ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 2, Issue 2 , February 2015

A Review on Detection of an Object in Space Location System Using WSN Technology

Komal Padole , Priya Barde , Prof. Anup Pachghare

B.E. Student, Department of Electronics and Telecommunication Engineering, JDIET Yavatmal, India

B.E. Student, Department of Electronics and Telecommunication Engineering, JDIET Yavatmal, India

Assistant Professor, Department of Electronics and Telecommunication Engineering, JDIET Yavatmal, India

ABSTRACT: Wireless sensor networks (WSN) is mostly used technology in various field. Self-localization of WSN has been the basis of most of uses in WSN. In the recent year, GPS system would be used to find position of any object but this is not used in space location such as mine, warehouses etc. so to implement this, new technology is introduced which is WSN technology. To find the position of any object no. of steps are given in algorithm. In space location system, any object can be track with the help of algorithm and flowchart. This is the easiest way to find the position of any object**.**

KEYWORDS:GPS, RADAR, RFID, Space Location, WSN technology.

I. INTRODUCTION

Space location system is based on the wireless technology which goes through three main stages; the first two stages are consist of both adapt RFID technology. RFID is radio frequency identification technology, which uses radio waves to read and write on the recording media. Reader of this technology is expensive, to achieve staff-intensive to track the location, the system cost will be unbearable. Personnel positioning system as an integrated system, only small-scale implementation of the personnel detection, it is difficult to show its value and, more difficult to exert its application prospects.

According to the performance of smart grid and actual conditions of power networks, and combining with main technical characteristics of wireless sensor network (WSN), the applications of WSN in condition-based maintenance, intelligent metering and intelligent home, coping with grid catastrophe, fault location and distributed bulbar protection are consist; the basic design philosophy of application of WSN in various fields is described and the superiority of applying WSN in the construction of communication system for smart grid as well as concrete structure of such a communication system are expounded. Node localization has been an important and critic research direction in the study of WSN.

With the development of the modern sensor network, the wireless sensor network (WSN) technology increases day by day and has been successfully applied in many domains. Therefore, the third generation personnel tracking system that based on the WSN technology become a hot in recent years. WSN is composed by massive and inexpensive miniature sensor node that in monitors, which form an organization's network system through the wireless communication. Its goal is sensation, collecting and the transfer the information that the sensation region covers in network region and send to the viewer.

II. LITERATURE REVIEW

Sensor networks consist of a large number of very small nodes that are placed in some geographical area. The purpose of the network is to sense the environment and report what happens in the particular area. There are number of localization techniques. The Global Positioning System (GPS) provides global coverage but progress in Electromagnetics Research, specialized equipment is needed, which is energy inefficient and mostly ineligible for WSNs, except for the case of limited number of sensors with extended battery capabilities. Furthermore, GPS is not capable of used in indoors, because of the large attenuation introduced by walls of building and ceilings; therefore it cannot comprise a ubiquitous localization method [2].

There are number of wireless technology is used in indoor positioning, developed at Olivetti Research Laboratory (now AT&T Cambridge), and used diffuse infrared technology to realize indoor location positioning. The line-of-sight

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 2, Issue 2 , February 2015

requirement and short-range signal transmission are two major limitations that suggest it to be less than effective in practice for indoor location sensing.

Radio frequency techniques have been alternatively suggested in order to locate wireless units. Radio frequency position location systems are classified into two broad categories: one is Direction-finding and other is range-based systems. Direction finding systems utilize antenna arrays and Direction-of-Arrival estimation techniques in order to locate the Mobile Station, and are mainly used in areas with limited clutter. RADAR is an RF based system for locating and tracking users inside buildings. Reader of this technique is very costly [4].

With the development of the modern sensor network, the wireless sensor network (WSN) technology moves toward maturely, and has been successfully applied in many fields. Therefore, the third generation personnel tracking system that based on the WSN technology become a hot in recent years. WSN is composed by massive and inexpensive miniature sensor node that in monitors, which form an organization's network system through the wireless communication.

III. WIRELESS SENSOR NETWORK

A Wireless sensor networks are a budding technology with the potential to change the way that we live. Basically, Wireless Sensor Networks consist of collections of no. of motes. Motes are nothing but the individual computers that work together to form networks. Motes are small, energy efficient, multifunctional, and it should be wireless. When no of motes are in a common network, then collections of motes communicate with each other to reach a common goal. Nodes using wireless self- organization structure to transmit data, and using cooperation method to apperceive, collect and process information. So the information in anyplace inside in apperception fields can be processed and analyzed in any time.

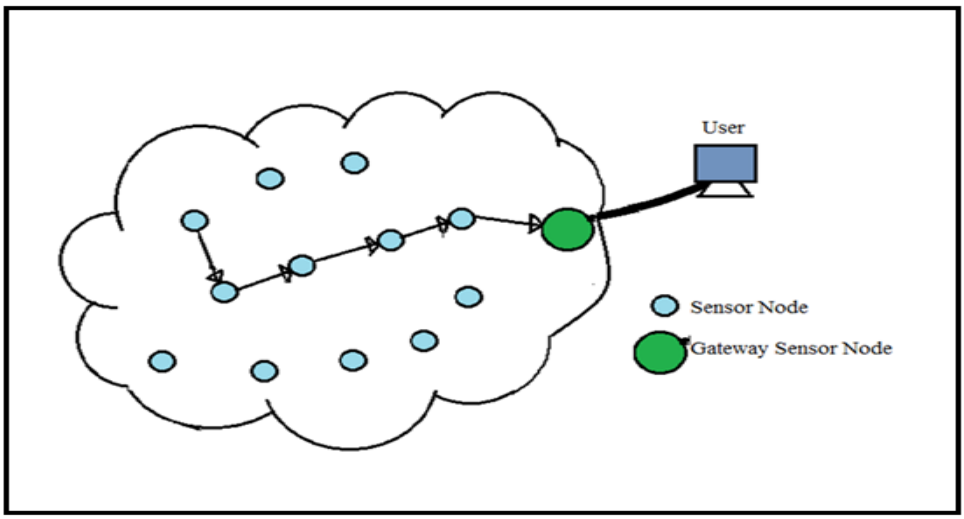


Figure (a): Structure of WSN System

Sensors consist of two basic components: one is hardware and the other is software. Hardware consists of collection of nodes which is also called as tree. The software consists of protocols used to manage the operations inside the network. Protocol is nothing but the set of rules which tells how to communicate [8].

Figure (a) shows structure of WSN system, in which no of nodes are connected to each other which form a network and no. of node connected to each other form a path through which information can be transmitted from one node to another. And whole path is connected to gateway sensor node which is also connected to a main computer on which viewer gets information or also viewer gets the exact location of any object. The user may also communicate with the motes. If the user gives some directives, the directives will be sent over the internet to the computer/station.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 2, Issue 2 , February 2015

IV. COMMUNICATION OF MOTE WITH EACH OTHER

Motes communicate with each other using radio transmitters and receivers. They form networks with other motes that change with the positions of the motes. They create links with each other in different configurations to maximize the performance for each mote. There are two types of motes one is parent mote and other is child mote. These links are connected between "parent" mote, which transmits the information from each of the "child" motes to whatever computer or PDA type device is used to collect and process the data. Figure (b) illustrates one possible path data can travel between the outer motes and those close to the computer/station.

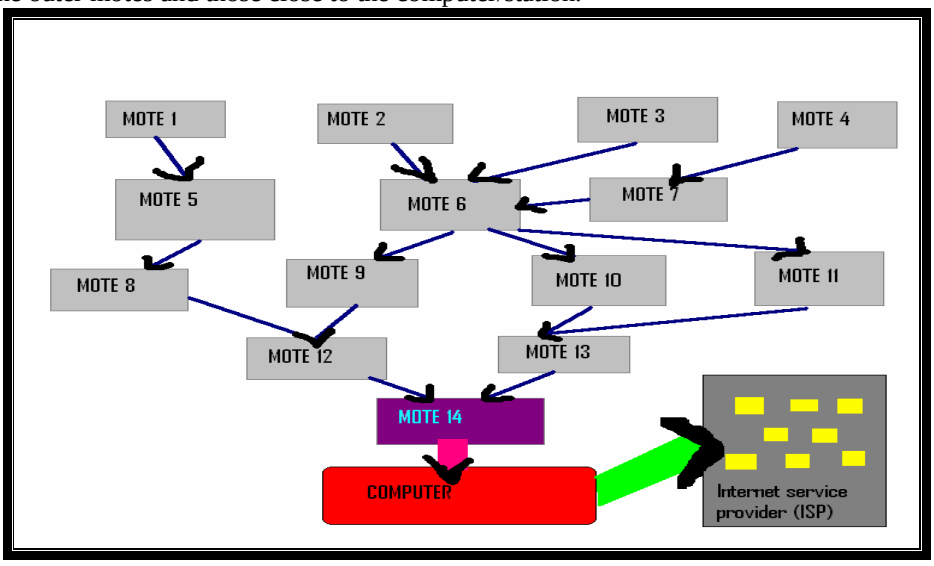


Figure (b): Communication of Mote with Each Other

When the motes are connected together, they form parts of a machine with greater computational power than any of the individual parts. These "machines" of motes change with position and with conditions. Sometimes humidity and other situations can affect behavior of many motes. Changes in conditions can make some connections stronger than they used to be, and others nearly impossible. The thinking capability within the network allows the pieces to reorganize in such a way that all motes will continue to be functional. The Motes from 1 to 13 are the children motes (all the ones in light grey), Mote 14 is the parent (in purple). The "Computer" (in red) can be any type of computer such as PDA, laptop, etc. as long as it is capable of accessing the internet via a specified ISP (the grey building with yellow windows). The arrows connecting the motes are not fixed, and to illustrate this, they are purposefully unorganized [3].

V. INDOOR LOCALIZATION METHODS

A. The Global Positioning System (GPS):

It is high precision means it gives exactly location, good real-time and good anti- interference ability. It provides global coverage but specialized equipment is needed, which is energy inefficient and mostly intelligible for WSNs, except for the case of limited number of sensors with extended battery capabilities But GPS technology have some limitation, it cannot be achieve indoor (such as warehouse) , because of the large no. of attenuation introduced by walls of building and ceilings and underground (such as mine) covered place localization of target, and can't meet the requirements of the three-dimensional coordinate location. Therefore this technique cannot give specific location.

B. Radio Frequency Identification Technology (RFID):

RFID technology consists of a combination of tags and readers. The tags store and transmit data to readers using radio waves. The readers take data from the different tags and then send them back to the server for other analysis and processing. The system serves the purposes of identification, monitoring, authentication and alerting through this exchange of data between the tag and the reader. The process is automatic and both the tag and the reader do not need to be in same sight. In other words, the RFID system facilitates remote and automatic identification [5].

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 2, Issue 2 , February 2015

C. Infrared Localization (IR):

Infrared Localization is a one of another method to determine position of objects or people by using various infrared emitters and receivers. The Infrared localization method using Modulated Infrared (IR) technology provide advantages such as confinement of the signals inside the room (IR does not passes through walls) and the absence of radio electromagnetic interference. In addition, the power of transmitted IR signal can be easily adjusted to cover only the area of interest.

VI. FINDING POSITION OF MOTE CARRY BY USERS

BASED ON THE PROBABILITY OF WSN MOTE MODEL:

Probability is a measure of likeliness that an event will occur. Probability is used to quantify an attitude of mind towards some proposition of whose truth we are not certain. Conditional probability measures the probability of an event given that another event has occurred.

In this space positioning system, there are two motes, one is fixed mote whose position is known, stationary. And another mote is nothing but the mobile which is carry by user. In this we take some assumptions,

- **k**-is the mobile mote which user carries.
- $\mathbf{Z_k}$-is in time step observed value k.
- $\mathbf{X_k}$-is position value of user.
- **P** $(\mathbf{X_k}/\mathbf{Z_{k-1}})$ - is Conditional probability of the Location value in the k time steps of the user carry the mote about the observations of the k-1 time steps. This probability depends on the movement objects model that had racked.
- $\mathbf{X_{k-1}}$-man's assumption position on k-1 time steps.
- **P** $(\mathbf{X_k}/\mathbf{Z_k})$- It represents the possibility when the position value is$\mathbf{X_k}$ of user carry the mote, Its observation value is $\mathbf{Z_k}$.

In order to locate user's mote in an overall situation, the probability value is as fallow-

$$\mathbf{P}(\mathbf{X_k}/\mathbf{Z_k}) = \mathbf{P}(\mathbf{Z_k}/\mathbf{X_k})\,\mathbf{P}(\mathbf{X_k}/\mathbf{Z_{k-1}}) \quad \text{.....equation (1)}$$

This shows observation model through the approaching way of subsection constant and approximation. In designing a mote a user carried observation model, the following two conditions would be considered:

1) There will be many false negative readings (false- negative readings).That is to say, even if there is a fixed mote in a range of the user's mote antenna's receiving, but it will actually be unable to be surveyed.

2) There will sometimes obtain the false positive reading (false-positive readings). In this case, the user's mote antenna survey one that is not in the range of receiving when it made [6].

There are many reasons about the above two kind of situation's production.

1) When metal will absorb the mote launch energy which the user carries. Therefore, the mote that attach to the metal object can be surveyed just in the very near scope. But, even if the non-metal objects also possibly to surveys has the serious influence.

2) The electric wave which will coming from the antenna sometimes by other object reflection will therefore enable the antenna even to be able to survey outside its searching range fixed mote. We said that this kind of phenomenon is Non-Line-Of-Sight (NLOS).

VII. ALGORITHM TO FIND POSITION OF MOTE IDEA OF PROPOSED ALGORITHM

In this, represent the density $\mathbf{p}(\mathbf{X_k}/\mathbf{Z_k})$ in equation (1) by a set of **N** random or particles= $\{\mathbf{S^i_k}, \mathbf{i=1,...N}\}$ drawn from it, where$\mathbf{Z_k}$ denotes the time-of-flight measurement at time step **k** . These random samples' position may be the position of the person that is tracked.

From the sample density can always approximately reconstructed. The goal is to recursively compute at each time step **k** the set of samples$\mathbf{S_k}$ that is drawn from **P** $(\mathbf{X_k}/\mathbf{Z_k})$.

This algorithm proceeds in two steps:

1) Pretreatment step: In this step, it start from the sample $\mathbf{S_{k-1}}$ computed in the previous iteration and apply the motion model to each particle $\mathbf{S_{k-1}^i}$ by sampling from **P** $(\mathbf{X_k}/\mathbf{Z_{k-1}})$

P $(\mathbf{X_k}/\mathbf{Z_{k-1}})$ can be expressed as;

$$\mathbf{P}(\mathbf{X_k}/\mathbf{Z_{k-1}}) = \sum_{i=1}^{N} \mathbf{P}((\mathbf{X_k}/\mathbf{S^i_{k-1}}) \quad \text{.....equation(2)}$$

It consists of one equally component **P** $(\mathbf{X_k}/\mathbf{S^i_{k-1}})$ per sample $\mathbf{S^i_{k-1}}$. For each sample $\mathbf{S^i_k}$, we draw a new sample $\mathbf{S^i_k}$from **P** $(\mathbf{X_k}/\mathbf{Z_{k-1}})$.

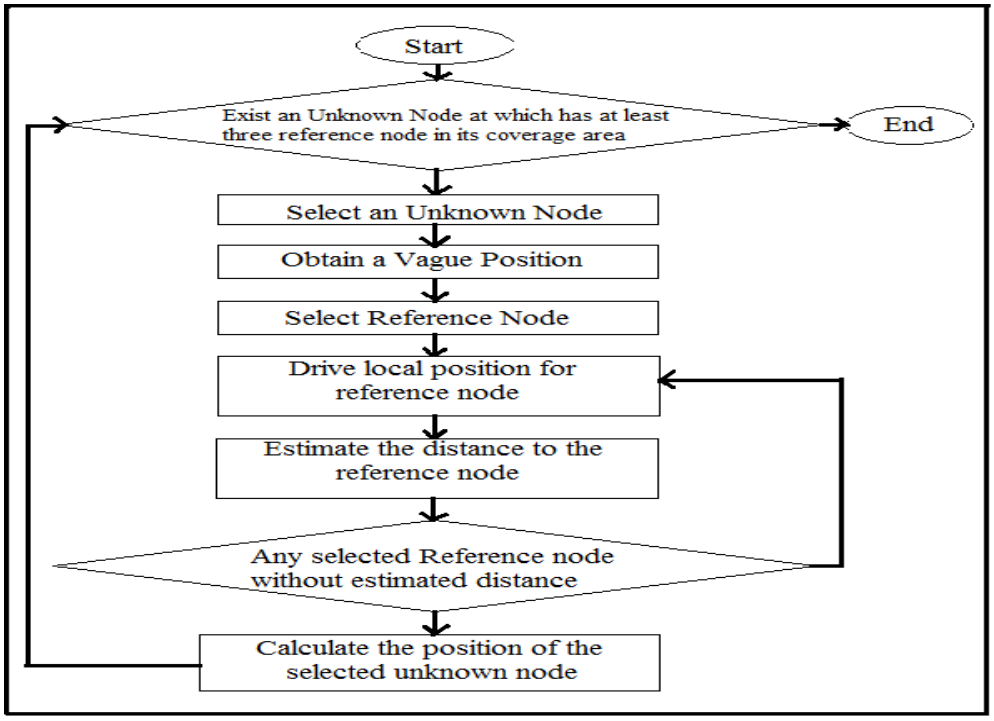
ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 2, Issue 2 , February 2015

2)Renewal step: In the update step, we consider the new observation $\mathbf{Z_k}$, and integrated into the sample set $\mathbf{S_k}$. This is done by weighting each sample according to the observation likelihood $\mathbf{P\ (Z_k/X_k)}$ **[6].**

VIII. LOCALIZATION



Figure(c): Flowchart of Proposed Algorithm

In general, almost all the sensor network localization algorithms consist of three main phases.

A. DISTANCE ESTIMATION:

The distance estimation phase involves measurement techniques to estimate the relative distance between the nodes. In this first select any unknown node from sample set, and then find its vague position nothing but the temporary position.

B. POSITION COMPUTATION:

The Position computation consists of algorithms to calculate the coordinates of the unknown node with respect to the known anchor nodes or other neighboring nodes.

C. LOCALIZATION ALGHORITHM:

The localization algorithm, in general, determines how the information concerning distances band positions, is manipulated in order to allow most or all of the nodes of a WSN to estimate their position. Optimally the localization algorithm may involve algorithms to reduce the errors and refine the node positions. Localization has been concentrated increasingly.

IX. ALGORITHM TO TRACK THE POSITION OF UNKNOWN MOTE

Under the known all fixed mote positional information's premise, the above algorithm might use for to the human who wear moved mote to realize the localization. The algorithm concrete step is as follows:

Step 1: Gains all fixed mote positional information, the abandonment all satisfies the condition $\mathbf{r_{km}}$>$\mathbf{r_{max}}$ fixed mote.

Step 2: With $\mathbf{X_{k-1}}$ that thought the centre satisfies the N Gaussian distribution the random sample set $\mathbf{S_k}$ to replace $\mathbf{X_{k-1}}$.

Step 3: Preserves one for each sample to be bigger than, is smaller than 1 variable, preserve the probability value with this variable $\mathbf{P(X_k/S^i_{k-1})}$.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 2, Issue 2 , February 2015

Step 4: If $rt_{ij} \leq rt_{kj}(i = 1 \ldots N, j = 1 \ldots M)$, $P_i = P_i * P_1$; or $P_{i=} P_1 * P_2$ $(P_1 > p_2)$, and **M** is the fixed mote quantity which the step in 1 examines.

Step 5: These samples of enormous probability are discovered value in N samples which take to.

Step 6: The sample mean place X_k is discovered in computation step 5.

Step 7: K=k+1.

Step 8: Repeat step 1

Where,

r_{km}- is the m survey distance which is surveyed between fixed mote and moved mote.

r_{max}- is the mobile mote the biggest searching range.

rt_{ij}- is the distance between the i sample and the j fixed mote.

P_i-is i sample of probability.

$P_1$and P_2-constant

In this above algorithm, person's initial point is mean value of all mote position which first time surveys. Above algorithm was not influenced by Non-Line-Of-Sight (NLOS) question. False positive reading (false-positive readings) that the question may be considered that is Non-Line- Of-Sight the (NLOS) question. Therefore we get rid all fixed mote that surpasses the probing range in step 1 us all. That is, the above algorithm can avoid all having the conflict which Non-Line-Of-Sight (NLOS) question mote creates [6].

In the above algorithm, user will select any unknown node, if this node is in maximum range of mobile then user will select that node otherwise discarded that node. Then distance between fixed mote and moving mote will be calculated if this distance is less than by selecting that node ,probability will calculated. This step is repeated for each fixed node. Then the node which has highest probability is gathered and its mean probability will be calculated. Its mean probability is nothing but its exact location.

When one take less no. of sample i.e., 100 it gives the location of any object but this area of location is more so it can't find exact location of any object. As no. of sample increases the area of localization is reduced .so as we take 1000 sample we get smallest area of localization that's why we can track the exact location of any object

When no. of sample is in between 250~1000 is taken, the mistaken localization will not increase suddenly because of the sample value reduction. Therefore this method avoids the sampling number of positioning system's excessive dependence, and it also reduces the systematic sampling load.

X. OTHER APPLICATION OF WSN SYSTEM

A. LANDSLIDE DETECTION:

Landslide causes because of Undercutting of a slope by stream erosion, wave action, glaciers, or human activity such as road building, and Intense or prolonged rainfall, rapid snowmelt, or sharp fluctuations in ground- water levels. Shocks or vibrations caused by earthquakes or construction activity and Loading on upper slopes. So to alert people from this landslide we have used the wireless sensor which useful to reduce damage [9].

B. HEALTH APPLICATION:

We can use sensor in human body to detect any physiological changes occur in body. Also it is having different purposes such as Tele-monitoring of human physiological data, Tracking and monitoring patients and doctors inside a hospital, Drug administration in hospitals. There are many products applicable for health care such as Pulse Oximeter, Glucose Meter, Electrocardiogram (ECG), and Social Alarm Devices.

C. WAREHOUSES MANAGEMENT

In supply chain management, the warehouses management is an important component. It is necessary to improve storage management efficiency and reduce cost and error rates.so, it needs a new logistics information technology to replace the traditional mode of storage operation. WSN technology can solve this problem. In this it can manage entering storage, delivery of cargo and inventory pre-warning, and can push services actively. This model greatly improves the level of human computer interaction and enhances the level and efficiency of warehouses management.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 2, Issue 2 , February 2015

XI. CONCLUSION

WSN can collect the information of all kinds of environment and objects in a real time situation. In this paper, one kind of new method has proposed about how to localize the human, namely the method that applies the WSN technology the space orientation. This method states that how to calculate a person's current position and its next recent position, as well as how to locate person's position and to calculate person's path. According to the analogue result, estimate a person's position and path fast and effectively.

XII. FUTURE SCOPE

Sensor networks related to welfare and health- care are perhaps the most significant applications for entirely wireless sensor networks. In the future, wireless sensor networks will be constructed in areas prone to natural disasters. These networks will be entirely or partly based on mobile telephone networks. Sensor use has been common place in industry, cars and consumer electronics for a long time. However, mere baby steps have been taken in the fields of real estate, environmental monitoring. Sensor systems are usually installed where wires can easily be drawn. Where the construction of a wired network is impossible or too expensive, sensor network development has fallen by the wayside, brushed off with a statement that a wireless network will be the solution for these applications.

REFERENCES

[1] BaoXu, Wang Gang, Random Sampling Algorithm in RFID, Indoor Location System[C],In Proceedings of the Third IEEE International Workshopon Electronic Design, pp.326-340,2003.
[2] Chong C.Y. and Kumar S. P., "Sensor networks: evolution, opportunities, and challenges," Proceedings of the IEEE, vol. 91, no. 8, pp. 1247–1256, 2003.
[3] Holger Karl, Andreas the Willig, Wireless sensor network cooperates to discuss with the architecture [M], Beijing: Electronics industry publishing house, pp.68–73, 2006.
[4] L.Ni, Y.Liu, Lau Y.C., A. Patil, LANDMARC,Indoor location sensing using active RFID[C],Proceedings of the 1st IEEE International Conference on Pervasive Computing and Communications , April 2003, pp.407-415.
[5] Mathieu Bouet and Aldri L. dos Santos," RFID Tags: Positioning Principles and Localization Techniques"
[6] Pratik S. Patel, Localization Algorithm for Mobile Sensor Nodes Using 3D Space in Wireless Sensor Network in proceeding of International Journal on Recent and Innovation Trends in Computing and Communication
[7] Priyantha N. B., Balakrishnam H., Anchor-free distribute localization in sensor networks[R], MIT Lab for Computer Science,2003.
[8] Sun Limin and so on, Wireless sensor network, The Tsinghua University press [M], Beijing, pp.68–73, April 2005.
[9] Thampi. P. K., Mathai. John. Sankar. G.,Sidharthan. S., Landslides: Causes, Control and Mitigation ˇT, (based on the investigations carried out by the Centre for Earth Science Studies, Trivandrum)