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Real Time Voice Communication in Mobile Ad-Hoc Network

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***Abstract*-- A Mobile Ad hoc Network (MANET) is an accumulation of remote portable nodes framing a self-arranging system without utilizing any current base. We consider the issue of node situating in specially appointed systems. We propose an appropriated, framework free situating calculation that does not depend on GPS (Global Positioning System). Rather, the calculation utilizes a relative direction framework as a part of which the node positions are registered in two measurements. The fundamental commitment of this work is to characterize and register relative positions of the nodes in an impromptu system without utilizing GPS for constant voice correspondence. We facilitate clarify how the proposed methodology can be connected to wide range specially appointed systems. In Mobile Ad hoc system (MANETs), nodes versatility causes system topologies to change progressively after some time, which muddles critical errands, for example, TV and steering. Portability following is utilized to gauge the nodes area, with the goal that we can discover whether the node lies inside the scope zone or not for ongoing voice correspondence.**

Keywords--Autoregressive (AR-1); Received Signal Strength Indicators (RSSI) and Time-Of-Arrival (TOA)

I.AIM AND SCOPE OF THE PRESENT INVESTIGATION

The primary commitment of this work is to characterize and figure relative positions of the nodes in an impromptu system without utilizing GPS. The future location of the destination can be computed as far as co-ordinates. Utilizing the destination location and source location we can ascertain the separation as far as meters. In the event that the separation is more than the scope region of the source node, it implies destination node lies out of scope region. Source node needs to move towards the destination node to make a continuous correspondence. We utilize location based forecast to gauge the future location of the nodes. In portable specially appointed systems (MANETs), nodes versatility cause system topologies to change progressively after some time, which entangles imperative assignments, for example, TV and directing. Portability following is the undertaking to decide a direction of the versatile node in time which can encourage the sending choice in system conventions' outline. A system is various PCs or gadgets that are associated with one another through physical or remote connections.

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A system is various PCs or gadgets that are associated with one another through physical or remote connections. An Ad Hoc system is a kind of neighborhood where every individual gadget in this system can speak specifically with some other gadget in a shared style. This game plan kills the contribution of a focal gadget that goes about as a base station or a switch. Impromptu systems work with the nonattendance of a settled base. The nodes in Ad Hoc systems can be has and switches which permits a message to be transmitted structure node to node through the system until it achieves its last destination. In the event of natural disaster like seismic tremor, surge, violent wind framework based correspondence will undoubtedly endure unsettling influence or absence of operability. Salvage or alleviation groups for the most part must be all around furnished with costly gear's to empower correspondence between people. Presentation of impromptu system based voice correspondence can fill well in this need. The node's portability greatly affects the execution and limit of versatile impromptu system. Much work on versatility administration has been done for the outline of directing conventions.

As a military driven examination range, versatile specially appointed systems (MANETs) rose to defeat the reliance on framework and give remote correspondence for all intents and purposes all around. Notwithstanding the inconsistent qualities of remote channels, the absence of foundation builds the effectively dynamic and hard to foresee conduct of portable remote interchanges. There is a requirement for circulated coordination among the system nodes, alongside element adjustment of the system conventions as channel Conditions change, with a specific end goal to beat the difficulties introduced by MANETs. With the expansion of convenient gadgets and additionally advance in remote correspondence, specially appointed systems administration is picking up significance with the expanding number of across the board applications.

II.RELATED WORKS

Location data is utilized to gauge the close time of the connection between two nearby has which decides the choice of course way. In [3] a diagram of existing portability expectation plans is given. Nonetheless, those expectations are likewise for connection accessibility and way unwavering quality estimation. Almost no work has been attempted to keep up an exact topology perspective to help the course way determination. There are two existing works: one is, the place a steady zone and an alert zone of every node have been characterized in light of a node's position, pace, and heading data acquired from GPS. In particular, a steady zone is the territory in which a versatile node can keep up a generally stable connection with its neighbor nodes. An alert zone is the range in which a node can keep up an insecure connection with its neighbor nodes.

Another is that Wu and Dai proposed a preservationist \two transmission range" strategy to repay the obsolete topology nearby view[5]. In any case, all of above methodologies are latent since they simply attempt to repay the mistake of the system topology see as opposed to foresee portable nodes' positions (versatility following) to build a system topology view in time. Few versatility following for MANETs has been finished. One existing work is Zaidi et al.. A first-arrange autoregressive (AR-1) model is utilized as portability model. Every node utilizes a stretched out Kalman channel to gauge its own portability state by joining system based sign estimations, for example, got signal quality pointers (RSSI) and time-of-entry (TOA), and the position assessments of the neighbor nodes. The issue of their work depends on exceptional AR-1 display instead of broadly utilized versatility models, which is not suitable to help the outline of system convention. Each foundation based voice correspondence framework (GSM, CDMA and so forth) is driven by incorporated structures such as Base Station/MTSO and so forth. Which are restricted in limit and can accommodate some measurably normal burden. At the point when a tremendous social event happens, as in a football match or show or some parade they pitiably neglect to bolster voice correspondence. In such a compelling cases, impromptu system can give valuable substitute method for correspondence between individuals.

A. Location Prediction

We proposed portability tracking schemes to predict nodes' directions. Nonetheless, there exist a few conceivable imprecision elements: GPS perusing got may not generally be precise because of different reasons (e.g., multi-path fading, indoor conditions, etc.). In this present reality, these components cause anticipated directions erroneous. Utilizing nearby facilitate framework we can ascertain precisely. In section 3 we can see intricately about location prediction

B. Forward Decisions

Forward choices taking into account obsolete system topology perspective might be wrong and subsequently cause conveyance disappointment which can prompt poor scope of show assignment or course disappointments. The left a portion of Fig.2 speaks to the perspective of node i, and right part is the genuine physical topology. In view of a mistaken neighborhood view, node i chooses forward nodes k and l and allots forward nodes' transmission spans. Be that as it may, in genuine physical topology, node l moves out of the transmission scope of i and can't get the message and forward it. On the off chance that the elements of the system topology could be anticipated ahead of time, proper forward choice can be made with a specific end goal to stay away from or lessen conveyance disappointments. Subsequent to the nodes are versatile, the system topology might change quickly and capriciously and the availability among the terminals might shift with time. MANET ought to adjust to the activity and engendering conditions and in addition the portability examples of the versatile system nodes. The portable nodes in the system powerfully build up steering among themselves as they move about, shaping their own system on the fly.

In MANET, every versatile terminal is a self-ruling node, which might work as both a host and a switch. In other, since there is no foundation system words, other than the essential preparing capacity as a host, the portable nodes can likewise perform exchanging capacities as a switch. So generally endpoints and switches are undefined in MANET. It permits the gadgets to keep up associations with the system and also effortlessly including and evacuating gadgets in the system. In specially appointed systems, the system topology elements can be construed from the versatility of the nodes. Versatility following is the undertaking to decide a direction of the portable nodes position in time. In this manner, it could be of noteworthy advantage to the configuration of system conventions. We utilize here proactive portability administration arrangements, versatility expectation, to address the above obsolete perspective issues. We propose both piecewise direct which make utilization of node's authentic data to foresee a direction of the versatile node position

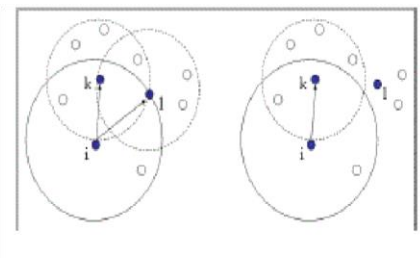

Fig 1. Impact of outdated topology view on delivery

III.PROPOSED ALGORITHM

In this section we present local coordinate and then propose mobility tracking schemes based on historical information extracted from updates. In local coordinate scheme each node can build its coordinate. In the location prediction scheme future location of the node can be calculated.

- To build local coordinate system
- Location based prediction
- The overall algorithm

A. To Build Local Coordinate System:

Here local coordinate system can be calculated by assuming source node lies at origin (ݔ□,ݕ□) and direction □□□□). Now source node shares its information with its one hop neighbor node at time ݐ□. One hop neighbor node receives at time ݐ□. Now the one hop neighbor node builds local coordinate using this information. Then local coordinate (ݔ□;ݕ□) at ݐ□ can be calculated as

ݔ□= ݔ□ + (ݐ□- ݐ□).□

(1) ݕ□ =ݕ□ + (ݐ□- ݐ□).□

(2)

Each node's local coordinates can be build using the above formula to build its coordinates. In figure 2 shows i.e each node builds its coordinates by sharing their information to its one hop neighbor node so each node in the environment can build its coordinates.

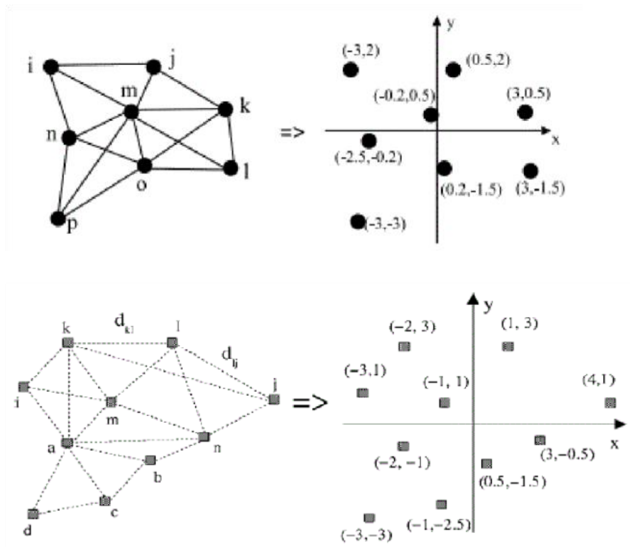

Fig 2.Builds the relative coordinate system

B. Location Based Prediction

Suppose that there are two latest updates records for a
particular node respectively at time
t_{2h} and t_{1h} $(t_{2h}<t_{1h})$ with location information of
(ݔ□,ݕ□) and (ݔ□,ݕ□). Assume at least within two successive update periods the node moves
in a straight line with fixed speed (depicted in Fig 3.).we get

(3) $$\frac{x_{2h}-x_{1h}}{t_{2h}-t_{1h}} = \frac{x_c-x_{1h}}{t_c-t_{1h}}$$

$$\frac{y_{2h}-y_{1h}}{t_{2h}-t_{1h}}=\frac{y_c-y_{1h}}{t_c-t_{1h}}$$

(4)

Then the location Then the location (x_c, y_c) at a future time t_c can be calculated as

$$x_c = x_{1h} + \frac{x_{2h} - x_{1h}}{t_{2h} - t_{1h}} * (t_c - t_{1h})$$

(5)

$$y_c = y_{1h} + \frac{y_{2h} - y_{1h}}{t_{2h} - t_{1h}} * (t_c - t_{1h})$$

(6)

The future location of the destination node (x_c, y_c), the location of source node $(x_e; y_e)$ are known. Now using distance calculation we can find the distance between the source and destination in terms of meters (m).

$$d = \sqrt{(x_e - x_c)^2 - (y_e - y_c)^2}$$

(7)

Each node has a coverage of 250m (ɭ=250m) if the distance value is less than the coverage means destination lies inside the coverage of source node here the communication is interactive (real time communication). If the distance value is more than the coverage means the destination node lies out of coverage of source node. So source node has to move towards the destination node linearly to make real time communication.

$$d = \sqrt{(x_e - x_c)^2 - (y_e - y_c)^2} \quad > \quad ɭ$$

(8)

C. The Overall Algorithm

Step1: Source node coordinates be (x_s, y_s) and direction (θ_s). Source node lies at origin.
Step2: Source node shares this information with its one hop neighbor node at time t_s.
Step3: Then local coordinate of one hop neighbor node $(x_e; y_e)$ at t_c can be calculated as

$$x_e = x_h + (t_c - t_h).\theta$$

(9)

$$y_e = y_h + (t_c - t_h).\theta$$

(10)

Step4: Each node builds its coordinate system accordingly.
Step5: Two latest updates of particular node is taken respectively at time t_{1h} and t_{2h} $(t_{1h} < t_{2h})$ with location information of (x_{1h}, y_{1h}) and (x_{2h}, y_{2h}).
Step6: Then the future location (x_c, y_c) at a future time t_c can be calculated as,

$$x_c = x_{1h} + \frac{x_{2h} - x_{1h}}{t_{2h} - t_{1h}} * (t_c - t_{1h})$$

(11)

$$y_c = y_{1h} + \frac{y_{2h} - y_{1h}}{t_{2h} - t_{1h}} * (t_c - t_{1h})$$

(12) *Step7:* Now we have source and destination coordinates using distance formula we can calculate the distance between the source and destination in terms of meter (m).

$$d = \sqrt{(x_e - x_c)^2 - (y_e - y_c)^2}$$

(13)

Step8: If the distance value is less than the coverage area (ɭ), it means the destination node lies inside the coverage area of source node. So communication will be real time.
Step9: If the distance value is greater than the coverage area (ɭ), it means the destination node lies out of coverage area, so source node has to move towards the destination.

Table 1. Mobility Tracking Simulation

Parameters	Values
Simulation network size	900 × 900 m2
Mobile nodes speed range	[0, 15] m/s
Simulation time	150 s
Location record	2 s
Prediction interval 20 ms	20 ms
Conditional update	5m
Movement Model	Linear
Antenna model	Omni Antenna
Number of nodes	10
Routing Protocol	AODV

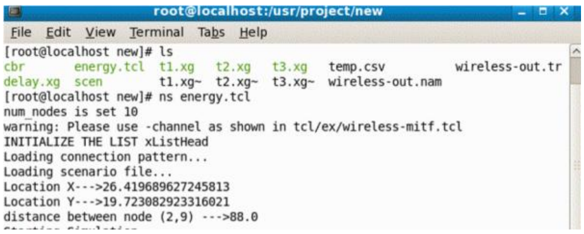

Fig4. Estimated location output

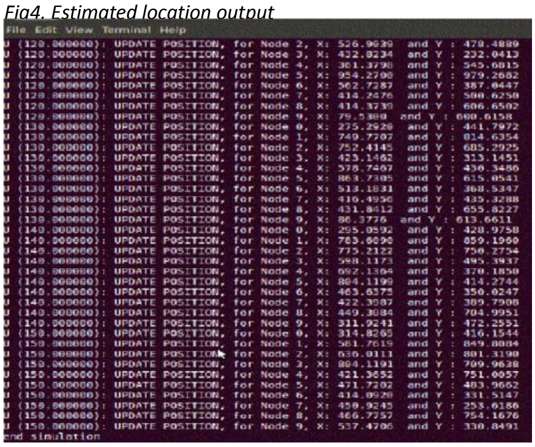

Fig 5. TCL and Trace file for the Scenario at 50sec

The above figure shows the location of 10 nodes.It also displayed the updated position for each of the node with their
X and Y coordinates details

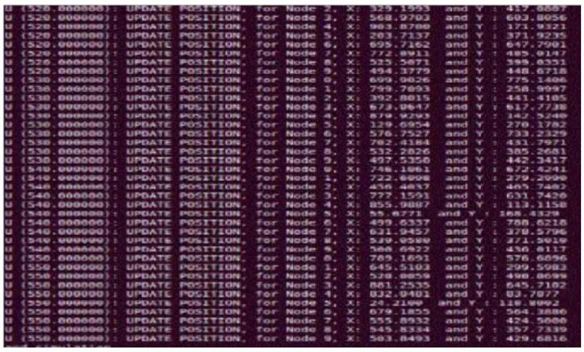

Fig 6. TCL and Trace file for the Scenario at 150sec

The above figure shows the location of 10 nodes .It also displayed the updated position for each of the node with their
X and Y coordinates details

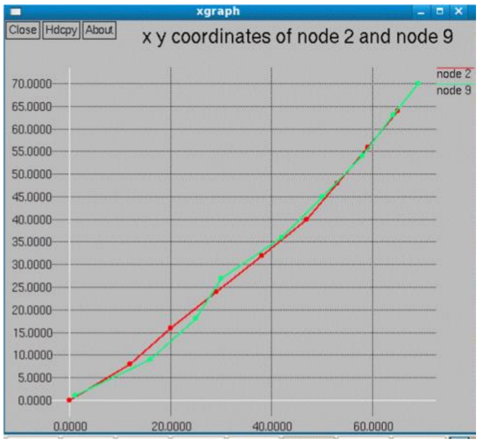

Fig 7. (x,y) coordinates of node 2 and node 9Fig7. represents distance between node 2 and node 9. Here the distance is 270 meter which is greater than ȷ (coverage area 250m). It means the node 9 lies node lies out of coverage area. So source node cannot communicate with its destination. In order to make it as real time communication source node has to move towards its destination.

Fig 8.Distance between Node 2 and Node 9 (<ǹ)

Fig8.Represents distance between node 2 and node 9. Here the distance is 88 meter which is less than ȷ (coverage area 250m). It means the node 9 lies inside the coverage of node 2. So source node can communicate with its destination. Here the communication will be real time because nodes lie inside the coverage area

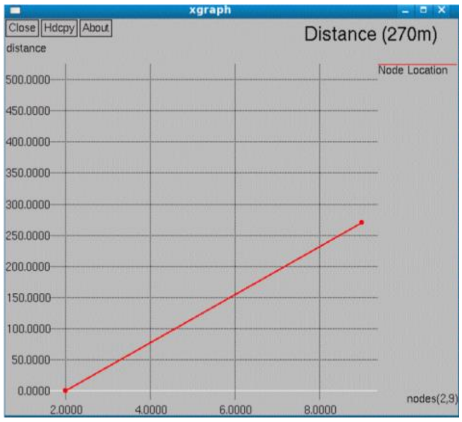

Fig 9.Distance between node 2 and node 9 (>ȷ)

IV.SUMMARY

In this paper we abridged the thought of GPS free situating strategy and demonstrated the execution yield achievable by utilizing nearby organizes framework. Specially appointed system is a rising field in systems administration enclosure. Transmission of voice over such system makes it more relevant in certifiable. In this paper, we depict a calculation for the situating of nodes in a specially appointed system that does not utilize GPS. The calculation gives position data to the nodes in the situations where a framework does not exist and GPS can't be utilized. Sans gps situating is likewise alluring, when the GPS sign is excessively feeble (e.g., indoor), when it is stuck, or when a GPS collector must be kept away from for expense or reconciliation reasons. The nodes in the impromptu systems are typically not mindful of their geological positions. As GPS is not utilized as a part of our calculation, we give relative positions of the nodes concerning the system topology. For the purpose of effortlessness, we show the calculation in two measurements this thought can be utilized as a part of instance of any Emergency administrations Search and protect operations, Disaster recuperation Replacement of altered base if there should arise an occurrence of natural calamities.

V. CONCLUSION

In this paper, we proposed linear mobility tracking schemes to predict nodes trajectory for real time voice communication. Our prediction schemes are based on historical information achieved through periodic updates.

Our algorithm uses GPS free positioning it does not rely on GPS device. The algorithm provides position information to the nodes in the scenarios where an infrastructure does not exist and GPS cannot be used. GPS-free positioning is also desirable, when the GPS signal is too weak (e.g., indoor), when it is jammed, or when a GPS receiver has to be avoided for cost or integration reasons. Our main contribution of this work is to define and compute relative positions of the nodes in an ad hoc network without using GPS for real time voice communication.

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设计（论文）题目：基于 TCP/IP 协议的网络语音通信系统的实现

指导教师：　肖英

二级学院：　信息工程系

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移动自组织网络中的实时语音通信

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摘要：移动自组织网络（MANET）是远程移动节点构造自排系统不利用任何现有的基础的集合。我们考虑节点定位在特定系统的问题。我们提出了一个框架，将拨出免费的计算不依赖于 GPS（全球定位系统）。相反，计算利用一个相对的方向框架的一部分，其中的节点的位置被登记在两个量度。这项工作的基本承诺是表征和登记的节点的相对位置的即兴系统，而无需利用 GPS 的恒定语音通信。我们努力理清楚所建议的方法如何可以连接到广泛的专门指定的系统中。在移动自组网系统中（MANET），节点的通用性导致系统的拓扑结构，一段时间后逐渐发生变化，从而破坏关键的坏事，例如，电视和遥控。轻便跟随是用来测量节点的区域，我们可以发现节点是否位于目标范围内的区域或不进行语音通信。

关键词：信号接受强度指示器 (RSSI)；到达时间 (TOA)。

Ⅰ.调查目的与范围

这项工作的主要承诺是表征和图形节点在即兴系统中的相对位置，而不使用 GPS。目的地的未来位置可以计算到坐标。利用目的地位置和源位置，我们可以确定分离直到米。在分离超过源节点的范围区域的情况下，其目的地节点位于范围外区域。源节点需要向目的节点移动以进行连续对应。我们利用基于位置的预测来测量节点的未来位置。在便携式专用系统（MANET）中，节点多功能性导致系统拓扑在一段时间之后逐渐改变，其中，该系统拓扑结构占据了命令分配，例如电视和定向。可移植性是确定多功能节点在时间上的方向的承诺，其可以鼓励系统约定的概述中的发送选择。系统是通过物理或远程连接彼此相关联的各种 PC 或小工具。

系统是通过物理或远程连接彼此相关联的各种 PC 或小工具。Ad Hoc 系统是一种邻域，其中该系统中的每个单独的小工具可以与共享风格中的一些其他小工具具体说话。这个游戏计划杀死了作为基站或交换机的焦点小工具的贡献。即兴系统与固定基地的无人值守合作。Ad Hoc 系统中的节点可以是具有和交换机，其允许消息通过系统被传送到节点的结构，直到其实现其最后目的地。在自然灾害如地震震颤的情况下，浪涌，基于暴风的框架的通信无疑将承受不稳定的影响或缺乏可操作性。打捞或减轻团体大部分必须全部配备昂贵的齿轮，以授权人们之间的通信。基于即兴系统的语音通信的呈现可以很好地填补这种需要。节点的可移植性极大地影响了通用即兴系统的执行和限制。对指导性惯例的大纲已经进行了关于多功能性管理的许多工作

作为一个军用的驱动检查范围，多才多艺的特定系统（无线自组网）能击败依赖框架给远程函授所有周围的一切意图和目的。尽管远程信道不一致的质量，基础的情况下建立有效的动态的和难以预见的便携式远程交换行为。在系统节点之间的协调要求的循环系统，与公约元调整为信道条件的变化，与一个特定的目标打了无线自组网的困难。随着方便的小工具的扩展，并进一步在远程通信的进步，特别指定的系统管理正在获取重要应用的数量并不断扩大。

Ⅱ.相关产品

利用位置数据来衡量相邻两个站点之间的连接关闭时间，决定了进程的选择方式。图中给出了现有的可移植性预期计划。然而，这些期望是同样的连接可达性和方式坚定的质量估计。几乎没有工作一直试图保持一个确切的拓扑透视，以帮助进程的决心。有两个现有的工作：一个是稳定的区域和警报区域的每个节点的特点是在一个节点的位置，速度和航向数据采集 GPS。特别是一个稳定的区域是一个多功能节点可以保持一个普遍稳定的连接与它的邻居节点的领土。警报区域是指节点可以与其相邻节点保持不安全连接的范围。另一个是 Wu 和 Dai 保护“两传输范围”的策略来偿还附近陈旧的拓扑视图。在任何情况下，所有这些方法是潜在的，因为他们只是试图偿还错误的系统拓扑结构，而不是预见便携式节点的位置（多功能以下），以建立一个系统拓扑结构的时间观。几个多功能性的无线自组网已完成。一个现有的工作是 Zaidi 等人。第一排自回归（AR-1）模型作为移植模型。每个节点利用伸出的卡尔曼信道来衡量自己的携带状态加入基于符号的估计，系统为例，得到的信号质量指针（RSSI）和输入时间（TOA），和邻居节点的位置评估。他们工作的问题取决于特殊 AR-1 显示代替广泛应用的通用性模型，不适用于帮助系统公约概述。基于语音通信（GSM、CDMA 框架基础等等）被纳入结构如基站/ MTSO 等驱动。这是限制可容纳一些更加正常的负担。在一个巨大的社会事件发生时，如在足球比赛或表演和游行他们可悲地忽视支持语音通信。在这样一个引人注目的案例中，即兴系统可以为个人之间的交流提供有价值的替代方法。

A.定位预测

我们提出了可移植的跟踪计划，预测节点的方向。然而，存在一些可能的不精确性要素：GPS 阅读有可能不是一般的精确因为不同的原因（例如，多径衰落，室内条件等）。在目前的现实中，这些组件导致预期的方向错误。利用附近的便利框架，我们可以精确地确定。在 3 节中我们可以看到错综复杂的位置预测

B.提出决策

考虑到过时的系统拓扑视角的前向选择可能是错误的，并且随后导致传达失望，这可能提示展示作业或课程失望的范围较差。 图 2 的左边部分表示节点 i 的透视图，右边部分表示真正的物理拓扑。 鉴于邻居视图错误，节点 i 选择前向节点 k 和 l，并分配前向节点的传输跨度。是的，在真正的物理拓扑中是可能的，节点 l 移出 i 的传输范围，并且不能获得消息并转发它。 在可以提前预测系统拓扑的元素的不太可能的情况下，可以利用特定的最终目标进行适当的前向选择，以远离或减轻传输损耗。在节点通用之后，系统拓扑可能快速地和随机地改变，并且终端之间的可用性可能随时间移动。无线自组网应该适应活动和产生条件，以及多功能系统节点的可移植性示例。 系统中的便携式节点在它们移动时有力地在它们之间建立转向，在运行中形成它们自己的系统。在无线自组网中，每个通用终端是自治节点，其可以作为主机和交换机两者工作。 在其他方面，由于除了作为主机的基本准备能力之外，没有基础系统字，所以便携式节点同样可以执行作为交换机的交换容量。 因此，

通常端点和交换机在无线自组网中未定义。 它允许小工具跟上系统的关联，并且毫不费力地包括和撤出系统中的小工具。在特定的系统中，系统拓扑元件可以从节点的通用性来解释。多样性跟随是决定便携式节点在时间上的方向的承诺。 以这种方式，对于系统约定的配置可以是值得注意的优点。 我们在这里使用主动可移植性管理安排，多功能性期望，以解决上述过时的视角问题。 我们提出了利用节点的真实数据来预测多功能节点位置的方向的分段直接。

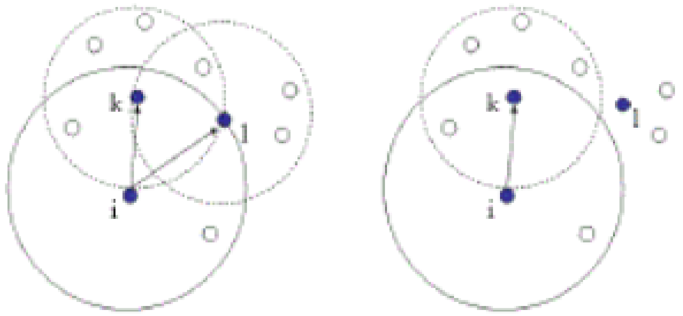


图 1.过期拓扑视图对交付的影响

Ⅲ.预处理算法

在本节中，我们呈现局部坐标，然后基于从更新提取的历史信息提出移动性跟踪方案。在局部坐标方案中，每个节点可以建立其坐标。 在位置预测方案中，可以计算节点的未来位置。

•构建局部坐标系

•基于位置的预测

•整体算法

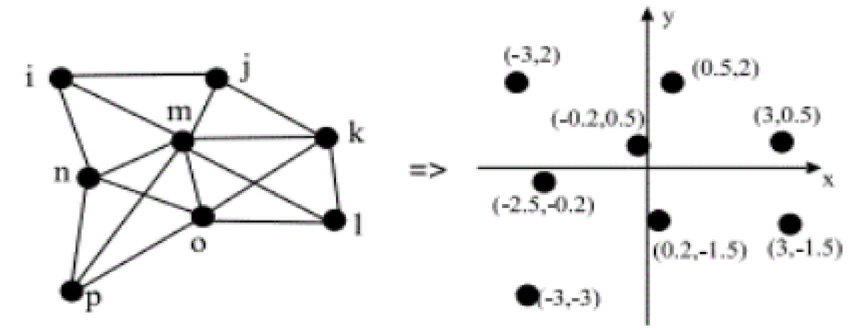
这里局部坐标系可以通过假设源节点位于原点（x_h, y_h）和方向来计算(d_x, d_y)。现在，源节点在时间t_h与其一跳相邻节点共享其信息。一跳节点相邻节点在时间t_c接收。 现在一跳邻居节点使用这个信息建立局部坐标。 然后可以计算t_c处的局部坐标每个节点的本地坐标可以使用上面的公式构建其坐标。

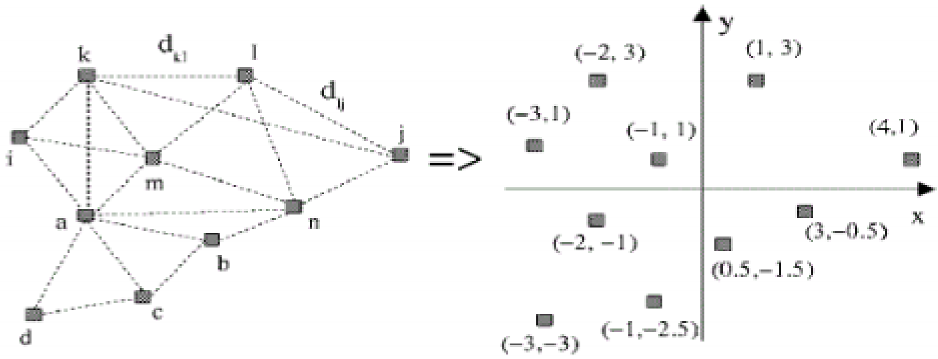
$$x_e = x_h + (t_c - t_h).d_x \quad (1)$$

$$y_e = y_h + (t_c - t_h).d_y \quad (2)$$

在图 2 中示出了每个节点通过将其信息共享到其一跳邻居节点来建立其坐标，因此环境中的每个节点可以建立其坐标。

图 2.建立相对坐标系





B.基于位置的预测

假设在时间 t_1 和 t_2 分别有特定节点的两个最新更新记录具有（x_{2h}, y_{2h}）和（x_{1h}, y_{1h}）的位置信息。假定至少在两个连续的更新周期内，节点以固定速度（如图 3 所示）沿直线移动。

$$\frac{x_{2h}-x_{1h}}{t_{2h}-t_{1h}}=\frac{x_c-x_{1h}}{t_c-t_{1h}} \tag{3}$$

$$\frac{y_{2h}-y_{1h}}{t_{2h}-t_{1h}}=\frac{y_c-y_{1h}}{t_c-t_{1h}} \tag{4}$$

然后位置然后在未来时间 t_c 的位置（x_c, y_c）可以被计算为:

$$x_c = x_{1h} + \frac{x_{2h}-x_{1h}}{t_{2h}-t_{1h}} * (t_c - t_{1h}) \tag{5}$$

$$y_c = y_{1h} + \frac{y_{2h}-y_{1h}}{t_{2h}-t_{1h}} * (t_c - t_{1h}) \tag{6}$$

目的地节点（x_c, y_c）的未来位置是源节点（x_e, y_e）的位置是已知的。 现在使用距离计算，我们可以找到源和目的地之间的距离，以米（m）表示。

$$d = \sqrt{(x_e - x_c)^2 - (y_e - y_c)^2} \quad (7)$$

如果距离值小于覆盖范围，则每个节点具有 250m（α = 250m）的覆盖范围。这里，通信是交互式的（实时通信）。 如果距离值大于覆盖范围，则目的节点位于源节点的覆盖范围之外。 因此源节点必须线性移动到目的节点以进行实时通信。

$$d = \sqrt{(x_e - x_c)^2 - (y_e - y_c)^2} > \alpha \quad (8)$$

C.总体算法

步骤 1：源节点的坐标为（x_h, y_h）和方向（d_h, d_h）。 源节点位于原点。

步骤 2：源节点在时间 t_h 与其一跳邻居节点共享该信息。

步骤 3：然后一跳邻居节点（x_e, y_e）在 t_c 的局部坐标可以计算为。

$$x_e = x_h + (t_c - t_h).d_x \quad (9)$$
$$y_e = y_h + (t_c - t_h).d_y \quad (10)$$

步骤 4：每个节点相应地建立其坐标系。

步骤 5：在具有位置信息（x_{2h}, y_{2h}）和（x_{1h}, y_{1h}）的时间 t_{2h} 和 t_{1h}（$t_{2h} < t_{1h}$）分别获取特定节点的两个最新更新。

步骤 6：然后可以将未来时间 t_c 处的未来位置（x_c, y_c）计算为

$$x_c = x_{1h} + \frac{x_{2h} - x_{1h}}{t_{2h} - t_{1h}} * (t_c - t_{1h}) \quad (11)$$
$$y_c = y_{1h} + \frac{y_{2h} - y_{1h}}{t_{2h} - t_{1h}} * (t_c - t_{1h}) \quad (12)$$

步骤 7：现在我们有源和目的地坐标使用距离公式，我们可以用米（m）来计算源和目的地之间的距离。

$$d = \sqrt{(x_e - x_c)^2 - (y_e - y_c)^2} \quad (13)$$

步骤 8：如果距离值小于覆盖区域（α），则意味着目的节点位于源节点的覆盖区域内。所以通信将是实时的。

步骤 9：如果距离值大于覆盖区域（α），则意味着目的节点位于覆盖区域之外，因此源节点必须向目的地移动。

表 1.移动性跟踪仿真

Parameters	Values
Simulation network size	900 × 900 m2
Mobile nodes speed range	[0, 15] m/s
Simulation time	150 s
Location record	2 s
Prediction interval 20 ms	20 ms
Conditional update	5m
Movement Model	Linear
Antenna model	Omni Antenna
Number of nodes	10
Routing Protocol	AODV

图 4。 估计位置输出

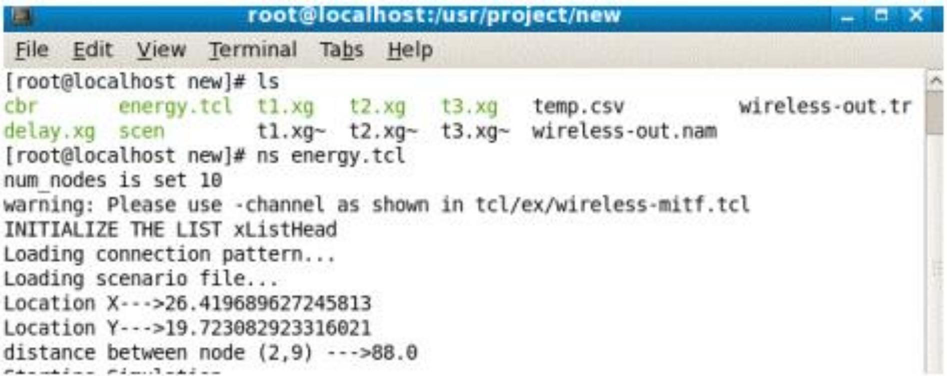
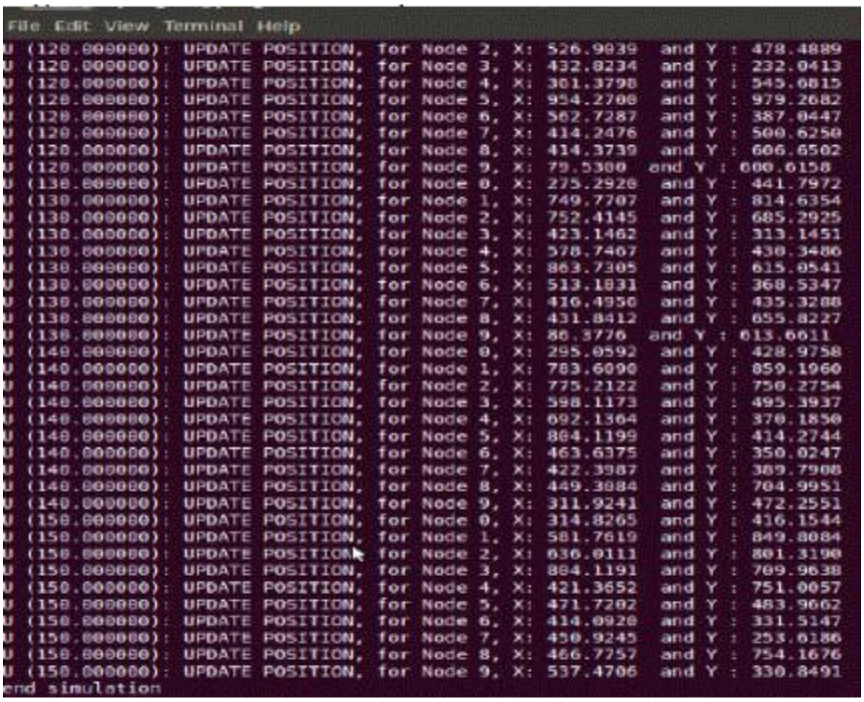


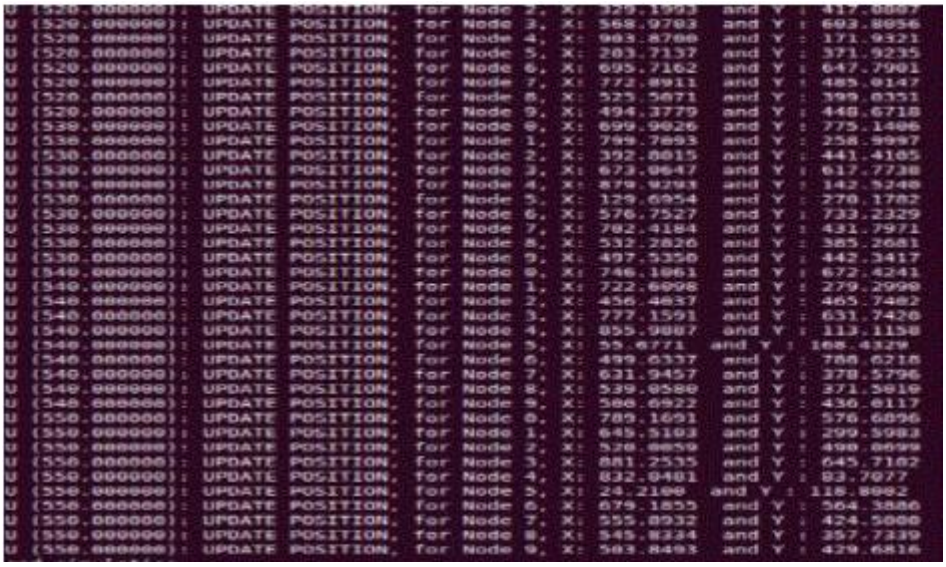
图 5. 50 秒情景的 TCL 和跟踪文件



```
File Edit View Terminal Help
U (120.000000): UPDATE POSITION, for Node 2, X: 526.9039 and Y : 478.4889
U (120.000000): UPDATE POSITION, for Node 3, X: 432.8234 and Y : 232.0413
U (120.000000): UPDATE POSITION, for Node 4, X: 301.3798 and Y : 545.6815
U (120.000000): UPDATE POSITION, for Node 5, X: 954.2700 and Y : 979.2682
U (120.000000): UPDATE POSITION, for Node 6, X: 562.7287 and Y : 387.0447
U (120.000000): UPDATE POSITION, for Node 7, X: 414.2476 and Y : 500.6250
U (120.000000): UPDATE POSITION, for Node 8, X: 414.3739 and Y : 606.6502
U (120.000000): UPDATE POSITION, for Node 9, X: 79.5300 and Y : 600.6158
U (130.000000): UPDATE POSITION, for Node 0, X: 275.2920 and Y : 441.7972
U (130.000000): UPDATE POSITION, for Node 1, X: 749.7707 and Y : 814.6354
U (130.000000): UPDATE POSITION, for Node 2, X: 752.4145 and Y : 685.2925
U (130.000000): UPDATE POSITION, for Node 3, X: 423.1462 and Y : 313.1451
U (130.000000): UPDATE POSITION, for Node 4, X: 578.7467 and Y : 430.3486
U (130.000000): UPDATE POSITION, for Node 5, X: 863.7305 and Y : 615.0541
U (130.000000): UPDATE POSITION, for Node 6, X: 513.1831 and Y : 368.5347
U (130.000000): UPDATE POSITION, for Node 7, X: 416.4950 and Y : 435.3288
U (130.000000): UPDATE POSITION, for Node 8, X: 431.8412 and Y : 655.8227
U (130.000000): UPDATE POSITION, for Node 9, X: 86.3776 and Y : 613.6611
U (140.000000): UPDATE POSITION, for Node 0, X: 295.0592 and Y : 428.9758
U (140.000000): UPDATE POSITION, for Node 1, X: 783.6090 and Y : 859.1960
U (140.000000): UPDATE POSITION, for Node 2, X: 775.2122 and Y : 750.2754
U (140.000000): UPDATE POSITION, for Node 3, X: 598.1173 and Y : 495.3937
U (140.000000): UPDATE POSITION, for Node 4, X: 692.1364 and Y : 370.1850
U (140.000000): UPDATE POSITION, for Node 5, X: 804.1199 and Y : 414.2744
U (140.000000): UPDATE POSITION, for Node 6, X: 463.6375 and Y : 350.0247
U (140.000000): UPDATE POSITION, for Node 7, X: 422.3987 and Y : 389.7908
U (140.000000): UPDATE POSITION, for Node 8, X: 449.3884 and Y : 704.9951
U (140.000000): UPDATE POSITION, for Node 9, X: 311.9241 and Y : 472.2551
U (150.000000): UPDATE POSITION, for Node 0, X: 314.8265 and Y : 416.1544
U (150.000000): UPDATE POSITION, for Node 1, X: 581.7619 and Y : 849.8084
U (150.000000): UPDATE POSITION, for Node 2, X: 636.0111 and Y : 801.3190
U (150.000000): UPDATE POSITION, for Node 3, X: 804.1191 and Y : 709.9638
U (150.000000): UPDATE POSITION, for Node 4, X: 421.3652 and Y : 751.0057
U (150.000000): UPDATE POSITION, for Node 5, X: 471.7202 and Y : 483.9662
U (150.000000): UPDATE POSITION, for Node 6, X: 414.0928 and Y : 331.5147
U (150.000000): UPDATE POSITION, for Node 7, X: 450.9245 and Y : 253.6186
U (150.000000): UPDATE POSITION, for Node 8, X: 466.7757 and Y : 754.1676
U (150.000000): UPDATE POSITION, for Node 9, X: 537.4706 and Y : 330.8491
end simulation
```

上图显示了 10 个节点的位置。它还显示了每个节点的更新位置及其 X 和 Y 坐标详细信息

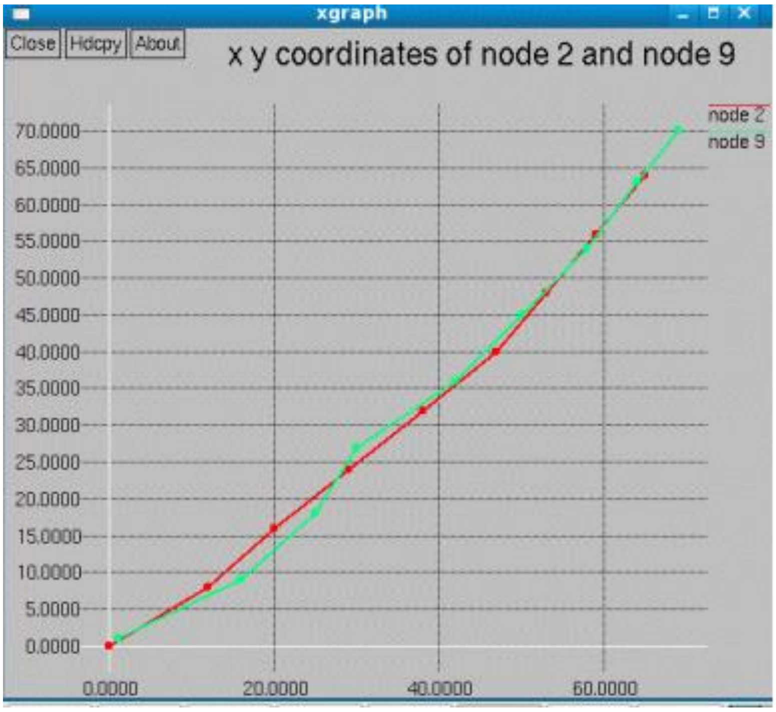
图 6.在 150 秒的场景的 TCL 和跟踪文件



```
U (520.000000): UPDATE POSITION, for Node 3, X: 568.9703 and Y : 603.8056
U (520.000000): UPDATE POSITION, for Node 4, X: 903.8700 and Y : 171.9321
U (520.000000): UPDATE POSITION, for Node 5, X: 203.7137 and Y : 371.9235
U (520.000000): UPDATE POSITION, for Node 6, X: 695.7162 and Y : 647.7901
U (520.000000): UPDATE POSITION, for Node 7, X: 772.8911 and Y : 485.0147
U (520.000000): UPDATE POSITION, for Node 8, X: 525.5071 and Y : 399.0351
U (520.000000): UPDATE POSITION, for Node 9, X: 494.3779 and Y : 448.6718
U (530.000000): UPDATE POSITION, for Node 0, X: 699.9026 and Y : 775.1406
U (530.000000): UPDATE POSITION, for Node 1, X: 799.7093 and Y : 258.9997
U (530.000000): UPDATE POSITION, for Node 2, X: 392.8015 and Y : 441.4105
U (530.000000): UPDATE POSITION, for Node 3, X: 673.0647 and Y : 617.7738
U (530.000000): UPDATE POSITION, for Node 4, X: 879.9293 and Y : 142.5240
U (530.000000): UPDATE POSITION, for Node 5, X: 129.6954 and Y : 270.1782
U (530.000000): UPDATE POSITION, for Node 6, X: 576.7527 and Y : 733.2329
U (530.000000): UPDATE POSITION, for Node 7, X: 782.4184 and Y : 431.7971
U (530.000000): UPDATE POSITION, for Node 8, X: 532.2826 and Y : 385.2681
U (530.000000): UPDATE POSITION, for Node 9, X: 497.5350 and Y : 442.3417
U (540.000000): UPDATE POSITION, for Node 0, X: 746.1061 and Y : 672.4241
U (540.000000): UPDATE POSITION, for Node 1, X: 722.6098 and Y : 279.2990
U (540.000000): UPDATE POSITION, for Node 2, X: 456.4037 and Y : 465.7402
U (540.000000): UPDATE POSITION, for Node 3, X: 777.1591 and Y : 631.7420
U (540.000000): UPDATE POSITION, for Node 4, X: 855.9887 and Y : 113.1158
U (540.000000): UPDATE POSITION, for Node 5, X: 55.6771 and Y : 168.4329
U (540.000000): UPDATE POSITION, for Node 6, X: 499.6337 and Y : 788.6218
U (540.000000): UPDATE POSITION, for Node 7, X: 631.9457 and Y : 378.5796
U (540.000000): UPDATE POSITION, for Node 8, X: 539.0580 and Y : 371.5019
U (540.000000): UPDATE POSITION, for Node 9, X: 580.6922 and Y : 436.0117
U (550.000000): UPDATE POSITION, for Node 0, X: 789.1691 and Y : 576.6896
U (550.000000): UPDATE POSITION, for Node 1, X: 645.5103 and Y : 299.5983
U (550.000000): UPDATE POSITION, for Node 2, X: 520.0059 and Y : 490.0699
U (550.000000): UPDATE POSITION, for Node 3, X: 881.2535 and Y : 645.7102
U (550.000000): UPDATE POSITION, for Node 4, X: 832.0481 and Y : 83.7077
U (550.000000): UPDATE POSITION, for Node 5, X: 24.2100 and Y : 118.8082
U (550.000000): UPDATE POSITION, for Node 6, X: 679.1855 and Y : 564.3886
U (550.000000): UPDATE POSITION, for Node 7, X: 555.8932 and Y : 424.5000
U (550.000000): UPDATE POSITION, for Node 8, X: 545.8234 and Y : 357.7339
U (550.000000): UPDATE POSITION, for Node 9, X: 583.8493 and Y : 429.6816
```

上图显示了 10 个节点的位置，还显示了每个节点的更新位置及其 X 和 Y 坐标详细信息

图 7 节点 2 和节点 9Fig7 的（x，y）坐标。



表示节点 2 和节点 9 之间的距离。这里，距离是 270 米，大于α（覆盖区域 250m）。这意味着节点 9 位于节点位于覆盖区之外。 所以源节点不能与其目的地进行通信。 为了使其作为实时通信源节点必须向其目的地移动。

图 8.节点 2 和节点 9 之间的距离（<A）

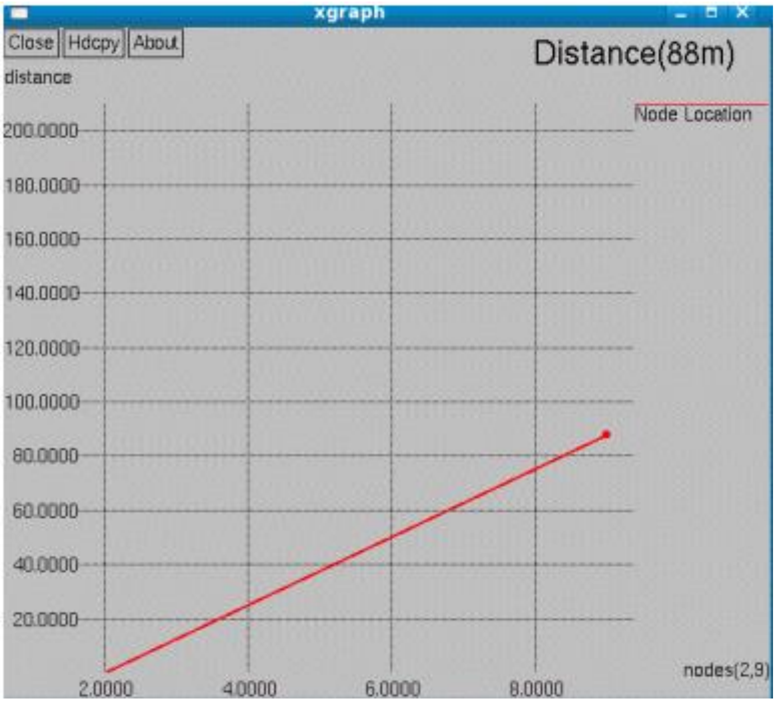
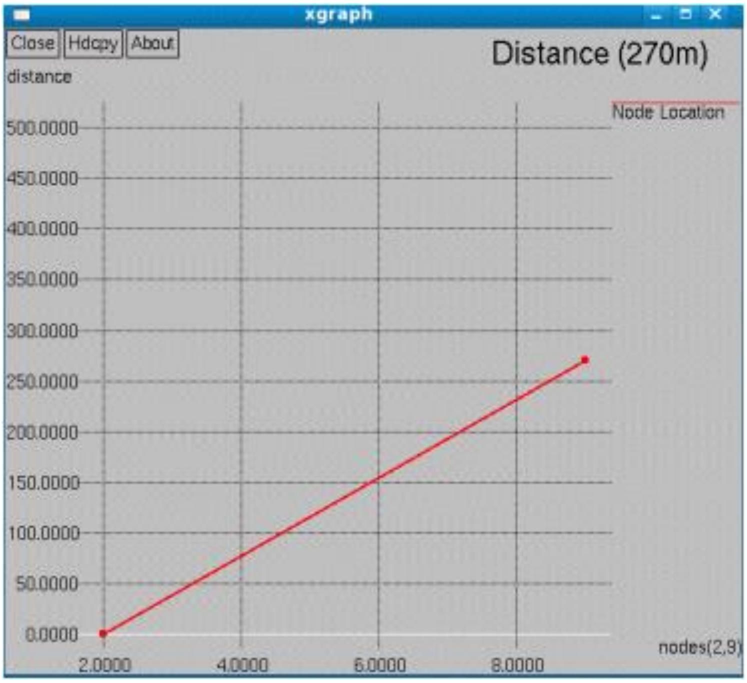


图 8 表示节点 2 和节点 9 之间的距离。这里，距离是 88 米，小于 1/2（覆盖区域 250m）。这意味着节点 9 位于节点 2 的覆盖范围内。因此，源节点可以与其目的地进行通信。 这里，通信将是实时的，因为节点位于覆盖区域内

图 9.节点 2 和节点 9 之间的距离（> α ）



Ⅳ.概要

在本文中，我们省略了 GPS 自由定位策略的思想，并演示了通过利用附近的组织框架可以实现的执行收益。 专用系统是系统管理机柜中的一个上升领域。语音这样的系统传输使得它在认证的更相关。 在本文中，我们描述了在不使用 GPS 的专用系统中节点的位置的计算。 该计算在不存在框架并且不能利用 GPS 的情况下向节点给出位置数据。 当 GPS 标志过于虚弱（例如，室内）时，当其被卡住时，或者当由于费用或调和原因必须远离 GPS 收集器时，无 GPS 定位同样是诱人的。临时系统中的节点通常不注意其地质位置。 由于 GPS 不作为我们计算的一部分，我们给出了关于系统拓扑的节点的相对位置。 为了毫不费力，我们在两个测量中显示计算，这个思想可以用作任何紧急行政管理的实例的一部分搜索和保护操作，灾难恢复如果应该发生自然灾害，更换改变的基地。

V.总结

在本文中，我们提出线性移动跟踪方案来预测节点轨迹，实时语音通信。 我们的预测计划基于通过定期更新获得的历史信息。我们的算法使用 GPS 自由定位，它不依赖于 GPS 设备。 该算法在基础设施不存在并且不能使用 GPS 的情况下向节点提供位置信息。 当 GPS 信号太弱（例如，室内）时，当其被卡住时，或者当由于成本或集成的原因必须避免 GPS 接收机时，也需要无 GPS 定位。 我们的这项工作的主要贡献是定义和计算在 ad hoc 网络中的节点的相对位置，而不使用 GPS 用于实时语音通信。

（**注：译文来自** Emerson P. Real Time Voice Communication in Mobile AdHoc Network[J]. D.M.I College of Engineering, 2016.）