1. Introduction

- Recently, music signal separation technologies have received much attention.

2. Generalized MMSE-STA estimator

- In the generalized MMSE-STA estimator, the priori statistical model of the target signal amplitude spectrum is set to chi distribution.

Chi-distribution

\[ p(x) = \frac{2^{\frac{1}{2\sigma^2}}}{\Gamma(\frac{1}{2\sigma^2})} x^{\frac{1}{2\sigma^2}-1} \exp\left(-\frac{x}{2\sigma^2}\right) \]

\( \chi^2: \) Gamma function  \( \rho: \) Shape parameter  \( p(x): \) p.d.f. of signal \( x \) in the amplitude domain

\( \rho = 1 \) gives a Rayleigh distribution that corresponds to a Gaussian distribution in the time domain.

\( \rho \) is a larger value of \( \rho \) corresponds to a super-Gaussian distribution signal.

The processed signal \( \tilde{y}(\tau) \) via the generalized MMSE-STA estimator is given as follows.

Target signal estimation by generalized MMSE-STA estimator

\[ \tilde{y}(\tau) = G(f,\tau) \tilde{C}(\tau) + N(\tau) \]

\( G(f,\tau) = \frac{1}{\sqrt{\Gamma(f)\Gamma(\tau)}} \exp\left(-\frac{|y(\tau)-\gamma(f)+z(f)|^2}{2\sigma^2}\right) \]

Problems of generalized MMSE-STA estimator

- To calculate \( \hat{y}(\tau) \), dynamic estimation of \( \hat{y}(\tau) \) is required if the interference signal is nonstationary.

3. Proposed method

- We propose the use of SSA as the interference signal estimator and estimate the shape parameter \( \rho \) using higher-order statistics.

Shape parameter estimation

\[ \hat{\rho}(\tau) = \frac{1}{N} \sum_{i=1}^{N} \left( \frac{\hat{y}(\tau)}{\gamma(\tau)} - \gamma(\tau) \right)^{\rho} \]

Signal estimation

\[ \hat{y}(\tau) = \frac{1}{\sqrt{\Gamma(f(\tau))\Gamma(\tau)}} \exp\left(-\frac{|y(\tau)-\gamma(\tau)+z(\tau)|^2}{2\sigma^2}\right) \]

Kurtosis of target amplitude spectrum (complex domain)

\[ \text{kurt}_{\text{target}} = \frac{\mu_4(\tilde{C}(\tau))}{\mu_2(\tilde{C}(\tau))^2} \]

Problems of generalized MMSE-STA estimator

To calculate \( \hat{y}(\tau) \), dynamic estimation of \( \hat{y}(\tau) \) is required if the interference signal is nonstationary.

Estimation of the shape parameter \( \rho \), which depends on the type of target signal is required.

4. Evaluation experiment

- We can confirm the separation performance of the proposed method is better than those of the other methods.

- This result indicates the efficacy of introducing the flexible a priori statistical model of the target signal.

References

