

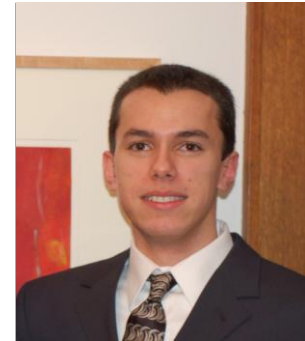
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Blind Source Separation as Applied to the Cocktail Party Problem

The goal of this project is to separate a desired speech signal from a pool of interfering speech signals, specifically a desired source signal from two mixtures corresponding to two microphones or channels. Because very little or no information is known about the sources and how they are mixed, the separation process is dubbed blind source separation. So far, a linear instantaneous model that assumes that there are no reverberations and that any source reaches the two microphones at the same instant has been adopted. Sparse decomposition (SD) has been the main approach to dealing with this model. The premise of SD is that there exists a representation of the mixture where only one source contributes to each coefficient in the representation. This representation is not the time domain, but is instead defined in an overcomplete dictionary which is basically a set of signals that can be linearly combined to represent any signal. Performing SD on one of the two mixtures means trying to find the least number of signals in the dictionary to represent that specific mixture. The sparseness of the decomposition depends on the sparseness of the chosen representation/dictionary. SD is done using a matching pursuit algorithm with an orthogonalized residual dictionary. SD of the two mixtures leading to successful separation of the sources has been achieved for simulated linear instantaneous mixtures of speech signals. However, trying to apply the solution to real recorded signals was unsuccessful, primarily because the effects of having a delay between when a specific source or reverberation reaches one microphone and then the other are too significant to neglect. Current investigations focus on modifying the realized solution to make it suitable for a convolutive model where propagation delays and reverberations are taken into account.



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