Literature Survey on Blind Source Separation in Audio Processing Application Based on Direction of Arrivals

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Abstract—Source separation (SS) has attracted a great deal of attention in the engineering field. Source refers to the physical object which generates a signal. For example, in a group of 10 people if 3 or 4 persons are speaking at a time then the generated mixture of voice signals propagate through air and sensed by the ears. For detail study read several paper on this topic. we provide an overview of existing algorithms for blind source separation of convolutive audio mixtures.

Key words: Source Separation

I. INTRODUCTION

Source separation (SS) has attracted a great deal of attention in the engineering field. Source refers to the physical object which generates a signal. For example, in a group of 10 people if 3 or 4 persons are speaking at a time then the generated mixture of voice signals propagate through air and sensed by the ears. The sensed signals are connected to the brain which is having capability of separation of mixed signals. Similarly, in real time there is a need of source separation.

Source separation is one of the major problems of information processing. Source separations are of two types
1) Non-Blind Source Separation
2) Blind Source Separation (BSS)

In non-blind source separation one of the problems is known whereas in blind source separation parameter is unknown. Blind source separation (BSS) refers to the problem of recovering signals from several observed data such as linear mixtures. The strength of the BSS model is that only mutual statistical independence between the source signals is assumed and not a priori information about, e.g., the characteristics of the source signals, the mixing matrix or the arrangement of the sensors is needed. Separation can be found in various applications such as
1) Speech processing
2) Medical engineering:

In the magneto encephalography (MEG) and electroencephalogram (EEG), the interference from muscle activity masks the desired signal from brain activity. BSS can be used to separate the two signals [13] to achieve an accurate representation of brain activity.

3) Biomedical engineering:
Separation of biomedical signals augments the power of human body scanning techniques and plays an important role in understanding of complex processes in biomedical phenomena [3].

B. Communication system:

When a digital data is transmitted using radio frequency signal then at the receiving signal may receive simultaneously as a several mixed data streams. To separate these signal BSS can be applied [4]. In communication, BSS can be used for the suppression of inter symbol interference (ISI), blind channel equalization [5], inter channel interference (ICI) cancellation etc.

As a fundamental research, many algorithms have been developed for instantaneous mixtures, where only simple mixing process without time delay is considered. They have shown very good abilities to separate signals which are suitably thought as non-time delayed mixing. However, in a real-time environment, observed signals are a resultant of convolution between the sources and the impulse responses of the different paths from the sources to the sensors for that convolutive mixture have to be taken into consideration. Various algorithms have been found in the literature for source separation, among them; frequency domain approaches [6] [9-12] are popular ones where observed convolutive mixture is approximated by an instantaneous mixture.

II. LITERATURE SURVEY

Kostas Kokkinakis and Philipos C. Loizou [1]- They describe a highly practical blind signal separation (BSS) scheme operating on sub band domain data to blindly segregate convolutive mixtures of speech. The proposed method relies on spatiotemporal separation carried out in the time domain by using a multichannel blind deconvolution (MBD) algorithm that enforces separation by entropy maximization through the popular natural gradient algorithm (NGA).

In this paper, they take on a new sub band-based BSS scheme relying on an MBD method, which combines the natural gradient with the entropy maximization criterion to separate convolutive mixtures of speech in the time domain. Experiments in a challenging convolutive setup signify the novelty and potential of our approach by proving that sub band MBD can match or even outperform full band MBD in terms of performance at a highly reduced computational cost.

Tu lay Adali, Yuri Levin-Schwartz, and Vince D. Calhoun [2]- In the medical field, acquisition of multiple brain imaging modalities from the same participants has been a common practice for some time. Different modalities report on different aspects of the given problem, and contain common, or complementary, as well as distinct, information. Hence, it is of particular interest to leverage the use of information that is common across different modalities to enable their full interaction for inference. Given the fact that data from multiple modalities have been available for some time, it is not a surprise that the field has been a particularly active one.

Yina Guo, Ganesh R Naik, and Hung Nguyen, [3]- Single channel source separation is one of the challenging tasks in Blind Source Separation (BSS) technique. It uses the technique to restore the original source signals from one
sensor, and it has large potential applications in many areas, including communication engineering, biomedical signal denoising, audio signal processing. Single Channel Blind Source Separation (SCBSS) is an extreme case of underdetermined (more sources and fewer sensors) Blind Source Separation (BSS) problem. In this paper, they propose a novel technique using Local Mean Decomposition (LMD) and Independent Component Analysis (ICA) combined with single channel BSS (LMD-ICA).

GockenCetinel, CabirVural [4]-Chaos has received a great deal of attention during the last two decades from a variety of researchers, including mathematicians physicists and engineers. Researches are interested in chaos especially in the area of signal processing and communication for the development of non-linear communication techniques. Chaotic signals are irregular, aperiodic, uncorrelated and impossible to predict over longer times. Spread-spectrum communication, multiuser communication and secure communication (cryptography) are three important applications of chaos arising from these properties. Furthermore, impulse-like autocorrelation and low cross-correlation functions are characteristic properties of chaotic signals.

OlcayKalkan, Mustafa A. Allmkaya [5]- In this work, a Pearson System based-blind source separation method is used for detecting the signal coming to a mobile USR which is subject to multiple access interference in a CDMA downlink communication. Considering some fading channel measurements showing that the fading channel coefficients may have an impulsive nature, these coefficients are modeled with an astable distribution whose shape parameter a takes values between 1.8 and 1.9. These II values show that the distribution resembles a Gaussian distribution but has an mm impulsive "nature. Simulation studies show that the conventional MMSE receiver fails in this impulsive fading scenario. Both le independent component analysis (ICA) method using the conventional hyperbolic tangent score function and the Pearson System-based ICA are successful in estimating le channel coefficients and the proposed Pearson System-based ICA method performs faster.

III. PROBLEM IDENTIFICATION
Developing the signal processing algorithms to solve the source separation problem.

IV. CONCLUSION
This report presents a brief overview of the mixing of the audio signals and the separation of mixed signals into the original signals.

REFERENCES


