

Research on Signal Processing and Noise Analysis of Wireless Sensor

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Abstract: In recent years, the Internet of Things technology has become increasingly mature, playing an important role in the fields of logistics, smart home, environmental monitoring, military, and medical health. Among them, there are two important problems in the collection of data, one is energy consumption and energy distribution, and the other is noise processing of data collection. The research topic of this paper focuses more on the noise processing problems in data collection. This study which uses the literature review methods mainly discusses the problem of signal collection and noise processing of wireless sensors, including reducing noise by analyzing the three elements of noise, modifying hardware and algorithms to reduce noise, obtaining a higher signal-to-noise ratio and more accurate and stable output results, and how to collect information normally in a noisy environment. Minimize the impact of noise. In conclusion, this paper explores the influence of sensor noise in agriculture, health, indoor positioning, circuit and other fields, directly improve the noise coupling mode, and propose the algorithm of minimum total error entropy. These processing methods proposed for a certain environment can solve the noise problem well and improve the purity of signal collection.

Keywords: Wireless sensor, Noise, Distributed algorithm, Accuracy

1. Introduction

The 21st century is the king of the data era. Any intelligent analysis needs a lot of data support; and how to collect data and collect high-quality data has become the key to solving the problem. In the process of data collection, the sensor plays an important role, so dealing with the sensor noise and using or reducing the sensor noise has become key issues that will directly affect the accuracy of the result.

According to the research of scholars Hu Ming and Li Daming, they start with the analysis of the noise source, noise coupling mode and coupling channel, eliminate and suppress the three elements of noise formation, so as to alleviate various types of noise in the circuit [1]. In terms of the light voltage sensor, scholars yong-jun wang chong-qing wu, xiang-jun xin has carried on the related research of Noise, the sensing head orientation of each device for measuring range and the influence of nonlinear distortion, and improved the SNR (signal-to-noise wire) approach. The optimal orientation for obtaining the highest SNR and the least nonlinear distortion is determined [2]. According to the research of Lu Zhenyu and Tian Yuping, indoor location and environment construction technology of wireless sensor network are studied. The localization and environment

construction problems are transformed into pure localization problems by constructing virtual nodes. The communication noise with quantization error as the main form is analyzed. An algorithm for distributed location and environment construction under communication noise is proposed, and the effectiveness and robustness of the algorithm are verified by simulation experiments [3].

According to the research of Wang Rou et al., a large amount of raw data generated in sensor networks needs to be transmitted to the central node for processing through limited bandwidth, and the high-frequency signals in these data may be susceptible to noise and interference, resulting in a decline in data quality and affecting the classification efficiency and quality. Therefore, a static node classification algorithm for wireless sensor networks is proposed. The static node data of the wireless sensor network is filtered, and the attributes of static nodes are described. A field Programmable Gate Array (FPGA) is used to realize digital down-conversion of sensor nodes, reduce signal frequency, further reduce the impact of noise and interference on signals, and reduce data transmission amount. A support vector machine algorithm is introduced to complete the classification of static nodes. Experiments show that this algorithm can complete a large number of data processing tasks in a short time, and has good classification effect and application value [4].

Several academic papers show how different types of noise are produced and what classifications are available, how to deal with different types of noise to make wireless sensors more accurate, and how to make the real value closer to the theoretical value.

Noise processing of wireless sensors has achieved great significance in all aspects, such as accepting environmental sound. The detection index is more conducive to the healthy growth of crops; and is more conducive to reducing the negative effect of noise on human health. Like environmental noise, breakthroughs have also been made in the processing of noise in the fields of wireless sensor network positioning and indoor composition algorithm. Improves measurement accuracy and practicality. No matter in which field, the collection and processing of noise improves accuracy and makes a great contribution to the better use of artificial intelligence.

Therefore, this article will mainly explore the noise processing problem of wireless sensors through the literature methods. The study shows that the latest progress in noise treatment at present, as well as the technological improvement obtained after noise treatment, can be conducive to the progress of productivity and human health.

2. Literature review

Noise processing is an essential stage to improve the measurement accuracy of computer vision processing. In order to deal with noise well, we should first understand the source and classification of noise in order to better develop corresponding weakening strategies. First of all, noise is divided into internal noise and external noise. Internal noise refers to the irregular movement of charged particles inside the sensor, such as shot noise. External noise refers to the detection system's external perception or natural interference.

Sensor noise removal has achieved remarkable results in various fields. Optical fiber sensors improve the signal-to-noise ratio by dealing with the nonlinear distortion effects of each component of the sensor head, making the performance of optical fiber voltage sensors much higher than that of transformers, and their continuous development will have a significant impact on the accurate measurement and control of high voltage [5]. The problem of dealing with ambient noise has also been improved by establishing a location algorithm and a probabilistic model about sensor nodes and ambient noise [6].

3. Case study

Wireless sensor network is composed of sensor nodes that can collect and process information. When sensor nodes collect and process data, background noise cannot be avoided. Therefore, solving the noise distribution plays a key role.

During operation, the main noise includes pulse noise and Gaussian noise, which will seriously disturb the results, enhance the instability of the system, and destroy the estimation performance of the algorithm. The original research methods are the distributed least mean square algorithm and the distributed symbol algorithm, but they can only deal with Gaussian noise. In order to further deal with pulse noise, this paper proposes an improved algorithm: the distributed minimum logarithmic absolute deviation algorithm, which is used to improve performance, enhance the service life of nodes in sensor networks, and enhance the stability of the whole algorithm.

First, define the error signal as $e_i = d_i - u_i^T w_i$, where w_i is the weight vector of the adaptive filter, u_i is the input signal, and d_i is the expected signal. This paper compares several error cost functions, including absolute error cost function, mean square error cost function and absolute deviation cost function, and finds that the logarithmic absolute deviation is more robust when dealing with errors. In order to estimate the location parameters in the distributed network, global and local cost functions are defined. The nodes share information through the topology structure, and each node minimizes its own local objective function, which is updated by combining the information of neighboring nodes. Then, the performance analysis is carried out, and the convergence and stability of the algorithm are analyzed under the framework of mean value and mean square error analysis. Finally, the local function is updated by the fastest descent method, and the update equations of the intermediate estimate and the final estimate are derived by combining the linear combination between the nodes. It ensures the stability and accuracy of the algorithm in the presence of noise and changes in statistical information [7].

Noise not only exists in the output part but also needs to be analyzed and processed in the input part. This paper further proposes a distributed minimum total error entropy algorithm based on diffusion cooperation strategy so that the internal nodes of the network can avoid serious interference from input Gaussian noise and output pulse noise.

This algorithm is a parameter estimation method for dealing with multi-noise systems, especially when the noise distribution is non-Gaussian. Unlike classical least squares and total least squares, this algorithm estimates the target coefficient of the system by minimizing the entropy-based cost function. For the analysis of mean value and military convergence, the algorithm achieves low error and fast convergence, which has been confirmed in simulation experiments [7].

4. Discussion

Noise processing has critical significance in various applications. In the high precision industry, noise processing can reduce the error, enhance the signal quality, and improve the measurement precision, but it can also improve the system stability, reduce system jitter, enhance the robustness, and improve the reliability of the system under different environments. In addition to this, noise processing can also ensure the data reliability, equipment life, and the user experience. But there is still much to be improved, noise processing algorithms need high computation costs, and also have a complex parameter adjustments; reliance on environment is also very strong, lack of commonality, the future will do more research in the above aspects. It is also necessary to apply the improved method more in practice, not just stay in the simulation experiment, with more actual environment and equipment for more improvement. In the future, with the continuous efforts of various scholars and researchers, computer vision sensor noise processing will make more breakthrough and stable progress.

5. Conclusion

The article mainly introduces the sensor analysis and processing of noise. The noise processing field has made rapid progress, and new algorithms have been created to solve the noise problem. But this article also has some disadvantages to improve in the future. This paper does not propose the improvement methods of specific cases, such as how to solve the problem that environmental factors have great influence, how to make the system stable in the face of different environments. and how the processing algorithm should be adjusted can reduce the cost. In the future, this paper should not only stay in the simulation experiment stage and text analysis stage, but also put forward practical operation, put forward improvement measures that can face the stability of different environments, and put forward new algorithms to reduce cost and computing power, to better deal with noise problems.

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