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FEASIBLE SENSING BASED ON SAMPLE SCHEDULING MECHANISM IN WSN

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ABSTRACT:

Sample scheduling is a realistic issue in wireless sensor networks (WSN). The design objectives of efficient sample scheduling are in general two-folds: to achieve a low sample rate and high sensing quality. Cluster in is an effective method to organize sensor nodes in a wireless sensor networks in the aspect of data transmissions and energy saving. Recently, compressive sensing (CS) has been regarded as an effective paradigm for achieving high sensing quality at allow sample rate. The successful deployment of a large scale solar powered (WSN) in an urban, dessert environment is a very complex task. However, most existing work in the area of Compressive sensing for WSNs use fixed sample rates, which may make sensor nodes in a WSN unable to capture some distinct changes oftar get phenomenon, unless the sample rate is sufficiently high, and thus degrades the sensing quality. In this paper, to pursue high sensing quality at low sample rate, we propose an adaptive CS based sample scheduling mechanism (ACS) for WSNs. ACS estimates the minimum required sample rate subject to given sensing quality on a per-sampling-window basis and accordingly adjusts sensors' sample rates. ACS can be useful in many applications such as environment monitoring, and spectrum sensing in cognitive sensor networks. Extensive trace driven experiments are conducted and the numerical results show that ACS can obtain high sensing quality at low sample rate.

INTRODUCTION

- **Overview of Domain:**

Wireless sensor networks (WSN) can be deployed to monitor physical phenomena, e.g., primary user signals in cognitive sensor network. In such

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networks, massive sensor nodes work to sense their surrounding environments and report their sensed data to a fusion center. For each individual sensor node, temporal correlation usually exists among its measurements since its monitored physical phenomenon usually changes continuously. In a wireless sensor networks (WSN), sensor nodes are usually randomly deployment and they operate in a unattended fashion, perhaps even in unpredictable or hash environments. Clustering is one of the efficient techniques to organize sensor nodes for energy efficient data transmission.

- **Need For The Study:**

Wireless sensor networks (WSN) can be deployed to monitor physical phenomena, e.g., primary user signals in a cognitive sensor network. In such networks, massive sensor nodes work to sense their surrounding environments and report their sensed data to a fusion center. Sensor nodes are usually powered by batteries that are energy limited. Since all the sensor nodes are targeted to monitor the same physical phenomena and the sensor nodes are usually deployed in a sufficient high density to guarantee high sensing quality, spatial correlation among the sensing measurements from neighboring sensor nodes is highly expected. In addition, for each individual sensor node, temporal correlation usually exists among its measurements since its monitored physical phenomenon usually changes continuously. Such spatial and temporal correlations have been exploited in various WSN technologies (e.g., spectrum sensing in a cognitive sensor networks, data aggregation and compression, route selection, clustering, and etc.) while meeting certain sensing quality requirements.

In WSNs, clustering is the process organizing sensor nodes that have high proximity in groups. Clustering coefficient can be differentiated in two categories: quantitative. For example, the location of sensor nodes is one kind of quantitative data. The distance between two nodes can be obtained based on the well known Pythagorean Theorem or Euclidean distance. In this case, distance is the dissimilarity quantitative coefficient. Normally, closer nodes are more likely to be form a cluster. Studies which use location data for clustering assume that every sensor node is aware of its location or has to GPS equipped. Although GPS is the accurate and direct localization identification method. The objective of CS design is to use the minimum sample rate to recover the original signal subject to given recovery.

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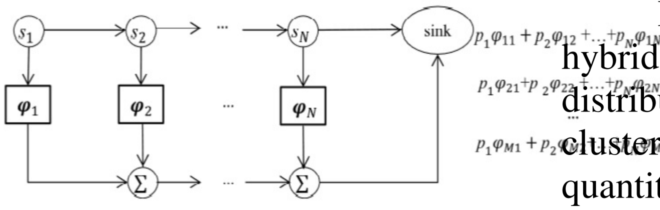

Fig 1 Transmission schedule

LITERATURE SURVEY

2.1 Introduction

Compression sensor based transmission schedule has significant advantage in terms of energy consumption balance and energy efficiency. Cs has been used in various sensor networks , such as data gathering sensor networks, cognitive radio sensor networks, MIMO based sensor networks and etc,. Compression sensor has applied to WSNs due to its high recovery high recovery quality. Certainly packets P1, P2….Pn as generated nodes S1, S2…Sn respectively need to transmitted to the to the sink node in the network. As a result the sink node in the network receives N encoded packets, N(N+1)/2 transmission in total need to be carried out in the network.

2.2 Survey

Hybrid clustering technique using quantitative and qualitative data for wireless sensor networks:

In this paper, it proposes a hybrid clustering protocol – hybrid distributed hierarchal agglomerative clustering (H-DHAC). It uses both quantitative location data and binary qualitative connectivity data in clustering WSNs. Clustering is an efficient method to organize sensor nodes in wireless sensor networks in data transmission. The cost of H-DHAC can be significantly lower in comparison to those approaches that use complete quantitative location data, as GPS is not required for all the sensor nodes.

Distributed self fault diagnosis algorithm for large scale wireless sensor networks using modified three sigma edit test:

In this research, a modified three sigma edit test based self fault diagnosis algorithm is proposed which diagnose both hard and soft faulty sensor nodes. The proposed distribute self fault diagnosis algorithm is simulated in NS3 and the performances are compared with the existing distributed fault detection algorithms.

The simulation results show that the detection accuracy, false alarm rate and false

Positive rate performance of the DSFD algorithm is much better in adverse environment where the traditional methods fail to detect the fault. The fault free sensor nodes

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produce correct results during the network operation. The hard faulty sensor nodes do not respond, whereas the soft faulty sensor nodes respond with erroneous data skewed from the original data. The actual and erroneous data sensed by different sensor nodes is assumed to be a random variable which
Varies from one region to another region of the sensor network.

TOA-based joint synchronization and source localization with random errors in sensor positions and sensor clock biases:

In this paper, considers the problem of joint synchronization and source localization using time of arrival (TOA) when the known sensor positions and sensor clock biases are subject to random errors. We derive the Cramér–Rao lower bound (CRLB) of the source position and the source clock bias, and quantify the amount of estimation performance degradation due to sensor position errors and sensor clock bias errors. It proceeds to develop a new joint synchronization and source localization algorithm. The new method takes into consideration the presence of sensor position errors and sensor clock bias errors, and has the advantage of being a closed-form solution.

Lessons learned on solar powered wireless sensor network deployments in urban, desert environments:

In this paper, we share our experiences in all domains of sensor network operations, from the conception of hardware to post-deployment analysis, including operational constraints that directly impact the software that can be run. We illustrate these experiences using numerous experimental results, and present multiple unexpected operational problems as well as some possible solutions to address them. We also show that current technology is far from meeting all operational constraints for these demanding applications, in which sensor networks are to operate for years to become economically appealing

QoS-aware sensor allocation for target tracking in sensor-cloud:

In this paper, specifically, we address the issue of selection of an optimal set of sensors to track a particular target. However, in sensor-cloud the underlying physical sensor nodes are heterogeneous with respect to their owner, their sensing ability, transmission range, and the unit cost of usability. Considering the heterogeneity of the nodes, we propose the QoS-aware Sensor Allocation Algorithm (Q-SAA) that takes into account an assortment of parameters that determine QoS. Thereafter, using an auction-based

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mechanism we find the optimal solution for allocation of a subset of available sensors to achieve efficient target tracking. An auction-based scheme for autonomous allocation of sensors to a particular target through sensor-cloud service provider was formalized. The sensor-cloud architecture is able to retrieve and process sensor data in a cost-effective, timely, and easily accessible manner.

Maximum life time dependable barrier-coverage in wireless sensor networks:

In this paper, we defined a new security problem in the existing sleep-wake up scheduling algorithms in order to maximize life time barrier coverage of wireless sensors. By identifying a set of points, namely potential breach- points, an intruder can penetrate into the area without any detection of sensors by alternating barrier-covers, which there exists barrier – breach. Such potential -breach-points are found when one barrier – cover of sensors is replaced by another barrier-cover crossing with it. We proved there exists a schedule for a set of barrier-covers that does not allow any barrier – breach if two barrier-covers do not cross each other. To solve the problem, we proposed three heuristics that can be applied to both Stint and Prahari. Through extensive simulations, we evaluate their performances against the theoretical upper bound and analyzed the results. As a future work, we plan to study a distributed algorithm for the problem with allow complexity.

Residual energy-based adaptive data collection approach for periodic sensor networks:

In this paper, we proposed an adaptive sampling approach for energy efficient periodic data collection in sensor networks. We described three main mechanisms that form the core of our approach. First we study the sensed data between periods based on the dependence of conditional variance on measurements varies over time with three different tests (Fisher, Tukey and Bartlett). Then, we proposed a multiple levels activity model that uses behavior functions modeled by modified Bezier curves to define application classes and allow each node to compute its sampling rate while taking into account its residual energy level. We showed via simulations that our approach can be effectively used to increase the sensor network lifetime, while still keeping the quality of the collected data high. Our future work seeks to adapt our proposed method to take into account the correlation between neighboring nodes. Because if two sensor nodes operate with identical or similar sampling rates, collisions between packets from the two nodes are likely to happen

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repeatedly. Then it is essential for sensor nodes to be able to detect this repeated collision and introduce a phase shift between the two transmission sequences in order to avoid further collisions.

Distributed Compressive Wide-Band Spectrum Sensing

In this paper, we consider a compressive wide-band spectrum sensing scheme for cognitive radio networks. Each cognitive radio (CR) sensing receiver transforms the received analog signal from the licensed system in to a digital signal using an analog-to information converter. The autocorrelation of the compressed signal is then collected from each CR at a fusion center. A compressive sampling recovery algorithm that exploits joint sparsity is then employed to reconstruct an estimate of the signal spectrum and used to make a decision on signal occupancy. We compare the performance of this distributed compressive spectrum sensing scheme with a compressive spectrum sensing scheme at a single CR and show the performance gains obtained from spatial diversity.

A Fast Approach for over complete Sparse Decomposition Based on Smoothed Norm

In this study, a fast algorithm for over complete sparse decomposition, called SL0, is proposed. The algorithm is essentially a method for obtaining sparse solutions of underdetermined systems of linear equations, and its applications include underdetermined sparse component analysis (SCA), atomic decomposition on over complete dictionaries, compressed sensing, and decoding real field codes. Contrary to previous methods, which usually solve this problem by minimizing the l 1 norm using linear programming (LP) techniques, our algorithm tries to directly minimize the l 1 norm. It is experimentally shown that the proposed algorithm is about two to three orders of magnitude faster than the state-of-the-art interior-point LP solvers, while providing the same (or better) accuracy.

All is not Lost: Understanding and Exploiting Packet Corruption in Outdoor Sensor Networks

In this paper, we have described how corruption systematically affects symbols and packets in an outdoor 802.15.4 sensor network. We described a pattern in corruption that we attributed to the use of MSK demodulators, a specific tie resolution strategy when decoding, and a channel model with independent errors. These insights allowed us to formulate a novel probabilistic approach to recover information from

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corrupt packets. We showed that the approach reduces the uncertainty associated with a corrupt packet, and that it correctly assigns a high probability to the data that was actually sent. We will address systems aspects of our approach in future work and develop a concrete implementation of the proposed ideas. We specifically plan to investigate the trade-off between data quality and energy consumption, as well as the the relationship of our proposed recovery mechanism to other approaches such as forward error correction. We conclude that patterns in packet corruption in outdoor sensor networks can be understood, and that information may be recovered from some corrupt.

Non uniform Compressive Sensing for Heterogeneous Wireless Sensor Networks

In this paper, we consider the problem of using wireless sensor networks (WSNs) to measure the temporal-spatial profile of some physical phenomena. We base our work on two observations. First, most physical phenomena are compressible in some transform domain basis. Second, most WSNs have some form of heterogeneity. Given these two observations, we propose a nonuniform compressive sensing method to improve the performance of WSNs by exploiting both compressibility and heterogeneity. We apply our proposed method to real WSN data sets. We find that our method can provide a more accurate temporal-spatial profile for a given energy budget compared with other sampling methods.

Data Collection And Capacity Analysis In Large-Scale Wireless Sensor Networks:

In this paper, in this dissertation, we study data collection and its achievable network capacity in Wireless Sensor Networks (WSNs). Firstly, we investigate the data collection issue in dual radio multi-channel WSNs under the protocol interference model. We propose a multi-path scheduling algorithm for snapshot data collection, which has a tighter capacity bound than the existing best result, and a novel continuous data collection algorithm with comprehensive capacity analysis. Secondly, considering most existing works for the capacity issue are based on the ideal deterministic network model, we study the data collection problem for practical probabilistic WSNs. We design a cell-based path scheduling algorithm and a zone-based pipeline scheduling algorithm for snapshot and continuous data collection in probabilistic WSNs, respectively. By analysis, we show that the proposed algorithms have competitive capacity performance

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compared with existing works. Thirdly, most of the existing works studying the data collection capacity issue are for centralized synchronous WSNs. However, wireless networks are more likely to be distributed asynchronous systems. Therefore, we investigate the achievable data collection capacity of realistic distributed asynchronous WSNs and propose a data collection algorithm with fairness consideration. Theoretical analysis of the proposed algorithm shows that its achievable network capacity is order-optimal as centralized and synchronized algorithms do and independent of network size. Finally, for completeness, we study the data aggregation issue for realistic probabilistic WSNs. We propose order-optimal scheduling algorithms for snapshot and continuous data aggregation under the physical interference model.

On the Interplay between Routing and Signal Representation for Compressive Sensing in Wireless Sensor Networks:

In this paper, we studied the behavior of CS when used jointly with a routing scheme for recovering two types of signals: synthetic ones and real sensor data. We showed that for the synthetic signal the reconstruction at the sink node is enhanced when applying CS, whereas the application of CS for real sensor data is not straightforward. Thus, as a next step of our ongoing research, we intend to further investigate which signal representation and routing allows CS to outperform random sampling in realistic WSN deployments. This requires to jointly investigating the design of the two matrices Φ and Ψ, since the sparsity requirements and the incoherence between routing and signal representation have to be met.

Energy-Aware Sparse Approximation Technique (EAST) for Rechargeable Wireless Sensor Networks:

In this paper, we discuss energy-aware work load distribution is therefore necessary for good data accuracy while ensuring an energy-neutral operation. Recently proposed signal approximation strategies, in form of Compressive Sensing, assume uniform sampling and thus cannot be deployed to facilitate energy neutral operation in rechargeable WSNs. We propose a sparse approximation driven sensing technique (EAST) that adapts sensor node sampling workload according to solar energy availability. To the best of our knowledge, we are the first to propose sparse approximation for modeling energy-aware work load distribution in order to improve signal approximation from rechargeable WSNs. Experimental result, by using data from an outdoor WSN deployment, suggests that EAST significantly improves the approximation accuracy while supporting approximately 50% higher sensor on-time compared to an approach that assumes uniform energy profile of the nodes.

Design and optimization of a tiered wireless access network:

In this paper, we are having high potential for broadband wireless access, wireless mesh networks are known to suffer from throughput and fairness problems, and are thus hard to scale to large size. To this end, hierarchical architectures provide a solution to this scalability problem. In this paper, we address the problem of design and optimization of a tiered wireless access network. At the lower tier, mesh routers are clustered based on traffic demands and delay requirements. The cluster heads are equipped with wireless optical transceivers and form the upper tier free space optical (FSO) network. We first present a plane sweeping and clustering algorithm aiming to minimize the number of clusters. PSC sweeps the network area and captures cluster members under delay and traffic load constraints. We then present an algebraic connectivity-based formulation for FSO network topology optimization and develop a greedy edge-appending algorithm that iteratively inserts edges to maximize algebraic connectivity. The proposed algorithms are analyzed and evaluated via simulations, and are shown to be highly effective as compared to the performance bounds derived in this paper.

Novel Covert Data Channel in Wireless Sensor Networks Using Compressive Sensing:

In this paper, with the limited energy of sensor nodes and the increasing requirement of secure data transmission, how to save nodes energy as well as realize a transmission of sensitive information in WSN effectively is becoming an interesting research problem recently. In this paper, we present a novel scheme to transmit sensitive information in the pattern of energy efficient way by utilizing compressive sensing (CS) which is an emerging technology in recent years. In this method, sensor nodes need not to do complex computing but simple linear operations which can save the energy extensively, and thus extend the life time of the wireless sensor networks. Theory analysis and detail simulation results demonstrate the effective of our method, and the sensitive information can be accurately reconstructed even when the communication channel is lossy.

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Enhanced compressive wideband frequency spectrum sensing for dynamic spectrum access:

In this paper, CS is used to deal with the too high sampling rate requirement problem in the wideband spectrum sensing for CR. The sub-Nyquist random samples is obtained via the AIC with the partial Fourier random measurement matrix. Based on the random samples, incorporating the a priori information of the fixed spectrum allocation, an improved block-sparse constraint with different block length is used to enforce locally block distribution and globally sparse distribution of the estimated spectrum. The new constraint matches the practical spectrum better. Furthermore, the iterative reweighting is used to alleviate the performance degeneration when the C2/ C0 norm minimization is relaxed to the C2/ C1 one. Because the a priori information about boundaries of different types of primary users is added and iteration is used to enhance the VLBS constraint performance, the proposed EVLBS-CWSS outperforms previous CWSS methods. Numerical simulations demonstrate that the EVLBS-CWSS has higher spectrum sensing accuracy, better denoising performance, etc.

Wireless sensor networks: a survey

This paper describes the concept of sensor networks which has been made viable by the convergence of micro-electro-mechanical systems technology, wireless communications and digital electronics. First, the sensing tasks and the potential sensor networks applications are explored, and a review of factors influencing the design of sensor networks is provided. Then, the communication architecture for sensor networks is outlined, and the algorithms and protocols developed for each layer in the literature are explored. Open research issues for the realization of sensor networks are also discussed.

An adaptive traffic MAC protocol based on correlation of nodes

In this paper, an improved algorithm of EA-MAC protocol is given to address the deficiencies of the SMAC protocol. Firstly, an algorithm for correlation computing between nodes is proposed which divides similar nodes to a certain area and chooses the representative node for data transmission in the considered region. Representative node is cyclically elected upon some parameters such as node residual energy and distance to sink node. In the transmission, network traffic prediction is conducted by ARMA mode and the duty cycle is dynamically changed accordingly through comparing the predicted value with the pre-setting threshold value. Conflict probability is

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significantly controlled by altering the back-off range and constraining the back-off window size, effectively reducing energy consumption. Finally, NS2 is adopted to implement for simulations of EA-MAC protocol and SMAC protocol.

Bridging the gap among actor–sensor–actor communication through load balancing multi-path routing

In WSANs, the communication among actors in different partition can be completed through relaying the data to the destination actor by sensor node, but the difference of throughput capacity between sensor nodes and actors is huge, which affects the throughput of the network. In this paper, a novel high-throughput disjoint multi-path (HTDM) routing scheme is proposed to fill the gap. In the thesis, the routing protocol of HTDM scheme is introduced in detail. It has proved that multiple routing paths are established among actor sets in HTDM scheme, thus bridging the gap among actor–sensor–actor communication (ASAc). Then, an EHTDM scheme is proposed to balance the energy consumption and prolong network lifetime.

Performance characterization and transmission schemes for instantly decodable network coding in wireless broadcast

In this paper, we studied the throughput and average packet decoding delay (APDD) performance of S-IDNC in broadcasting a block of data packets to wireless receivers under packet erasures. By using a random graph model, we showed that the throughput of S-IDNC decreases with increasing an number of receivers. By introducing the concept of perfect S-IDNC solution, we proved the NP-hardness of APDD minimization. We derived an upper bound on APDD and showed that minimizing the IDNC solution size can effectively reduce APDD. By applying stochastic shortest path method, we showed that it is intractable to make optimal coding decisions in the presence of random packet erasures. We then used heuristic objective functions to determine the preferred coded packet(s) to send when fully- or semi-online receiver feedback is collected.

Scaling hierarchical clustering and energy aware routing for sensor networks

In this paper, energy efficiency and scalability are the most important design objectives for WSNs. We have presented a distributed, energy efficient clustering routing protocol with energy aware path selection schemes to improve the lifetime of sensor networks. A key feature of the proposed approach is that cluster

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heads are elected based on the maximum local residual energy of the neighboring nodes to distribute energy dissipation evenly among all clusters. Based upon this approach, we have introduced the SHEAR protocol that inherits the power efficient and scalable hierarchical topology control of SHPER; and overcomes the weakness of its indeterminate random procedure for dividing the sensor field into upper and lower levels. The energy aware path selection scheme of SHEAR further balances the network-wide energy consumption by finding the least energy cost paths. This is achieved by exploiting relationship between the residual energy of bottleneck nodes present on a path and the total energy consumed along the path.

On the asymptotic equivalence between stochastic and deterministic energy sources in energy harvesting sensing systems

In this paper, we seek answer to the question: can a wireless sensing system with energy harvesting power supplies perform as well as the one with conventional power supplies? Conventional sensing systems with deterministic energy sources usually employ uniform sampling. However, due to the stochastic nature of the energy harvested from the ambient environment, uniform sampling is usually infeasible for energy harvesting sensing systems. We thus propose a simple best-effort sensing scheme, which defines a set of equally spaced candidate sensing instants. At a given candidate sensing instant, the sensor will perform sensing if there is sufficient energy available, and it will remain silent otherwise. It is analytically shown that the percentage of silent candidate sensing instants goes to zero as time increases, if and only if the average energy harvesting rate is no less than the average energy consumption rate. Therefore, the difference between the best-effort sensing policy and the uniform sensing policy diminishes as time evolves. The theoretical results are then used to guide the design of a practical sensing system that monitors a time-varying event.

Experimental evaluation of the WiMAX downlink physical layer in high-mobility scenarios

In this paper,We have experimentally evaluated the performance of the WiMAX downlink physical layer in high-mobility scenarios. Both SISO and MIMO transmissions were considered, as well as placing the receive antennas outside and inside the car used for the experiments. We focused on the ICI caused by channel time variations in such scenarios. Cost-effective measurement campaigns were carried out where high-mobility scenarios are emulated

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with a vehicle moving at a low speed. The key idea is the enlargement of the symbol period prior to its transmission over the air. Such enlargement reduces the frequency spacing between the OFDM subcarriers in WiMAX transmissions and hence induces high ICI values on the received signals. Experiments illustrate the performance of WiMAX receivers with and without ICI cancellation in terms of EVM and throughput. ICI cancellation produces significant performance gains mainly when the received SNR is high. Otherwise, thermal noise dominates over the ICI, and gains are not so much appreciated.

Compressive sensing problem for wireless sensor networks and accordingly proposed an adaptive CS-based sample scheduling (ACS) mechanism to overcome the drawback that fixed sample rate in existing compressive sensing mechanisms is unable to quickly react to significant phenomena change. ACS can work with either of the following metrics, signal sparsity or change intensity, for window-by-window sample rate adjustment by using hash table built during training phase.

PROBLEM DEFINITION & OBJECTIVE

PROBLEM DEFINITION:

ACS aims at only sampling the phenomena of interest at a very low sample rate while meeting expected sensing quality. Existing work in CS can generally be categorized into two types: SMV-based (single measurement vector) and MMV - based (multiple measurement vectors). SMV- based CS compresses one-dimensional signals and it is motivated by an observation that for an N-sample signal that is K -sparse. One straight forward solution to MMV is to divide an MMV into multiple SMVs and then solve each SMV individually

3.2 OBJECTIVES:

- Existing work in CS can generally be categorized into two types: SMV-based (single measurement vector) and MMV - based (multiple measurement vectors). SMV-based CS compresses one-dimensional signals and it is motivated by an observation that for an N-sample signal that is K -sparse.
- Initially all the sensor nodes in the area will sense a large amount. Data is collected per min and all the sensed data's will be send to the sink node
- Sink node receives all the data's and process the data to get a cumulative result.

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- To transfer the data from sensor to sink it consumes more time.
- To reduce the time the data is compressed and send using a novel scheduling. Let the normal time to send is T1 and after compression the time will be T2 (compression time + sending time).

SYSYTEM DESIGN

4.1 INTRODUCTION:

In this section, we propose our ACS mechanism. ACS aims at only sampling the phenomena of interest at a very low sample rate while meeting expected sensing quality. First, we present the basic idea behind ACS. Second, we present the detailed design of ACS including its representation basis, measurement matrix design, and recovery algorithm. Third, we present the sample rate adjustment strategy in ACS.

We consider a network scenario wherein massive sensor nodes are deployed to monitor a target phenomenon in an interested area. The sensor nodes sample the phenomenon according to their own sample schedules and report their measurements to a sink node. In ACS, the sample schedules of sensor nodes are decided by using compressive sensing, where the measurements of all sensor nodes in the network form an MMV which can have high spatial and temporal correlations. In this section, we propose an efficient sample scheduling mechanism called ACS, which performs adaptive compressive sensing in order to achieve a low sample rate while meeting desired stably high sensing quality.

Each node estimates the change intensity (or sparsity degree) of its monitored phenomenon during a certain period of time called checking window whose size is denoted by N, decides on how to adjust its sample rate in the following checking window based on certain knowledge of target phenomenon obtained during a training phase. By adaptively adjusting the sample rates of sensor nodes, ACS achieves a low sample rate while meeting desired stably high sensing quality.

We choose a measurement matrix such that ACS performs uniform sampling (in each checking window). Note that different checking windows can have different sample rates. The reason to choose uniform sample schedule is that intense change of the target signal could happen at any time and uniform sample schedule is a good choice to achieve high data accuracy when no apriori

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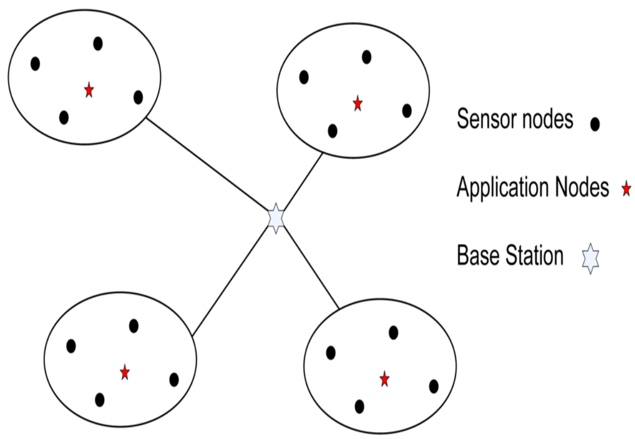
knowledge regarding the monitored signal is known in advance.

4.2 SYSTEM DIAGRAM:



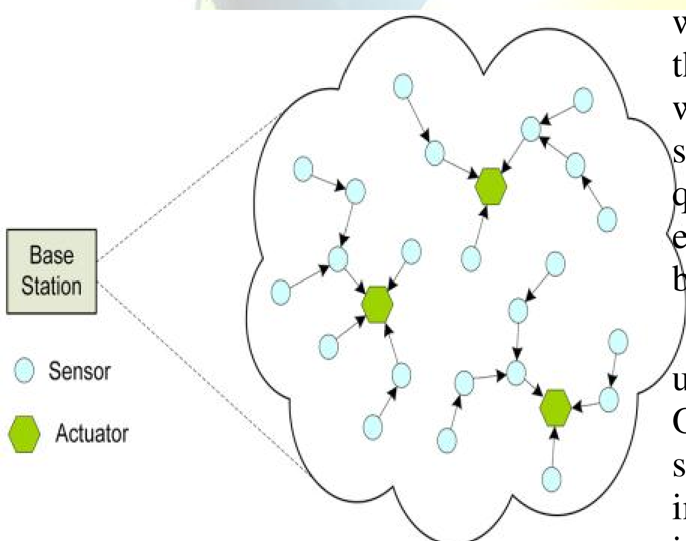


Fig: 4.2 System Design

4.3 MODULE DESCRIPTION:

In CS theory, sample rate is defined to equal to M/N. Intuitively, in ideal condition, the sample rate should be tuned in real time based on the change intensity of the target signal. The more intense the target signal changes in a short period of time, the less sparse the sensed signal is, the higher the sample rate within that period of time should be; otherwise, the more stable the signal is, the more sparse the signal is, thus the lower the sample rate should be. In this subsection, we propose mechanisms for adaptive sample rate control, which inspects the measurements in each checking window, whose size is N, and adjusts the sample rate in the next checking window accordingly. To pursue high sensing quality, we expect the sensing quality of each checking window exceeds a desired threshold, denoted by SNR.

There are two key metrics useful for the sample rate adjustment. One is the sparsity degree of the signal and the other is the change intensity of the signal. The change intensity indicates how intense a signal varies with time. The change intensity of a window is measured by the SNR (Signal to Noise Ratio), where the signal is the one of the current window and noise is defined as the signal of current window minus that of its preceding window. Fig. 2

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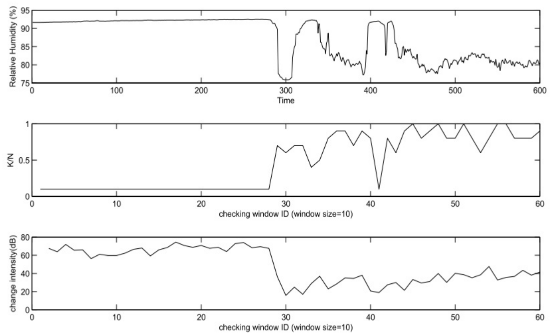
shows how sparsity degree and change intensity of a signal (measurements of relative humidity) vary over time as observed on per checking window basis..



From this figure, it is seen that the sparsity degree and change intensity associated with different checking windows change over time. The significant change part of the original signal (see the top subfigure) accords to the peak points of sparsity degree (see the middle subfigure) and the steep drop of change intensity (see the bottom subfigure). Motivated by the observation in Fig. 2, it is possible to adjust the sample rate for the next checking window by leveraging the sparsity degree or change intensity detected in the preceding checking window since sparsity degrees (or change intensities) in neighboring checking windows are very close. Later on, we will further show that our sample rate adjustment mechanism in ACS is highly resilient to certain error in sparsity degree or change intensity estimation. Next, we will present adaptive sample rate control mechanism based on sparsity degree and change intensity, respectively.

CONCLUSION

Compressive sensing problem for wireless sensor networks and accordingly proposed an adaptive CS-based sample scheduling (ACS) mechanism to overcome the drawback that fixed sample rate in existing compressive sensing mechanisms is unable to quickly react to significant phenomena change. ACS can work with either of the following metrics, signal sparsity or change intensity, for window-by-window sample rate adjustment by using hash table built during training phase.

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