SOUND EVENT DETECTION USING WIRELESS SENSOR NETWORKS

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ABSTRACT

The development of wireless technologies has influenced the applications of sensor networks. Using sound recognition for home automation or smart homes in our daily lives has become a new research issue. This work focuses on the capturing and processing of sound signals in a WSN. In a real living setting, sounds rarely occur isolated from one another. We consider the capturing and processing of sounds of interest that are mixed with other sounds. Sound event classification can provide significant help in home environmental monitoring. Predefined home automation services can be triggered with associated sound classes. The system can monitor home events by detecting kettle whistling, glass breaking, and doorbell/telephone ringing. After further sound verification, the system subsequently activates that procedures like switching off the oven, cleaning the floor, or alerting residents while simultaneously lowering the volume of television/radio. Here a convolutive blind source separation system with source number estimation using time-frequency clustering. An accurate mixing matrix can be estimated by the proposed phase compensation technique and used for reconstructing the separated sound sources. In the verification phase, Nuero fuzzy from the wavelet packet decomposition of signals are used as features for support vector machines. Finally, a sound of interest can be selected for triggering automated services according to the verification result.

KEY WORDS: Fuzzy, Nuero Fuzzy, Doa

I INTRODUCTION

The development of wireless technologies has influenced the applications of sensor networks. The capturing and processing of sounds of interest that are mixed with other sounds. Here we using two methods sound separation and sound verification. In sound separation phase fuzzy classifier is used. Sound verification phase SVM training is used. Database mainly for the purpose of storing multiple sounds. The system is designed to select the sensor node with maximum average DAO difference. The separated signals corresponding to that sensor node are utilized to perform sound verification. The sound verification is performed using Fuzzy classifier. For estimating the directions of arrival (DOA) of unknown signals that are received from each sensor node the operations are carried out in the sink. Our observations indicate that the proposed CBSS method exhibits better separation performance as the DOA difference increases. Based on such findings, the system is designed to select the sensor node with the maximum average DOA difference, and the separated signals that correspond to this sensor node are utilized to perform sound verification. A mixed signal received by sensor node 3 is chosen to perform sound separation and verification.

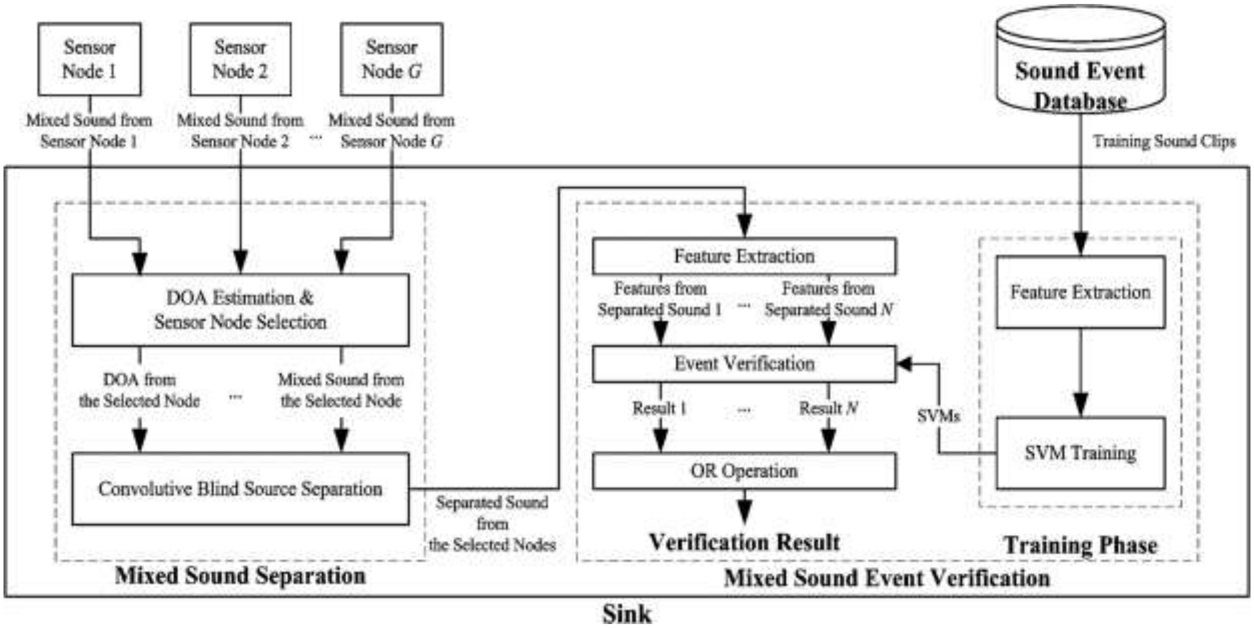
II RELATED WORK

Sound processing and capturing is very low .In sound separation phase convolute blind source is used to separate the sound source. Sound verification phase here SVM training and testing mechanism is used. Using this method sound separation and verification is lacking. System compute only poor recognition. The literature still lacks full discussion on mixed sound recognition for home automation. In a real living setting, sounds rarely occur isolated from one another. To tackle the problem, we first propose a solution to overcome the demixing/separation problem of simultaneous sound occurrence and then perform a sound verification procedure on the separated sound.

III PROPOSED SYSTEM

The proposed system is equipped with microphone capturing simultaneously generated sound in a room. The microphone array at each sensor node receives and transmits the mixed signal to the sink. The system is designed to select the sensor node with maximum average DAO difference. The separated signals corresponding to that sensor node are utilized to perform sound verification. The sound verification is performed using Fuzzy classifier. For estimating the directions of arrival (DOA) of unknown signals that are received from each sensor node the operations are carried out in the sink. Our observations indicate that the proposed FUZZY CLASSIFIER method exhibits better separation performance as the DOA difference increases. Based on such findings, the system is designed to select the sensor node with the maximum average DOA difference, and the separated signals that correspond to this sensor node are utilized to perform sound verification. A mixed signal received by sensor node 3 is chosen to perform sound separation and verification. Our verification phase aims at verifying whether the input signals comprise the sound of interest or not. The last item on the list, criterion estimation, is covered. The difficulty to overcome is that a defined criterion (a relevance index or the performance of a learning machine) must be estimated from a limited amount of training data. Two strategies are possible: “in-sample” or “out-of-sample”. The first one (in-sample) is the “classical statistics” approach. It refers to using all the training data to compute an empirical estimate. That estimate is then tested with a statistical test to assess its significance, or a performance bound is used to give a guaranteed estimate. The second one (out-of-sample) is the “machine learning” approach. It refers to splitting the training data into a training set used to estimate the parameters of a predictive model (learning machine) and a validation set used to estimate the learning machine predictive performance. Averaging the results of multiple splitting (or “cross-validation”) is commonly used to decrease the variance of the estimator.

IV BLOCK DIAGRAM AND ITS DESCRIPTION



In this block diagram here two processes are used for sound triggering. That is sound separation and sound verification. In separation side, here number of sensors is used. Sensor work is collecting the mixed sound from the each sensor using small microphone array. Then it given into the DOA estimation and sensor node selection.DOA for the purpose of which direction from the sounds is comes here. Node selection is mainly used to select the node from the mixed sound nodes. Then it given to the easily separated sound from the selected nodes. These functions are done in sound separation phase. Sound event Database it contains all available sounds that is assigned sounds all are included. Here only we compare with the assigned sound and recent getting sound.SVM training tools are available for the purpose trained the separation sound.SVM have testing tools also but here we cannot use that, under database it contain feature extraction. This three components contain one format is called as Training phase.

Sound Verification method here using feature extraction it used for leveling the sounds that means dividing the sounds. It also has phase difference it is measured by difference between observation and reference. OR operation is used for adding all the sounds. The whole process is called as sink. In proposed method here we used fuzzy classifier.

Sensor nodes are mainly used for the purpose of getting the sounds from various locations and then it can do mixed sound from the each sensor node. Those sensor nodes are available only in the order of numbering. It used to sense the fitting place not than other place.

DOA in the sense Direction of Arrival it mainly used to find out which direction from the sounds are comes from and which one is sink with target sounds and which one is sink with non-target sounds. Each sensor has one separate

DOA difference that values are different from each other. Sensor node selection it is used for selecting the sound from the mixing sound matrix. So it filterize the unwanted sound events from the whole sounds. Then it given into the convolute blind source separation.

Direction-of-arrival (DOA) algorithm plays a crucial role in smart antenna system to ensure that the antenna array is able to estimate the direction of the incoming signal and thus, with the aid of adaptive beam forming, to point the array beam towards the estimated direction. The performance of DOA depends on several factors such as the number of element in the array, spacing between elements, number of signal samples (snapshot) and signal-to-noise ratio (SNR) Previous works on DOA estimation usually using isotropic antenna array and mutual coupling effect between isotropic elements is ignored. There are also experimental works using directional antenna array that employ various DOA To the best of our knowledge, there is no previous work that provides analysis of DOA estimation between and directional antenna array. Therefore, this paper aims to analyze the DOA estimation using both types of antenna array. The DOA estimation is performed on the two types of ULA, the isotropic antenna array and directional antenna array. These results are then analyzed to gauge how the algorithm performs to estimate the AOA. A classifier is an algorithm that assigns a class label to an object, based on the object description. It is also said that the classifier predicts the class label. The object description comes in the form of a vector containing values of the features (attributes) deemed to be relevant for the classification task. Typically, the classifier learns to predict class labels using a training algorithm and a training data set. When a training data set is not available, a classifier can be designed from prior knowledge and expertise. Once trained, the classifier is ready for operation on unseen objects. Classification belongs to the general area of pattern recognition and machine learning.

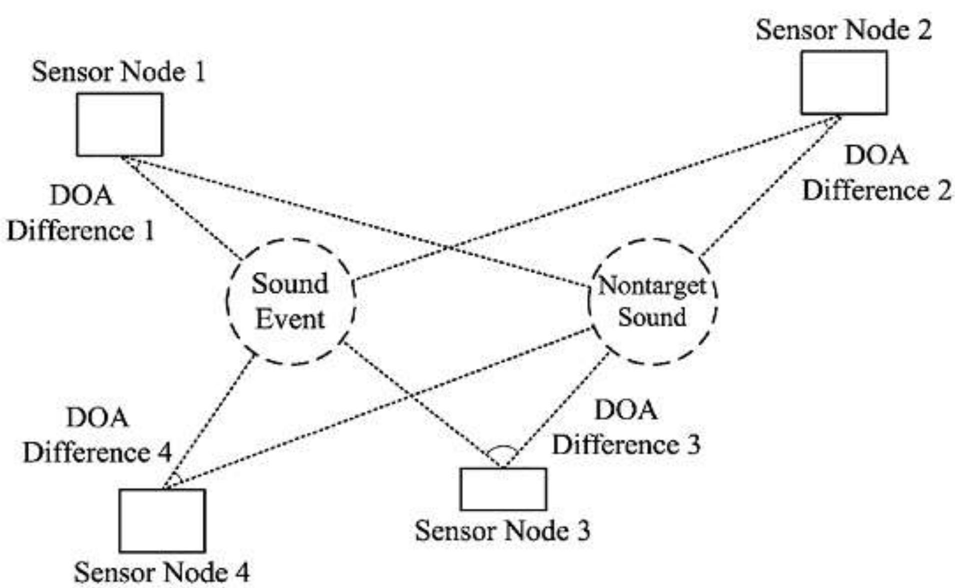


Fig 1: Direction of Arrival

V RESULTS AND DISCUSSIONS

Here the result is obtained from one mixed sound given into the database. If we want one particular sound in the mixed sound source using fuzzy key coding.

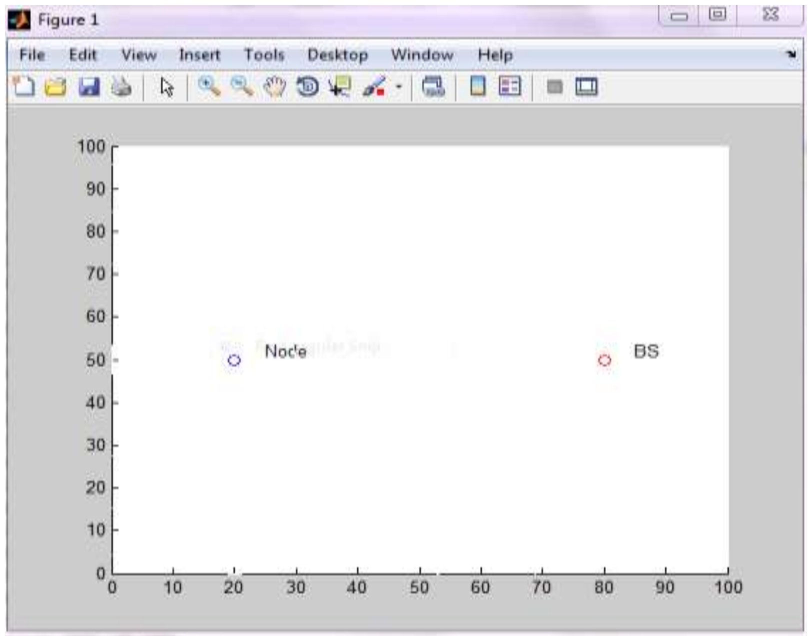


Fig 2: It represent the data that means sound sources are transferred.

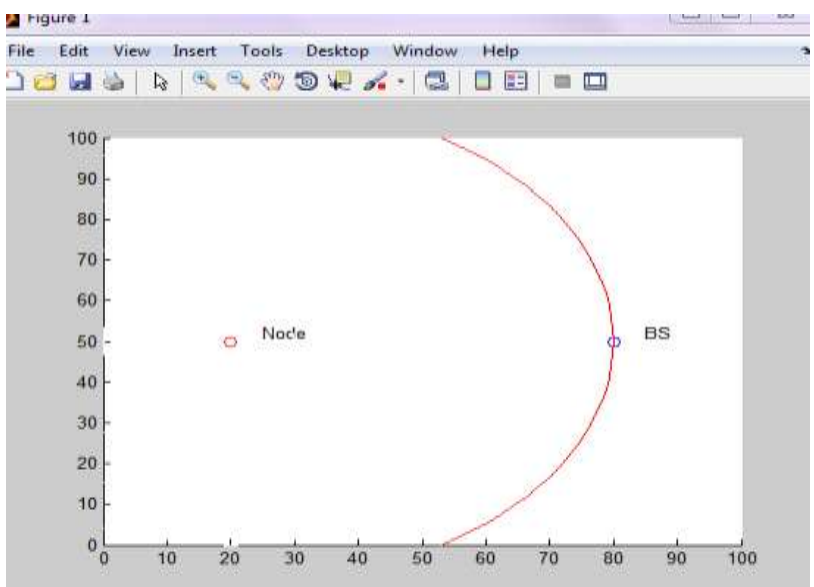


Fig 3:It represent the correct signal only transferred to node to base station

VI CONCULSION

In this paper, we have presented a mixed sound event separation and verification system for WSNs in home automation systems. We show that the **FUZZY CLASSIFIER** can be used to separate mixed sound event signals. In addition to the mixed sound separation, we perform sound verification using SVMs. The presented feature set includes k-means algorithm and Bayesian information criterion derived from the energy distribution throughout a sound's wavelet decomposition. Our experiment shows that the proposed mixed sound separation framework improves the sound verification performance significantly. This is particularly important in automation systems which depend on the verification of sounds in its surrounding environment to trigger certain operations. Our experimental results also show room for future improvement in the mixed sound separation system. The improvement may concern the features used in the separation process to better differentiate a wider range of sound classes.

VII APPLICATION AND ADVANTAGES

Home Automation
Security System
Military Sensing and Tracking
Power Management
Industry Management
Efficiency
In emergency situation only Efficiency is detected by emergency fall detection method.
Time Independent
In Harvesting method it works based on time dependent policy.

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