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POSITION ESTIMATION STRATEGIES IN NODE LOCALIZATION

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ABSTRACT

The term localization refers to the gathering of techniques and mechanisms that measure these spatial relationships. Similar yet different from translation, localization refers to the difference of a specific piece of content to the language and cultural preferences of the target locale. Hence, through localization, the merchandise gets a replacement version, which is user-friendly for the audience and appears as if, originally created for them. It takes under consideration several things, viz. language, culture, keyboard usage, customs, monetary formats, fonts, Graphics, date, time and other allied characteristics of the target market. On the other hand, translation could also be a a neighborhood of the localization process and refers to the mere conversion of words or phrases from one language to a special.

The development of giant scale distributed sensor systems could also be a big scientific and engineering challenge, but they show great promise for an honest range of applications. The potential to sense and integrate spatial information with other elements of a sensor application is critical to exploring the entire potential of these systems. During this article we discuss the range of application requirements, introduce a taxonomy of localization mechanisms, and briefly discuss this state of the art in ranging and positioning technologies. We then introduce two case studies that illustrate the range of localization applications.

Keywords- Localization, sensor nodes, sensor networks, position estimation, ranging, global position system

1. INTRODUCTION

Traditional location finding solutions, like Global Positioning System, aren't feasible for wireless sensor nodes because of multiple reasons. Therefore, new methods, techniques and algorithms got to be developed to unravel the matter of location of sensor nodes. Variety of algorithms and techniques based upon different characteristics and properties of sensor nodes have already been proposed for this purpose. This chapter discusses the essential principles and techniques utilized within the localization algorithms, categories of these algorithms and also takes a more closer inspect a few of of the representative localization schemes.

In a sensor network meant for earthquake disaster relief, the sensor positions must be knownto a specific things of survivors buried somewhere within the rubble of a collapsed building. Similarly, one of the foremost important challenges in sensor networks is that the efficient utilization of energy resource which isn't easily available to sensor nodes. And one of the foremost energy dependent operations is data transmission from sensor nodes to base stations which should use some energy- efficient and energy-aware routing algorithm. One among the approaches being figured out and which holds great promise is geographic location based routing, which is predicated upon mathematical modeling of sensor positions rather than using IDs. Again for location-based approach to be possible, the locations of the nodes must be known. Thanks to various constraints, existing localization systems, like GPS, cannot be used for the localization of wireless sensor nodes. Therefore, new strategies and algorithms for the localization of sensor nodes are needed to be designed and developed. The algorithms should be designed within the constraints . In wireless sensor networks using only static sensor nodes, localization algorithm usually runs only at the time of initial deployment of the nodes. However, duringa sensor network using mobile sensor nodes, the localization algorithm is required to work out the new positions of mobile nodes as they move within the sensor field. Hence, localization algorithms for mobile sensor nodes need more energy compared to algorithms designed for static sensor nodes.

2. BACKGROUND STUDY

Certain applications of wireless sensor networks require that the sensor nodes should remember of their position relative to the sensor network. For it to be significant and to be useful , the info like temperature, humidity and pressure gathered by sensor nodes must be described to the relative position from where it had been collected. For this to happen, the sensor nodes must remember of their positions. The literature has come to term this problem of location or position estimation of sensor nodes simply as localization. The term localization has earlier been utilized in robotics where it's wont to ask determination of location of a mobile robot in some frame of reference . Under certain circumstances, the nodes shouldn't only by conscious of their position but also the direction or orientation relative to the network cooperative effort of sensor nodes.

SENSORNETWORKS

A Sensor network consists of an outsized number of sensor nodes that are deployed either insidephenomenon or very on the brink of it The position of sensor nodes needn't be engineered or predetermined. Another unique feature of sensor network is that the cooperative effort of sensor nodes. The number sensor nodes during a sensor network are often several orders of magnitude above the nodes in a billboard hoc network.

DESIGNFACTORS

Design factors are important because they function a suggestion to deasign a protocol or an algorithm for sensor networks.these influencing factors are often wont to compare different schemes.

FAULT TOLERANCE

Fault tolerance is that the power to sustain sensor network functionalities with none interruption because of sensor node failures.The reliability Rk(t) or fault tolerence of a sensor node is modeled using the position distribution to capture the probability of not having a failure within the interval (0,f):

$$R_k(t)=e^{-\lambda_k t},$$

Where λ_k is that the failure rate of sensor node k and t is that the period of time.

SCALABILITY

The number of sensor nodes deployed in studying a phenomenon could also be on the order of hundreds or thousands or thousands.they must utilize the high density of the sensor networks.

$\mu(R)=(N.\pi R2)\ /A$

where N is that the numbe,and R is that the radio transmission ranger. Basically, $\mu(R)$ gives the quantity of nodes within the transmission radius of each node in region A.

PRODUCTION COST

Since sensor networks consists of an outsized number of sensor node .The sensor network isn't cost-justified.As a result the value of every sensor node has got to be kept low. the value ofa Bluetooth radio which is known to be a coffee cost device,is even 10 times costlier than the targeted price for a sensor node.Most of the sensor networks routing techniquesandsensingtasksrequire knowledge of location with high accuracy . Thus,it is common that a sensor node features a location finding system. A mobilizer may sometimes be needed to maneuver sensornodes when it's required to hold out the assigned tasks.

NEED OF LOCALIZATION

- The situation of the nodes plays a big role in many areas like routing, surveillance and monitoring and military.
- The sensor nodes must know their location reference in order to carry-out Location-basedrouting[LR]
- So on determine the shortest route ,the location Aided Routing [LAR] protocol makes use ofthe locality reference of the sensor nodes

The localization can be classified as

Known location based localization.Proximity based location

Angle based location Range based location Distance based location

The range and Distance based localization are categorized separately, though both are same.For Range based localization, special hardware is required to seek out the range, however it's not required for distance based localization.

THE MAJOR TYPES OF LOCALIZATION

Website Localization Software LocalizationBrand Localization App Localization Mobile App IOS App

Android App App Store

Marketing Localization Multimedia LocalizationContent Localization SEO Localization

Software App Localization E-Commerce App LocalizationiPad App Localization iPhone App Localization

Graphic User Interface Localization Subtitling Localization Broadcast Commercial Localization Marketing Content Localization

Advertising Localization Multilingual Localization

Language Localization Indian To Foreign LocalizationIndustry Localization Document Localization Certificate Localization Web App Localization

In a sensor network, the nodes may be categorized as: Dumb Node (D) it's the node that doesn't know its position and which might eventually find its location and position from the output of the localization algorithm under investigation. Dumb nodes also are referred to as free or unknown nodes. Settled Node (S) A settled node may be a node which was initially a dumb node but managed to seek out its position using the localization algorithm.

Beacon Node (B) A beacon node may be a node that knows its position from the very start and always knows its position afterwards also without the utilization of localization algorithm. It has a mechanism aside from the localization algorithm to seek out its position. For example, the beacon nodecould also be equipped with a GPS device or it's going to be placed at an edge with known coordinates.

The beacon nodes are also called reference nodes, anchor nodes or landmark nodes.It should be noted that sensor nodes may have symmetric or asymmetric communication links. If two nodes u and v are symmetric then u reaches v and v reaches u also . In the case of asymmetric communication links, either u reaches v or v reaches u but both u and v do not reach each other simultaneously.

Let us now consider a sensor network which is symmetric, two-dimensional and arranged during a square shape. Then this sensor network are often represented as a graph G(V, E) where the set of sensornodes are often represented as set of vertices as under:

V = { v1, v2, …, vn }

all edges e = (i, j) E iff vi reaches vj i.e. the distance between vi and vj∈The set of edges E in the graph G(V, E) comprises of may be a smaller amount than r where r is that the utmost distance between the two r of the sting e = (i, j) between them.≤nodes after which communication between them ceases to exist i.e. if the distance between two nodes is greater than r, no direct communication between them is possible. In other words, if the distance between two nodes is greater than r, the two nodes are not neighbor nodes. The distance between two neighbor nodes vi and vj is defined because the weight w(e)

It is to be noted that problem of localization is typically solved just for two dimensions with the supposition that when needed or deployed, it might be extended to 3 dimensions. It is for this reason, we have stated graph G(V, E) to be two-dimensional. Therefore, it are often stated that G could also be a Euclidean graph during which each 2 during a two-dimensional space. The coordinate (xi, yi) represents the location of a node i in the given sensor field.∈ ℜsensor node features a coordinate (xi, yi)

The sensor node localization problem can now be stated as following: Let there be a multihop sensor network represented by a graph G = (V, E). The graph features a group Das possible. Finding the location of a node implies finding its latitude, longitude and altitude.∈ B. The localization problem requires to seek out the position set (xd, yd) of as many dumb nodes d ∈of beacon nodes B with known positions given by (xb, yb) for all b Problem of node localization and positioning during a sensor network are often solved if each node is provided with a GPS device. However, within the case of sensor networks, this is often not a feasible option for variety of reasons.

3 OBJECTIVES OF LOCALIZATION ALGORITHMS

The main objective of a localization algorithm is to determine position of a node. However, there are certain criteria that the algorithm should meet for it to be practicable. The criteria usually depend on the sort of application that the localization algorithm is meant . General design objectives or desired characteristics of a perfect localization algorithm are:

It is highly desirable that the localization algorithms are RF-based. The sensor nodes are equipped with a short-range RF transmitter. An efficient localization algorithm exploits this radio capability for localization in addition to its primary role of data communication.A wireless sensor network is unplanned in nature. The localization algorithm should take the ad hoc nature of the network into consideration.The nodes should be able to determine their position in as small time as possible so that the localization algorithm has a low response time. This would enable sensor nodes to be deployed quickly. The position of the sensor node found by such an algorithm should be accurate enough for the precise application that this algorithm is getting used .

The algorithm must be robust so that it may work in adverse conditions. The algorithm should be scalable in order that if sensor nodes are added or removed, it should still be ready to compute the position of the nodes. Furthermore, the algorithm should produce acceptable results for sensor networkscomprising of small to sizable amount of nodes.

The localization algorithm should be energy efficient and preferably energy aware also because the sensor nodes are autonomous and normally don't have any external source of power.

The localization algorithm should be adaptive to the change in the number of beacon nodes. If the number of available beacon nodes changes, the algorithm should still be able to provide location estimates. However, the accuracy of node estimates will change with the change in number of 10

available beacon nodes. In general, with a better number of beacon nodes, a localization algorithm is in a position to compute more accurate estimates of node positions.

The algorithm should be efficient in order that it's ready to compute node locations with as smallnumber of beacon nodes as possible.The algorithm should be universal in order that it's ready to compute node locations under all conditions of adjusting environments and weather. In particular, it should work in constrained environments such as indoors and unconstrained environments such as outdoors. Only a perfect localization algorithm are going to be ready to meet all the goals stated above. The localization algorithms in practice will only meet a subset of those characteristics depending upon the actual application that it's designed.

4 LOCALIZATION IN SENSOR NETWORKS

The development of large scale distributed sensor systems is a significant scientific and engineering challenge, but they show great promise for a wide range of a these systems can yield increased signal quality, or equivalent signal quality at reduced cost. By reducing deployment overhead, whether in terms of cost or installation time, they allow the sensors to be placed in greater numbers. Relative to other types of distributed systems, distributed sensor systems introduce an interesting new twist: they are coupled to the physical world, and their spatial relationship to other objects in the world is usually a crucial factor within the task they perform. The term localization refers to the gathering of techniques and mechanisms that measure these spatial relationships. When raw sensor data is combined with spatial information, the worth of the info and therefore the capability of the system that collects it increases substantially. For example, a set of temperature readings without location information is at the best only useful to compute simple statistics like the typical temperature. At worst, analysis of the info might yield incorrect conclusions if inaccurate assumptions are made about the distribution of physical sampling. By combining the data with location information, the resulting temperature map can be analyzed much more effectively. For instance, statistics are often computed in terms of spatial sampling rather than the count of sensor readings, and thus the arrogance of the results are often assessed more meaningfully. Location also exposes entirely new application possibilities: a model for warmth transfer are often applied to filter noise and pinpoint the situation of warmth sources. This simple example is meant for instance a more general point. As anyone who has worked with distributed sensor systems is painfully aware, there's a high cost in moving from a centralized, wired application to a large-scale, distributed, wireless application. The application is for certain to grow in complexity; new techniques must be developed, new protocols deployed, and therefore the application must be resilient to the whims of nature. In addition, there are the more mundane details of handling large numbers of independent parts, each of which needs the right software version and fresh batteries, and every of which can independently fail. But what makes all of this effort worthwhile is that the ability to deploy applicationsthat collect data that would never be collected before, and for this we'd like localization.

APPLICATION REQUIREMENTS

The field of networked sensor systems encompasses a really broad array of applications, with a broad range of requirements. Often different application requirements can motivate very different systems. While these differences are sometimes tunable parameters, often they're significant structural choices. For example, adding a low-power requirement rules out many possible designs from the beginning To introduce this variety, we first present two points within the application space, then enumerate a group of requirements axes that characterize the wants space of localization system Scientists in numerous disciplines have an interest in methods for tracking the movements and population counts of animals in their natural habitat. While there are various techniques currently employed (e.g. rings on birds' claws, "drop buckets" for little animals on the ground), these techniques don't scale wellin terms of the time required of experimenters. One of the open challenges during this field is to develop an automatic system which will build a record of the passage and habits of a specific species of animal, without disturbing it in its natural habitat. One possible solution could be built around a informant localization and species identification system. Such a system would detect and count animals by localizing the sounds they make, then training a camera system on them to aid in counting. Sensor nodes equipped with microphones would be distributed through the target environment. When an acoustic source is detected by a node, it communicates with nearby nodes to undertake to estimate the situation of the source by comparing the days of arrival of the signals. Analysis techniques like beam-forming [19] might apply to the present application, along side species recognition techniques to filter acoustic sources not relevant to the task. From this application we will derive variety of requirements:

TAXONOMY OF LOCALIZATION MECHANISMS

Localization systems will differ not only in details of algorithms and protocols, but also fundamentally within the structure of their system and within the assumptions they create . The challenge of this section is therefore to construct a taxonomy of general system structures that capture the breadthand depth of the answer space. Having done this, hopefully we'll better classify localization systems and components for the requirements of comparison and contrast.

EXAMPLES OF LOCALIZATION

A non-cooperative system can only use Time Difference of Arrival (TDoA) techniques to estimate position, because truth time of the signal emission isn't known. In contrast, a cooperative system can sometimes use an out-of-band synchronization protocol to establish a consistent timebase, and then provide receivers with the send time so that they can measure Time of Flight (ToF). These differences end in important structural differences among our example systems. We place the habitat monitoring application within the "Passive Target Localization" category. The smart environment application are often broken into two phases, that fall under different categories: a “bootstrapping” introduce which the infrastructure of beacons self-organizes into a frame of reference , and a “service” introduce which the badges localize themselves with reference to the beacon infrastructure. The bootstrapping phase fits into the “Cooperative Target” category, while the service phase fits into “Cooperative Infrastructure”.

A TAXONOMY OF LOCALIZATION SYSTEMS

The categories are partitioned into “active” and “passive”.Active localization techniques emit signals into the environment that are wont to measure range to the target. These signals could also be emitted by infrastructure components or by targets. Within the category of active localization there are three subcategories: Non-cooperative.

In a lively, non-cooperative system, system elements emit ranging signals, which are distorted or reflected on the wing by passive elements. The system elements then receive the signals and analyze them to deduce their location relative to passive elements of the environment. Examples include radar systems and reflective sonar systems often utilized in robotics. Cooperative Target. In a cooperative target system, the targets emit a symbol with known characteristics, and other elements of the system detect the signals and use information about the signal arrivals to deduce the target’s location. Often a cooperative target system also involves some synchronization mechanism to readily compute signal ToF.This category includes both infrastructure-less systems and systems that localize with reference to infrastructure receivers. Infrastructure-based systems include the ORL Active Bat and the service phase of the GALOR Elocalization system . Infrastructure-less systems include the bootstrapping phases of both the GALORE and Smart Kindergarten systems. Cooperative Infrastructure. In a cooperative infrastructure system, elements of the infrastructure emit signals that targets can receive. The infrastructure itself is assumed to be carefully configured and synchronized to simplify the processing done by the target. Another property of this technique structure is that receivers can compute their own location passively, without requiring any interaction with the infrastructure. Examples of this sort of system include GPS and therefore the refore the MIT Cricket system and the service phase of the SmartKindergarten system.

Passive Localization.

Passive localization techniques differ from active ones therein they discover ranges and locations by passively monitoring existing signals during a particular channel. The term “passive” doesn't imply that they emit no signals, only that the signals they emit are outside the channel that's primarily analysed for time-of-flight measurement. For example, a way that uses RF signals for synchronization and coordination, but measures range by TDoA of ambient acoustic signals would still be considered passive. Blind Source Localization. In a blind source localization system, a sign source is localized with none a priori knowledge of the sort of signal emitted. Typically this is often done by “blind beam- forming”, which effectively cross-correlates the signals from different receivers. These techniques generally only work goodbye because the signals being compared are “coherent”, which in practice often limits the spacing of receivers due to signal distortion induced by the environment. Coherent combining techniques can generally localize the foremost prominent source within the convex hull of a sensor laydown, or alternatively can compute an impact angle to a foreign source, but not a range or location. This work is described by Yao et. al. Passive Target Localization. Similar to blind localization, a passive target localization system is usually supported coherent combination of signals, with the added assumption of some knowledge of the source. By assuming a model for the signals generated by the source, filtering are often applied to enhance the performance of the algorithms and to scale back the computational and communications requirements. Examples include our previous example of habitat monitoring, UCLA work on beamforming , and a few E911 telephone location proposals. Passive Self-localization. In passive self-localization, existing beacon signals from known infrastructure elements are employed by a target to passively deduce its own location. Most commonly, properties of RF signals Localization in Sensor Networks from base stations are used to deduce location of a mobile unit. Examples include RADAR , which measured RSSI to different 802.11 access points, and the work of Bulusu et. al, which measured RSSI to Ricochet transmitters. Cross-cutting Issues. As a rule, active and cooperative techniques tend to be more accurate, more efficient, and usually simpler . Because cooperative techniques can design both the receiver and transmitter, the designs are often optimized for performance far more effectively. Cooperative systems also can synchronize explicitly, improving the performance of ranging supported signal propagation time. However, applications such as habitat monitoring can only be addressed using passive techniques. Although passive techniques are attractive because they can leverage existing signaling, they often perform poorly when the signaling is not designed with ranging or localization in mind. Another aspect of sensor network localization that cuts across these categories is a capability to support ad-hoc deployment and operation.

In an ad-hoc setup, there's no guarantee that each one the sensor nodes are going to be in communication and sensing range to every other, nor that the sensing and communications properties will remain constant over time. Thus, regardless of category, systems that can operate in an ad-hoc fashion must collaborate across the sensor nodes, must operate within a multihop network, and must react to system dynamics.

5 RANGING TECHNOLOGIES

When designing a localization system, a crucial think about the planning are the mechanisms wont to measure physical distances and angles. Typically for cooperative systems this will involve some kind of emitter and detector pair. The selection of those elements features a significant impact on how well the ultimate system will fit the appliance requirements. In this section, we'll discuss the relative merits of three kinds of ranging mechanism, supported light, radio signals, and acoustic signals.

RANGING USING RF

RF ranging generally follows one among two approaches: distance measured supported received signal strength, and distance measured supported the ToF of the radio wave . RF RSS. Received Signal Strength (RSS) is roughly a measure of the amplitude of a detected radio wave at a receiver. If we assume a model for path loss as a function of distance, the received signal strength should generally decrease as a function of distance. The path loss model is highly dependent on environmental factors: in open space the model is near the ground, the model is closer to Under some conditions (e.g. waveguides, corridors, etc.), path loss can actually be less than in free space, e.g. Because the path loss model is dependent on details of the environment, automatically choosing a valid model can be difficult. In practice, the behavior of RSS depends on variety of things , not the smallest amount of which is just whether the RSS estimator is neat . Some radios, like the RFM radio utilized in the Berkeley mote, just sample the baseband voltage to estimate RSS, which may be a very crude measurement; other radios have a more capable measurement circuit. Another important factor is that the frequency range employed by the radio. Multipath fading may be a change in RSS caused by the constructive or destructive interference of reflected paths. Multipath fading depends on the environment and is in many cases hooked in to the frequency of the signals being transmitted. A radio that uses just one frequency will be more susceptible to multipath fades that will cause substantial error in a distance estimate based on RSS. If a variety of frequencies are used and appropriate filtering is applied, the effects of frequency dependent multipath fading may be removed from the RSS estimate, although frequency independent multipath like ground reflection will still be present. In general, the effectiveness of RSS estimation varies from system to system and cannot be implemented without hooks into the internals of the radio hardware. Another difficulty with using RSS is that the transmit power at the sender won't be accurately known. In many cases this is often a function of specific component values on a given board, or a function of battery voltage. Without knowing the original transmit power it it may not be possible to correctly estimate the path loss. RF Time of Flight. Measuring the time of flight of radio signals is another possible solution. Because the ToF of a radio signal is not very dependent on the environment, ToF approaches can be much more precise than approaches based on measuring RSS. The two main challenges in implementing an RF ToF scheme are: (1) synchronization must use signals also traveling at the speed of sunshine , and (2) to realize high precision ToF measurements require high frequency RF signals and fast, accurate clocks. The timing and synchronization issues are the central problems with RF ToF ranging. The synchonization problem is simplified for Infrastructure based systems where elements of the infrastructure are often synchronized by some out-of-band mechanism, or by taking under consideration knowledge of their exact locations. However, this doesn't eliminate the necessity for accurate clocks, which tend to be expensive in terms of power.

RANGING USING ACOUSTICS

Acoustic ranging is perhaps the foremost developed ranging technology in use in sensor networks. There are variety of things that make acoustics attractive, given currently available COTS components. Acoustic transducers ar easy to interface, and simple, inexpensive detector chipsets are available for ultrasound. However the key advantage to using acoustics is that timing and synchronization is far easier to implement. A 32 KHz clock is sufficient to achieve ranging accuracy to 1 cm, and synchronization between sender and receiver can be implemented using most radio modules without modification. In terms of power, acoustics performs quite well, even near the bottom . Whereas RF communication suffers path loss near the ground because ground reflections are phase-shifted by 180 degrees, this is not the case for acoustic waves. Acoustic path loss near the bottom under good conditions is far closer to Outdoors, acoustics is vulnerable to interference from weather , like wind that causes noise, and convective updrafts that carry signals up and away from the ground. However, acoustics has a few disadvantages as well. First, acoustic emitters tend to be physically large, especially if they emit low frequencies. The other main disadvantage is that acoustic signals are stopped by solid obstructions. However, for some applications this can be advantageous, such as the case of an asset tracking system which only needs to know which room the asset is in. When using acoustics, a wide band of frequencies are available for use. Some systems are supported ultrasound frequencies (typically 40 KHz to 1 MHz), while others are supported audible frequencies (100 Hz to twenty MHz). Some systems use tuned piezo emitters at specific frequencies, while others use wide-band acoustic signals. The choice of frequency depends on the application (e.g. is audible sound acceptable), as well as the environment. Experience with 40 KHz ultrasound systems outdoors indicates a typical range of about 10 meters at a voltage of three volts, and about 16 meters at 16 volts. The type of emitter used also features a significant effect on the performance of the system. Many ultrasound emitters are directional, substantially increasing their output during a conical beam. This can be disadvantageous from a packaging perspective, because it may require many emitters and receivers so as to support ad-hoc deployment. Audible acoustics are often very effective outdoors, due to the wide diversity of wavelengths possible. A wide-band signal will be more robust to environmental interference, because of the process gain in the detection process. A wide-band signal is additionally less vulnerable to narrowband sources of noise, also as absorption and scattering of specific frequencies. Under ideal weather , audible ranging systems are shown to realize ranges as large as 100m for power levels of 1/4 Watt. High power emitters like heavy vehicles are detectable at ranges of 10’s of kilometers. Acoustic range is longest at night when the air is still and cool. The worst conditions for acoustics are warm, sunny afternoons, when heated air near the ground rises and deflects signals up and away from other ground-based receivers. Under these conditions, an equivalent acoustic system might achieve only 10m range. Errors in line-of-sight (LoS) acoustic ranges tend generally to be independent of distance, up to the limit of the signal detector. However, when obstructions or clutter are present, severe attenuation are often observed, also as radical outliers when the LoS path is totally blocked and a reflected path is detected. When designing positioning algorithms around an acoustic ranging system it is important to take these issues into account.

6 LOCALIZATION CHALLENGES IN MULTIHOP AD-HOC SENSOR NETWORKS

Despite the attractiveness of ad-hoc multihop localization, the application requirements need tobe carefully reviewed before any design choices are made. Unfortunately the flexibility promised by such localization systems is also coupled with large set of challenges and trade-offs that have so far inhibitedtheir widespread deployment. Some of these challenges are listed here. Physical Layer Challenges. As described within the previous section, measurements are noisy and may fluctuate with changes within the surrounding environment. Algorithm Design Challenges. The algorithm designer needs concurrentlyconsider multiple issues when designing such systems. Noisy measurements call for the use of optimization techniques that minimize the error in position estimates. Despite the well-established bodyof data in optimization techniques, the utilization of any optimization algorithm is merely nearly as good because the validity of the assumptions on the underlying measurement error distribution within the actual deployment scenario. Computation and communication trade-offs. Cost and energy limitations force designers to think about the event of lightweight distributed algorithms which will operate low cost resource constrained nodes, where the computation is performed inside the network. Problem setup. A large variety of problem setups has appeared in the literature. Some approaches consider the utilization of a little percentage of location aware anchor nodes spread randomly distributed inside the network. Some other approaches, suggest that one should ensure that enough anchor nodes are placed on the network perimeter, while some others advocate anchor free setups. In addition to the detup decision, the sort of measurements utilized in each case, vary across different solutions, some attempt to infer locations supported mere connectivity information while others, use angular and/or distance measurements. Error behavior and scalability. Perhaps the most overlooked aspect of multihop localization in currently proposed solutions understands how the network parameters affect the resulting position error behavior and scalability. Network topology and geometry between nodes, network density, ranging accuracy, anchor node concentration and uncertainty in anchor node locations, affect the quality of location estimates; therefore their behavior needs to be formally understood. System Integration Challenges. All the previously discussed requirements imply a non-trivial system integration effort. Many off-the-shelf measurement technologies aren't directly suitable to be used in sensor networks, so customized hardware and software often must be developed to form a functional system

CONCLUSION AND FUTURE WORK

In this chapter, we've defined the matter of localization of nodes in wireless sensor networks, described the specified characteristics of a localization algorithm and the way these algorithms areoften classified. We have also discussed a couple of of the representative localization algorithms. None of the present localization algorithms is suitable for the whole class of applications of wireless sensor networks. For example, a localization algorithm which is suitable for static sensor nodes might not work well with mobile sensor nodes. It should be noted that these algorithms describe only the essential principles and techniques which may be used for localization of sensor nodes. A complete localization application and framework for a practical wireless sensor network are often built employing a combination of those techniques. However, the accuracy of estimated positions is best because the central node has global knowledge of the sensor network. On the other hand, localization. Along the way, new techniques and algorithms are being proposed and developed for various layers within the sensor networks. Majority of proposed localization algorithms are generic in nature and don't take any particular application of sensor network into consideration. However, it's possible that one localization algorithm might not be suited to the whole spectrum of wireless sensor network applications. For example, if an algorithm is suitable for the situation awareness of sensor nodes during a body sensor network to watchthe physiological activity of a living being, it is much likely that it's going to not be suitable for the sensor network which is getting used for the surveillance of a particular area like a battlefield. Therefore, work must be done to work out the suitability of proposed localization algorithms for various applications, and if no current algorithm is suited to a specific problem, new algorithms might got to be developed and tested for it. All the localization algorithms depend on some quite measurement, like RSSI or timing, which is formed by the underlying sensor hardware. However, these measurements are susceptible to errors thanks to practical limitations of the hardware and end in poor localization accuracy. This problem are often alleviated by careful calibration of sensor node or by making the algorithm robust against measurement errors by employing techniques to detect and either reject or correct these errors. Most of the present add the world of node localization focuses on static sensor nodes as is that the case with wireless sensor network applications. However, future applications will use mobile nodes also . For example, a mobile node are going to be ready to move to the world that needs sensing coverage. The localization algorithm should be able to detect this movement and determine the new position of the node. The localization algorithm should be scalable to either a very small or a really sizable amount of sensor nodes and will provide the specified level of accuracy in both the acute cases. Not many current localization algorithms take the scalability factor into consideration. So, additional work is required in order that the localization algorithms are scalable and work well with hundreds and thousands of sensor nodes. Majority of node localization algorithms uses a group of beacon nodes whose position information is understood either through GPS or similar device or by positioning them at locations with known coordinates. Localization algorithm might not converge thanks to error propagation or it's going to end in unacceptable errors in location estimation. New techniques got to be developed tolimit the buildup and propagation of errors in localization in order that the accuracy of localization are often increased.

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