© 2013 FIZ Karlsruhe

io-port 05966393

Yamakawa, Nobuhide; Takahashi, Toru; Kitahara, Tetsuro; Ogata, Tetsuya; Okuno, Hiroshi G.

Environmental sound recognition for robot audition using matching pursuit.

Mehrotra, Kishan G. (ed.) et al., Modern approaches in applied intelligence. 24th international conference on industrial engineering and other applications of applied intelligent systems, IEA/AIE 2011, Syracuse, NY, USA, June 28 – July 1, 2011. Proceedings, Part II. Berlin: Springer (ISBN 978-3-642-21826-2/pbk). Lecture Notes in Computer Science 6704. Lecture Notes in Artificial Intelligence, 1-10 (2011).

Summary: Our goal is to achieve a robot audition system that is capable of recognizing multiple environmental sounds and making use of them in human-robot interaction. The main problems in environmental sound recognition in robot audition are: (1) recognition under a large amount of background noise including the noise from the robot itself, and (2) the necessity of robust feature extraction against spectrum distortion due to separation of multiple sound sources. This paper presents the environmental recognition of two sound sources fired simultaneously using matching pursuit (MP) with the Gabor wavelet, which extracts salient audio features from a signal. The two environmental sounds come from different directions, and they are localized by multiple signal classification and, using their geometric information, separated by geometric source separation with the aid of measured head-related transfer functions. The experimental results show the noise-robustness of MP although the performance depends on the properties of the sound sources.

Keywords: environmental sound recognition; matching pursuit; robot audition; computational auditory scene analysis
doi:10.1007/978-3-642-21827-9_1