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A Survey on Energy-Efficient Localization and Tracking of Mobile Devices Using LEACH in Wireless Sensor Networks

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Abstract—For the various industrial environments, Wireless Sensor Networks (WSNs) are very effective for locating and tracking people especially in the vehicular networks. Since energy consumption is not effective for the device which is used in the Wireless Sensor Networks (WSN). Lifespan of WSN is critical; we propose a LEACH and E-START protocol system for vehicular network to reducing the energy consumption of the tracking devices. To achieve high energy efficiency in the network level scheme coordinating collision and interference is proposed. Based on the information of location, mobile devices can quickly associate with the particular channel in a given area. Through avoiding unnecessary transmission we can save energy. Finally, a tool called NS2 is used for the real time network simulation.

Keywords—Energy-efficiency, Localization, Vehicular networks.

I. INTRODUCTION

Device location in wireless networks are considered as one of the important technological innovations in current industrial services, which can provide high reliability and efficiency through accurately tracking people based on location and objects. For example, there are applications such as numerous of location- based services(LBSs) in hospitals and retail outlets, which help staff and administrators for better, deliver care and manage costs. The ability of tracking the location of a subject in real time gives human operators the ability to effectively manage situations, tackle the safety problems, increase efficiency, and there by reduce costs while improving outcomes.

Traditional techniques of localization and tracking such as GP-S, cellular and Wi-Fi do not work perfectly in many scenarios, such as high rises, underground or any other disaster zones where signals from mobile infrastructure or satellites can not be received.

Their accuracy and the physical size are not meets the demand of present industrial applications, which aim to be highly precise in all environments even with devices of tiny sizes. Nowadays, Wireless technology is used in various industries. Compared with other wireless technologies, WSNs are not only the low power consumption and complexity, is also supports amore number of nodes in a wide coverage area. Therefore, WSN can be functional to both indoor and outdoor positions in interested area. A huge number of studies on localization in WSNs have been reported in there cent surveys.

Usually a mobile node associated to another object in a WSN is a small device powered by battery can contains a limited energy budget. The battery is often disposable and inconvenient for substitute. Meanwhile, it is projected to work normally for a long enough lifetime, e.g., several months or even years. Therefore, energy-efficient techniques to reduce energy consumption are essential for wireless positioning and tracking systems. In this paper, we develop a *Low Energy Adoptive Clustering Hierarchy* system, which uses low-cost, portable hardware to enable highly accurate tracking of targets. In order to provide ubiquitous services both indoor and outdoor, the fingerprint localization and track approach with the Adaptive Weighted *K*-Nearest Neighbor(AWKNN) is projected and implement in LEACH.

Different from the weighted *K*-nearest neighbor (WKN- N), the number of position locations is adjustable in the AWKNN according to the surrounding environment in order t o improve the localization accuracy .In the LEACH system, battery recharging is assumed to be available at anchor nodes so that much more attention is paid to reducing the energy consumption at mobile nodes. Multi-radio modules may be installed in anchor nodes. One radio channel is kept only for the wireless back haul communication, while another one is used for the transmission between the anchor nodes and the serving for mobile nodes. By this way, interference and collision can be reduced or eliminated through channel allocation and access schemes specially designed for the LEACH system. Then, avoiding unnecessary transmission can save the energy consumption of mobile nodes. Moreover ,an adaptive sounding scheme is applied at the mobile node, when it moves around the area in study. The proposed schemes can attain an elegant trade off between energy efficiency and localization accuracy. Moreover, we implement a demonstration platform basedonTICC2530chipsforindoorand outdoor positioning, and conduct general experimental studies in useful environments to verify our proposed schemes. Results show that our system reach good performances in the sense both of them are positioning accuracy and energy consumption.

The remainder of this paper is arrangement as follows. Section II Related works Section III Optimal Reliability in Energy Harvesting IV Least Square Localization for Cooperative V.

Outdoor Localization for Low power wireless networks by using received signal strength Section VI A Retail application of Indoor location with Grid estimates VII Analysis of RSSI based Location Estimation in WSN VIII Improving the Mutual Caching Service for Data access in disruption Tolerant Network with Cooperative Positioning and Tracking IX Empirical Evaluation of Wireless localization when using multiple antennas**.**

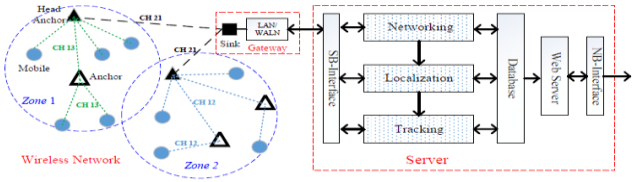
II. RELATED WORK

Various clustering protocols for typical WSNs, which composed of static sensor nodes and a static sink, have appeared in the literature [4]. Low-Energy Adaptive Clustering Hierarchy (LEACH) is the first clustering protocol has been residential in. In LEACH, CH collects and collective's data from the sensors in its own cluster and passes the data to the sink directly. The problem of LEACH protocol is chance by selection of CHs. LEACH requires the user to specify the desired probability of CHs that uses in influential whether a node becomes a CH or not. However, Genetic Algorithm base LEACH (LEACH-GA) proposed in uses GA to find the optimal probability of CHs. LEACH-GA improves the CHs threshold function, but still CHs are chance by selected and the residual energy of each node is not considered in CH selection process. A new protocol called Amend LEACH (A-LEACH) was developed for electing CHs in a distributed fashion and civilizing the stability period of two-level hierarchical heterogeneous WSNs.

WSNs with mobile sinks have involved a lot of attention recently more number of authors developed an Intelligent Agent based Routing (IAR) protocol en route for assurance efficient data delivery to sink and reduce signal overhead. The idea of IAR is choose some sensors as agent. Then, the sink moves near an agent and accept data if it is in the range of the agent, and if not, the sink choose a sensor as a temporary relay node which receives data from agent and forwards it to sink. Authors in formulated the distance required mobile sink problem as a mixed integer linear programming and devised a novel heuristic to find an optimal sojourn tour for the sink base on maximizing the sum of halt times during the tour. Mobile sink-based Routing Protocol (MSRP) for prolonging in the network lifetime in clustered WSN has been address. In MSRP, the sinks move to CHs having high energy in the clustered network to collect sensed data from them.

The optimizing LEACH clustering algorithm with mobile sink and rendezvous nodes was introduce. This algorithm combines the make use of the LEACH algorithm, mobile sink and meeting points to protect the benefits of the LEACH algorithm and improve the CH selection process. In addition, it may decreases energy utilization in WSNs further than in usual LEACH, particularly when the network is large. MIEEPB introduces the sink mobility in the multi-chain model and divides the sensor fields into four different regions, therefore achieving smaller chains and reducing load on the leader nodes. The sink moves along its path and stays for a time at fixed location in every region to guarantee information collection. The mobile sink in the existing routing protocols always follows a certain path and stops at fixed halt locations.

This makes the sensors near the fixed halt location to dissipate their energy faster than other nodes. So in this paper, we use a control of mobile sink guide based on minimize the dissipated energy of all other sensor nodes. In this case, the sensors sense the nearby sink and change over time, giving the chance to all sensors in the network to act as data relays to the mobile sink and balancing the load among all nodes. The simple way to improve the energy efficiency of localization is to use low-power radio node as an alternative of the Wi-Fi module. Furthermore, the power consumption of the WSN node can be minimize either by reducing the hardware power assumption or by decreasing the active time of protocol at the protocol level. In a distributed time division multiple access (TDMA) scheduling algorithm, i.e., distributed-saturation-degree-based algorithm (DSDA), for the target tracking in ultrasonic sensor networks was proposed, which can avoid the inter-sensor interference (ISI) among all active ultrasonic sensors. The device-to-device Communication is also be a good way to energy saving. Still, the performance of such schemes depends highly on the accuracy and the timeliness of the context information. It is difficult to obtain in realistic systems. For now, theoretical work on the tradeoff between the energy required for localization and the resulting accuracy of localization is also carried out .In both the centralized and distributed implementations of the range-based localization schemes are discussed and the linear relationship between the energy efficiency and localization accuracy is recognized under some basic assumptions. A measure to characterize the energy efficiency of localization algorithms in wireless networks is also presented.



Furthermore, a time and energy efficient TOF- based Device-free wireless localization (DFL)mechanism is proposed, where a particle filter(PF) frame work issued to predict shadowed link states. However, only little information may be acquired by DFL method, which limit sits applicable range. Although energy-efficient localization has been active- search subject, there is still little work on designing Localization systems with both high energy efficiency and good accuracy. Furthermore, the location information of mobile nodes has not been well exploited to assist in the energy-efficient design. Therefore, the proposed eLOT system can address these afore mentioned issues.

III. OPTIMAL RELIABILITY IN ENERGY HARVESTING

In recent times, energy harvesting (EH) has emerged and promising techniques to extend the lifespan of the sensor nodes with rechargeable batteries

through harvesting the available ambient energy (e.g., solar, motion, heat, Aeolian, etc.) especially when battery replacement is tricky or cost-prohibitive. In the energy harvesting industrial wireless sensor networks (EH-IWSNs), energy preservation is no longer the prime design issue since the sensor nodes can tentatively operate over an infinite time possibility with the renewable energy. Still, achieving high reliability in EH-IWSNs is a complicated technical issue due to the uncontrollable and unstable nature of the harvested energy arrival.

Thus, the energy management strategy for an EH-IWSN wants to take into account the energy replacement process, so that the enduring reliability performance of the overall system in regard to sensing and data communication tasks can be maximized by taking full benefit of the EH process and avoid premature energy depletion before the next renew cycle.

The reliability of EH-IWSN systems is necessary for most industrial applications, which means that data received at the sink node (the control center) must exactly reflect what is actually occurs in the industrial environment. The reliability of EH-IWSN systems based on both the process of sensing and transmission process, which means that the ecological data should be *reliably* capture by the sensor nodes and the sensed data should be *reliably* transmitted to the sink. Energy management is a hopeful approach to deal with this technical challenge.

Consider the EH-IWSN with a predetermined data buffer and a limited battery energy buffer for each energy harvesting sensor (EHS) node. If the EHS node reserves an excessive amount of energy for sensing and leaves an insufficient amount of energy for transmission, the recently sensed data possibly dropped by the data buffer due to its limited capacity. On the other hand, if a too much amount of energy is consumed for transmission, there may not be sufficient sensing power left to capture the environmental data. In addition, if the energy allocation at the present resolution epoch is overly aggressive, the EHS node possibly will stop functioning at the next decision epoch due to the energy outage. As well, since sensor data is typically time-sensitive, e.g., alarm notifications.

For the industrial facilities, it is also essential to receive the data at the sink in a timely manner. Delayed and incorrect received or lost data may cause industrial applications to malfunction and moves to wrong decisions in the monitoring system. In this paper, we consider an IWSN where a fusion center (FC) gathers data from multiple EHS nodes with the slot-by-slot transmission. Each sensor node has an energy buffer and a data buffer with limited size. A random number of packets from the industrial environment should be sensed at each EHS node while each time slot. Moreover, the scheduled sensor node along with the allocated energy for data communication need to be determined by taking into account the battery energy state information (BSI), queue state information (QSI) and channel state information (CSI) at the start of the time slot. The left behind energy in the battery can be used to sense the packets right through the time slot. Ideally, the EHS nodes must sense all these packets and send out them to the FC without any further loss or error within the constraints of delay. However, packets may be lost during data sensing because of limited sensing power), and data communication due to both the effect of queuing overflow in the Medium Access Control (MAC) layer, and the packet reception error in the physical layer). One of the objectives of this paper is to minimize the weighted packet loss rate in the system below per-node delay constraints, where the weight of the loss packet rate of every EHS node is used to model the many reliability requirements of different sensors. In other words, we plan at maximizing the system reliability at the same time as guaranteeing real-time transmission.

IV. LEAST SQUARE LOCALIZATION FOR COOPERATIVE

The problem of localizing and tracking mobile nodes acting in a fixed WSN is addressed. The strategy of empirical map of the received signal strength distribution is generated by the WSN and on a stochastic model of mobile node behavior. This approach is being well suited for low-density in critical environments. The method is implemented keen on a real-time framework and its performance is tested in an industrial indoor environment. WSN, which is a large network of spatially distributed electronic nodes capable of sensing, computation and wireless communication. One of the typical application is Vehicular networks.

In wireless application where the most of network activities becoming essential for required location information of ad-hoc sensor networks. In particular cooperation among nodes is very highly benefited for local coverage and localization accuracy in the harsh environments. In this study of paper we used to mechanism calling least square (LS) Cooperative Localization in the arbitrary of non-line-of-site (NLOS). To develop the network position we generate the NLOS bias model and it shows that extremely constant bias. We then analyze the essential performance such as uniform convergence consistency and efficiency of cooperative localization. For the different deviations of localization accuracy for LS square range LS and square range weighted LS. WE also propose a distributed algorithm for LS cooperative localization to integrating the square range relaxation for various biases. To account for stochastic nature of node location and population this is characterized randomly in the network according to the point processor.

V. OUTDOOR LOCALIZATION FOR LOW POWER WIRELESS NETWORKS BY USING RECEIVED SINGAL STRENGTH

Mobile robot localization deal by using received signal strength indicator (RSSI) low power IEEE 802.15.4 for a wireless communication of the outdoor environment. For reducing the radio irregularity and uniqueness increases of RSSI measure hardware modifications are derived. Submitted accuracy allows elaborated in a novel algorithm. Uncertainty implicitly models and noises are accounts by the submitted accuracy. Furthermore, this algorithm is robust to failures of

nodes. In addition to improve the accuracy a particular filter is employed to perform probabilistic sensor blending of odometer, ultrasonic, different sensors and a map. The appropriateness of this approach is shown with real measurements achieving a main positioning error of 0.32m. In the progress of computing technology devices intelligence in our environment is continually increasing. Resources are sharing as a service by start to communicate through wireless communication in a

Critical component. Intelligence devices are the aware of context for further more important aspect which is the location of devices. A more number of research efforts have been invested in to localization systems development for the device location enable services. Most of them utilizing networking technology such as Bluetooth, WLAN are UWB to determining device position. The available of received signal strength is without any additional hardware, there is lot of research activities done during the last years thoroughly it is localization use. The main problem of localization is received signal strength is highly irregularity; it is caused by nature of radio signals.

VI. A RETAIL APPLICATION OF INDOOR LOCATION WITH GRID ESTIMATES

Generally indoor positioning systems have technological verities and application scenarios through development of a LBS service for targeted retail scenario we have adapted Wi-Fi signal strength fingerprinting consider the cost, resolution and some scaling-up factors and to tackle the accuracy problem of return location coordinates and make the LBS service more impact to, we have looked into past studies of probabilistic smoothing techniques such as Bayesian model, clustering and recursion neural network. The robustness of the technique originates sensitive to signal attenuation because of the difficulty of indoor setup and dynamics of onsite crowd. During the last decade, many technologies to detect indoor location have been proposed and have been adapted including GPS, RFID, UWV, acoustic based, cellular based, WLAN based and many more. A good summary of existing techniques considered both application scale and resolution can be found. Many Wi-Fi signal strength fingerprinting solutions for commercial break were studied during the development of application the location of accuracy as found to near around 5 to 10m in general and comparable and among all the available options the captured data by designated Wi-Fi routers is consisted the dimensions of following.(1)Time stamp.(2) Device Mac address.(3) Floor level (4) X Coordinates.(5)Y Coordinate.

VII. ANALYSIS OF RSSI BASED LOCATION ESTIMATION IN WSN

For location awareness system many new models has been developed in order to increase application usage and with the increase in widespread of mobile wireless system usage. First everyone started seeking support from 802.11 networks and the major issue in this is indoor environment usage later it is recovered by a thorough analysis in radio signal strength which shortly referred as RSS model. This RSS model is basically for distance estimation through empirical quantification of error metrics in wireless sensor networks. In addition to this RSS model we also implemented K-nearest signal space neighbor match algorithm which isuseful for various cases and scenarios to obtain a good and better location estimate.

VIII. IMPROVING THE MUTUAL CACHING SERVICE FOR DATA ACCESS IN DISRUPTION TOLERANT NETWORK WITH COOPERATIVE POSITIONING AND TRACKING\

A disruption- tolerant network is a problem solver for temporary and intermittent interactions issues, limitations and anomalies will always have lowest possible adverse impact on the network. These DTNs have contacts in order to solve problems in low density and unpredictable node mobility. It follows carry and forward method for data transmission.

Disruption tolerant networks which are shortly known as DTNs. DTNs are illustrating with the low node frequency, unreliable node mobility and lack of global network information where most of the DTNs focuses on data promoting with the limited work has been done to have efficient data access to the end users. The first and for most intension is to particularly cache data set of network central locations (NCLs) which can be easily accessed by the other nodes. All these will in supporting for a novel approach to increase sharing rate and distribution of cached data from many nodes and reduces the data access delay. Nowadays we use Pulse Counting and Protracting technique for finding current position and tracking of transition which is similar to Global Positioning system technique.

IX. EMPIRICAL EVALUATION OF WIRELESS LOCALIZATION WHEN USING MULTIPLE ANTENNAS

Signal strength variability is reduced with the help of employing low cost antennas in the fixed locations so we explore many algorithms in order to reduce the wireless localization by analyzing and this uses fingerprint matching, statistical maximum likelihood estimation, threshold bounding for signal fingerprints and finally multilateration. Performance under multiple antennas will provide you an experimental evaluation in localization by using indoor wireless test bed. In addition to this multiple antennas will improve the localization stability when there are small scale three dimensional movements of a mobile device around all the location.

X. CONCLUSION

In the existing paper Energy Efficient Localization and Tracking (eLOT) system was proposed to reduce the energy consumption. For improving the energy efficient we proposed four protocols- eLOT improving system, Low energy Adaptive Clustered Hierarchy (LEACH), and E-START. It will reduce the energy consumptions and increase the lifespan of the device which is used in the vehicular networks. It improves the time efficiency by avoiding traffic area by choosing alternative path with the help of wireless

sensor network devices. It will highly benefit for vehicular drivers and transport department.

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