assigned a unique IP address, in our simulation, for simply to analyze, let the node only has a single OLSR interface, this is the reason why it only has one neighbor interface record in Table 3.

In order to verify the node localization accuracy for 1-hop neighbors when the nodes in MANET moving randomly, the following experimental environment is created. Within a 2000m * 2000m*2000m space, there are 25 nodes, and the distribution for these 25 nodes are randomly in the above space. The node's propagation radius approximately is about 650m, and the IP address for node n_1 is 10.1.1.1, the IP addresses of other nodes are set correspondingly as well. The Gauss Markov mobility model is used for all the nodes.

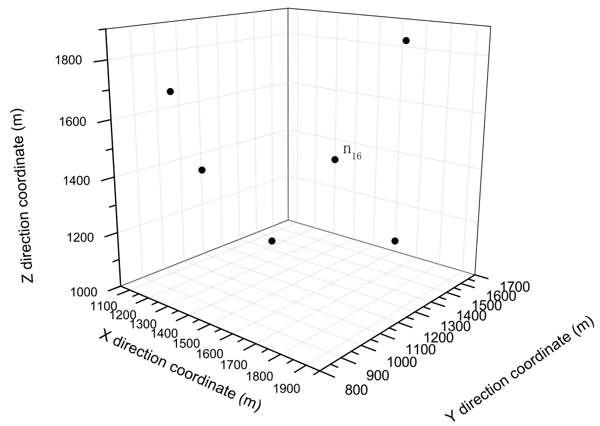

Fig.2. Node n_{16} and its neighbors' three-dimensional coordinates.

Fig. 2 is the distribution for node n_{16} (its location is 1469.24, 1479.86 and 1393.46) and its neighbor nodes. Node n_{16} and its neighbors' three-dimensional coordinates are displayed in Table 3, and the distances between node n_{16} and its neighbors are displayed in Table 4 as well. The experimental results still indicated that the neighborhood information base and the local link information base can locate the one hop neighbor node very well.

Table 3 The LinkSet when nodes remain stationary.

Simulation time	Local IfaceAddr	Neighbor IfaceAddr	xpos	xpos	zpos	symTime	asymTime	time
30.4141	10.1.1.16	10.1.1.21	0	2000	0	36.1459	36.1459	42.1459
30.4141	10.1.1.16	10.1.1.11	0	1000	0	36.1767	36.1767	42.1767
30.4141	10.1.1.16	10.1.1.17	500	1500	0	36.4141	36.4141	42.4141
30.4141	10.1.1.18	10.1.1.13	1000	1000	0	34.1084	34.1084	40.1084
30.4141	10.1.1.18	10.1.1.19	1500	1500	0	34.2028	34.2028	40.2028
30.4141	10.1.1.18	10.1.1.17	500	1500	0	36.4141	36.4141	42.4141
30.4141	10.1.1.18	10.1.1.23	1000	2000	0	36.0901	36.0901	42.0901
30.4141	10.1.1.22	10.1.1.21	0	2000	0	36.1459	36.1459	42.1459
30.4141	10.1.1.22	10.1.1.17	500	1500	0	36.4141	36.4141	42.4141
30.4141	10.1.1.22	10.1.1.23	1000	2000	0	36.0901	36.0901	42.0901
30.4243	10.1.1.1	10.1.1.6	0	500	0	36.4243	36.4243	42.4243
30.4243	10.1.1.1	10.1.1.2	500	0	0	36.2709	36.2709	42.2709

Table 4 Node n_{16} and its neighbors' three-dimensional coordinates.

currentNode Address	neighborMainAddr	xpos	ypos	zpos	distance
10.1.1.16	10.1.1.14	1673	905	1296	617.6412
10.1.1.16	10.1.1.17	1887	1284	1890	677.8175
10.1.1.16	10.1.1.11	1643	1634	1073	395.7857
10.1.1.16	10.1.1.2	1213	1052	1400	498.7644
10.1.1.16	10.1.1.3	1150	977	1682	661.8442

3 The Localization for the 2-hop Neighbor Nodes

A 2-hop neighbor which is not the node itself or a neighbor of the node, and in addition it is a neighbor of a neighbor, with willingness different from WILL_NEVER, of the node. In order to enable the node to save the location information of its 2-hop neighbors, the format for 2-hop Neighbor Set (TwoHopNeighborSet) is modified, three fields are added, which is shown in the following code. xpos, ypos and zpos specifies the 2-hop neighbor node's position expressed in three dimensional coordinates, twoHopNeighborAddr is the main address of a 2-hop neighbor with a symmetric link to neighborMainAddr, and expirationTime specifies the time at which the tuple expires and should be removed.

```
struct TwoHopNeighborTuple
{
  uint32_t xpos;
  uint32_t ypos;
  uint32_t zpos;
  Ipv4Address neighborMainAddr;
  Ipv4Address twoHopNeighborAddr;
  Time expirationTime;
};
```

The link sensing begins after the node receives the HELLO message, and the maintenance is carried out for the TwoHopNeighborSet according to the information getting from the hello message. The acquisition and update process for 2-hop nodes' position information is as follows:

(1) If the TwoHopNeighborTuple doesn't exist in the TwoHopNeighborSet, it is inserted into the TwoHopNeighborSet, and the location information for the 2-hop nodes is from the HELLO message.

(2) If the Tuple already exists, owning to the location information for the 2-hop node might have been changed since the last HELLO (which including the location information about this 2-hop node) message is received, the corresponding TwoHopNeighborTuple in the TwoHopNeighborSet should be updated using the information from the HELLO message.

(3) Due to the network topology changes dynamically or other reasons, some tuples in TwoHopNeighborSet may be not valid along the time goes by, this kind of tuples should be removed from the 2-hop neighbor information base according to the information getting from the hello message.

In order to verify the node localization accuracy for 2-hop neighbors, using the same simulation topology which is shown in Fig.1 above, and the simulation parameters are also set in common. Let the locations of each nodes remain stationary, verify node localization accuracy of the 2-hop neighbor, and the result is showed in Fig.3.

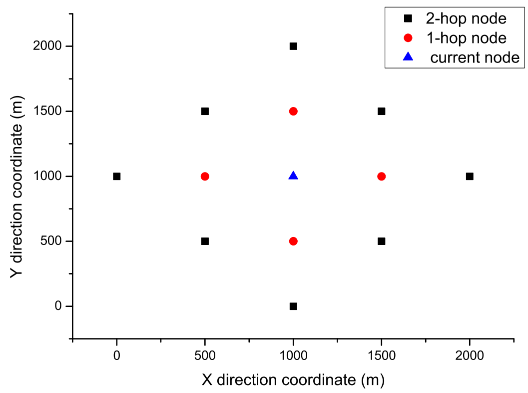

Fig. 3. The locations of 2-hop nodes.

n_{13} is selected as the reference node, and the locations of its neighbors and 2-hop nodes are analyzed. The red points are its 1-hop neighbors, and the black points represent its 2-hop nodes. According to the Fig.1, it is clearly to show that n_{13} can locate its 1-hop and 2-hop nodes precisely when all the nodes in the network remain motionless.

In order to verify the node localization accuracy for 2-hop nodes when the nodes in MANET move randomly, the above experimental environment is modified. Within a 2000m * 2000m rectangle area, there are 25 nodes, RandomDirection2dMobilityModel is used in the entire network, and the distribution for these 25 nodes is randomly in the above space as well. n_{13} is also selected as the reference node, and the locations of its neighbors and 2-hop nodes are analyzed. At some point, the neighbors' location is showed in fig.4, and fig.5 is the 1-hop and 2-hop nodes' distribution. The results shows that because of the nodes moving frequently, some of the locations for one or two hops nodes are already out of date, also some records in NeighborSet and TwoHopNeighborSet are not valid owning to the moving of the nodes in the network.

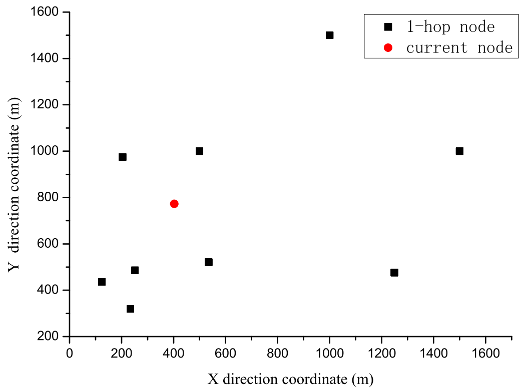

Fig.4. The locations of the neighbors.

4 The Localization for the mul-hop Meighbor Nodes

Beside one and two hop nodes, there are many other multi-hop nodes which need to be located in the network. In order to enable the node to save the location information of its mul-hop neighbors, the format for the topology set (TopologySet) is modified, three fields are added, which is shown in the following code. xpos, ypos and zpos specifies the multi-hop neighbor node's position expressed in three dimensional coordinates, and destAddr is the main address of a node, which may be reached in one hop from the node with the main address lastAddr. Typically, lastAddr is a MPR of destAddr. sequenceNumber is a sequence number, and expirationTime specifies the time at which this tuple expires and must be removed.

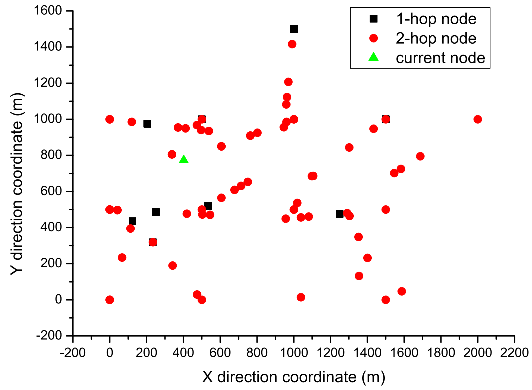

Fig.5. The locations of one or two hop nodes.

```
struct TopologyTuple
{
  uint32_t xpos;
  uint32_t ypos;
  uint32_t zpos;
  Ipv4Address destAddr;
  Ipv4Address lastAddr;
  uint16_t sequenceNumber;
  Time expirationTime;
};
```

Table 5. The TC message with three-dimensional coordinates.

ANSN	Reserved
Advertised Neighbor Main Address	
xpos	
ypos	
zpos	
Advertised Neighbor Main Address	
xpos	
ypos	
zpos	
…	

Each node in the network maintains topology information about the network. This information is acquired and updated by periodically sending the TC-messages. It contains at least the links of its MPR Selector set (the neighbors which have selected the sender node as a MPR) and can be used for routing table calculations. The three-dimensional coordinates for MPR Selectors are added in the TC message so as to implement the localization for the mult-hop nodes. The TC message with three-dimensional coordinates for the MPR Selectors is showed in Table 5.

Upon receiving a TC message, the TopologySet then is updated as follows:

(1) If the message is generated or forwarded by the sender interface which is not in the symmetric 1-hop neighborhood of this node, or it is the duplicated message which has been received multiple times, or it is already obsolete in this node, the message should be discarded or deleted.

(2) The message should be forwarded, if this message is from the sender interface which is in the MPR Selector set of this node.

(3) Otherwise, the TopologySet should be updated according to the advertised neighbor main address received in the TC message

In order to verify the node localization accuracy for the multi-hop neighbors, the experimental environment is just like Fig.1. The location of each node remains stationary, and the node localization accuracy is verified. The positions of the multi-hops nodes from the TopologySet in n_{13} are displayed in Fig.6, and it shows that the multi-hop nodes can be located accurately when the nodes remained stationary.

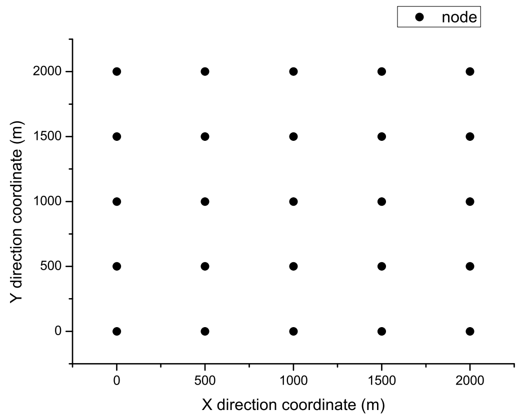

Fig.6. The locations of multi-hop nodes (static).

The RandomDirection2dMobilityModel is used for all the nodes, and all the nodes in the network move at spend of 25m/s. The experiment result of the node n_{25} (IP address, 10.1.1.25) is selected to analyze the positions of the multi-hop nodes in the network. In Fig.7, it shows that more than one path can reach the multi-hop destination node from the current node n_{25}, because these paths is worked out by its different neighbors, this causes the position for each multi-hop node have many different values, and it also reflects that the precise localization is very difficult when the nodes move randomly.

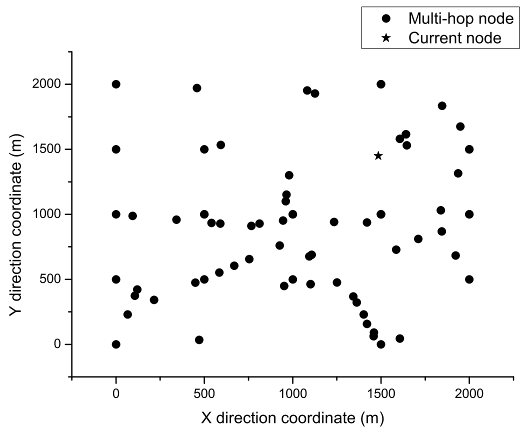

Fig.7. The locations of multi-hop nodes (moving).

5 Realize Localization in Routing Table

Each node maintains a routing table which allows it to route data, destined for the other nodes in the network. In order to save the three dimensional position information in the routing table, the storage structure for RoutingTableSet is changed, which is shown in the following code. xpos, ypos and zpos specifies the destination node’s position expressed in three dimensional coordinates, the node identified by destAddr is estimated to be distance hops away from the local node, that the symmetric neighbor node with interface address nextAddr is the next hop node in the route to destAddr, and that this symmetric neighbor node is reachable through the local interface with the address interface.

```
struct RoutingTableEntry
{
  uint32_t xpos;
  uint32_t ypos;
  uint32_t zpos;
  Ipv4Address destAddr;
  Ipv4Address nextAddr;
  uint32_t interface;
  uint32_t distance;
};
```

The routing table is recalculated in case of neighbor appearance or loss, when a 2-hop tuple is created or removed, when a topology tuple is created or removed or when multiple interface association information changes. The position information recorded in NeighborSet, TwoHopNeighborSet and TopologySet is used by current node for the routing table calculation, and the procedures to calculate (or recalculate) the routing table is as follows:

(1) All the records from the routing table are removed. The new routing records are added starting with the symmetric neighbors (h=1) as the destination nodes according to the NeighborSet, and also the position information for these paths in the routing table is from the NeighborSet.

(2) The new routing records for 2-hop paths are added or updated according to the TwoHopNeighborSet, and the position information in the TwoHopNeighborSet is used for these 2-hop paths in the routing table.

(3) The new routing records for multi-hop paths are added or updated according to the TopologySet, and also the position information for these multi-hop paths in the routing table is from the TopologySet.

The experimental topology is just like Fig.1, The position of each node remains stationary, and it is used to verify the localization accuracy for the destination nodes in the routing table. The results show that when the nodes in the network remain static, the current node can easily get position information for every other node in the whole network by using the Routing Table.

At the same time, we make use of the RandomDirection2dMobilityModel to testify the localization accuracy for the destination nodes in the routing table, the speed of the mobility model is 25m/s. The node n_{25} is selected for data analysis. The results also show that the current node can easily get position information for every other node in the whole network.

After the changes above, every node which uses the modified OLSR protocol as the routing protocol can easily get the position information of other nodes in the whole network. The distribution for 1-hop, 2-hop and multi-hop nodes can also be analyzed from the position information, and the relevant data is provided to calculate the density of nodes in the network as well.

The RandomDirection2dMobilityModel is used in every node in the whole network, and the speed of the mobility model is 10m/s. The node n_{25} is selected for data analysis, and it shows that the number of destination nodes of the routing table in current node n_{25} is changing timely which is display in Fig.8.

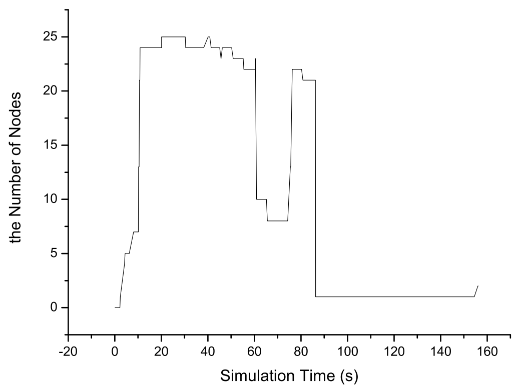

Fig.8. The number of destination nodes of the routing table in node n_{25}.

6 The Performance Analysis for the Localization Algorithm

Node can achieve the positions of other nodes in the Ad Hoc network based on the algorithm described above, the localization is based on the OLSR routing protocol, the function for localization is added to the original OLSR protocol, and it can be Located in the OLSR protocol, referred to as L-OLSR. A series of simulation experiments are carried out to analyze and compare the performance for L-OLSR and OLSR protocol. Table 6 shows the experimental parameters.

Table 6 Simulation parameters.

Modulation	802.11b
Area	2000m * 2000m
Nodes	⩽50
Mobility Model	ConstantPositionMobilityModel
Simulation Time	500s
Traffic Sources	⩽50
Traffic Type	CBR
Packet Size	1024 bytes

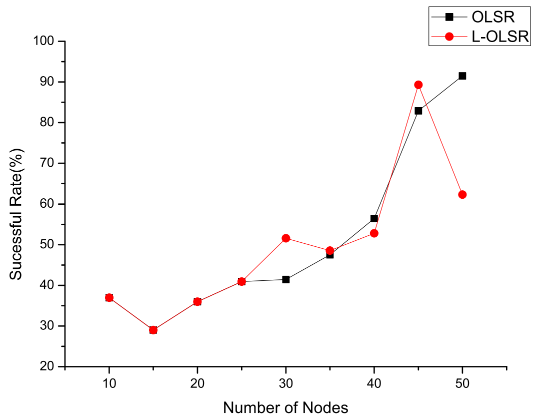

Fig.9. Delivery success rate (DSSS 1M).

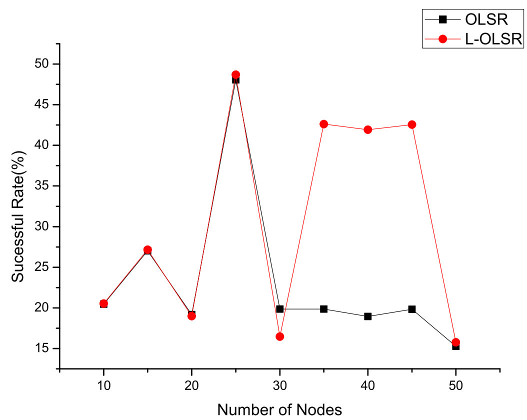

Fig.10. Delivery success rate (DSSS 2M).

The layout of the nodes in simulation environment is as follows, the horizontal and vertical distances between two nodes are both 600m, all the nodes keep stationary during the whole simulation. The node sends a data packet every one second, and totally 1500 data packets are sent during the period of the simulation. The number of the nodes in the simulation starts from 10, and it gradually increases every 5 to 50. The average success rate for the delivery data packets is work out for all the nodes.

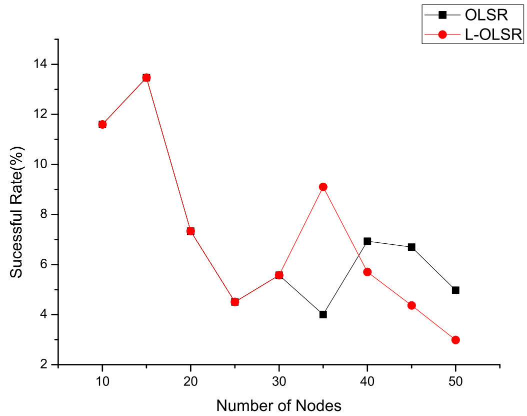

Fig.11. Delivery success rate (DSSS 5_5 M).

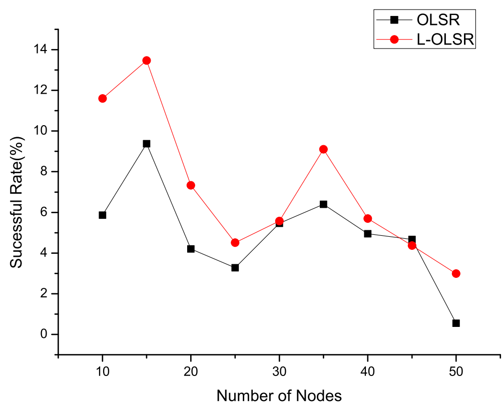

Fig.12. Delivery success rate (DSSS 11 M).

Fig.9, Fig.10, Fig.11 and Fig.12 are the success rate for the delivery data packets when all the nodes keep static during the whole simulation, the 802.11b is used in the simulation, and the number of nodes in the network changed dynamically. The packet delivery success rate for both L-OLSR and OLSR protocol changes dynamically with the increase in the number of nodes, and moreover, it presents the instability.

Although the localization function is added in L-OLSR based on the OLSR protocol, but its performance is very close to the OLSR, and in some cases, even better than the original protocol.

The following simulation is the analysis of the performance between the L-OLSR and OLSR protocol when the nodes in the network move randomly, the horizontal and vertical distances between two nodes are both 600m, all the nodes keep moving randomly during the whole simulation. The node sends a data packet every one second and totally 150 data packets are sent in the period of the simulation. The number of the nodes in the simulation starts from 10, and it gradually increases every 5 to 50. The average success rate for the delivery data packets is work out for all the nodes. The other parameters are given in the Table 7.

Table 7 Simulation parameters.

Modulation	802.11b
Area	4000m * 4000m
Nodes	≤50
Mobility Model	RandomDirection2dMobilityModel
Simulation Time	500s
Traffic Sources	≤50
Traffic Type	CBR
Packet Size	1024 bytes

Fig.13 is the success rate for the delivery data packets when all the nodes moving randomly according to the RandomDirection2dMobilityModel during the whole simulation, the 802.11b is used in the simulation, and the number of nodes in the network changed dynamically. The packet delivery success rate for both L-OLSR and OLSR protocol changes dynamically with the increase in the number of nodes, and moreover, it presents the instability. It also shows that the performance of L-OLSR is very close to the OLSR. [12, 13]

Another simulation is carried out to verify the distance impact on the performance for the L-OLSR and OLSR protocol. The layout of the nodes in simulation environment is as follows, the 16 nodes are distributed in a 4*4 network. At the beginning, the horizontal and vertical distances between two nodes are both 50m, all the nodes moving randomly during the whole simulation. The node sends a data packet every one second and totally 150 data packets are sent during the period of the simulation. The distance between the every two nodes in the simulation starts from 50m, and it gradually increases every 50m to 350m. The average success rate for the delivery data packets is work out for all the nodes.

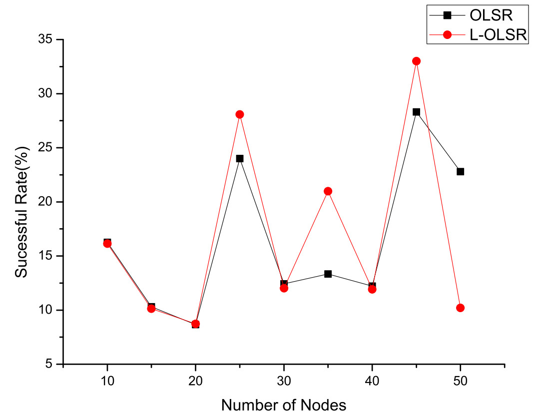

Fig.13. Delivery success rate (DSSS 11 M).

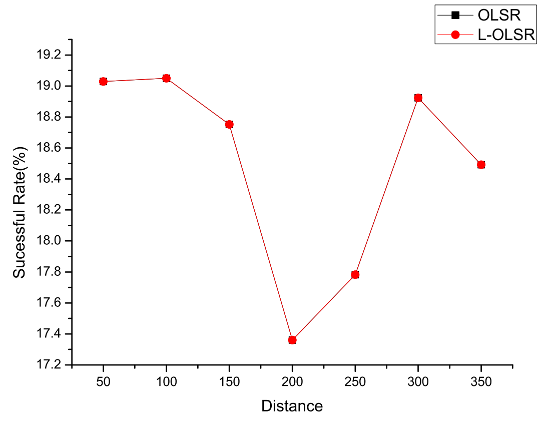

Fig.14. Delivery success rate (DSSS 11 M).

In Fig.14, it shows that when all the nodes move randomly and the distance between the every two nodes increases gradually during the whole simulation, the packet delivery success rate for both L-OLSR and OLSR protocol changes dynamically, but it shows that the performance of success rate for L-OLSR and OLSR is identical.

7 Conclusion

Along with the fast development of the wireless Ad Hoc network, it has become an important branch for the mobile communication technology. In many applications in wireless Ad Hoc network, it is one of the important conditions to accurately learn the node's positions, and therefore, the wireless node's localization technology has received more and more attentions. The node in wireless Ad Hoc network moves randomly, Thus it causes the node’s position is also stochastic. The node localization technology is one of the important technical in applied researches for the wireless Ad Hoc network. In this paper, we propose that the wireless Ad Hoc network node knows its position (three-dimensional coordinates, through the node equipped with a GPS or other positioning devices), based on the OLSR routing protocol in wireless networks, we try to let the node to achieve the precise positions of its surrounding nodes or the entire wireless Ad Hoc network nodes, in addition, the OLSR routing protocol which has localization function is analyzed.

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