Foreword from Kou Yamada, Professor of Gunma University, Japan

Kou Yamada

Kou Yamada received B.S. and M.S. degrees from Yamagata University, Yamagata, Japan in 1987 and 1989, respectively, and a Dr. Eng. degree from Osaka University, Osaka, Japan in 1997. From 1991 to 2000, he was with the Department of Electrical and Information Engineering, Yamagata University, Yamagata, Japan as a research associate. From 2000 to 2008, he was an associate professor in the Department of Mechanical System Engineering, Gunma University, Gunma, Japan. Since 2008, he has been a professor in the Department of Mechanical System Engineering, Gunma University, Gunma, Japan. His research interests include robust control, repetitive control, process control, and control theory for inverse systems and infinite-dimensional systems. Dr. Yamada received the 2005 Yokoyama Award in Science and Technology, the 2005 Electrical Engineering/Electronics, Computer, Telecommunication, and Information Technology International Conference (ECTI-CON2005) and ECTI-CON2008 Best Paper Awards, the Japanese Ergonomics Society Encouragement Award for an Academic Paper in 2007, and the Fourth International Conference on Innovative Computing, Information and Control Best Paper Award in 2009, the 14th International Conference on Innovative Computing, Information and Control Best Paper Award in 2019, and Outstanding Achievement Award from Kanto Branch of Japanese Society for Engineering Education in 2022, JSME (The Japan Society of Mechanical Engineers) Education Award in 2023 and the 2024 Electrical Engineering/Electronics, Computer, Telecommunication, Information Technology International Conference (ECTI-CON2024) Best Paper Award. He is a member of IEEE and SICE, and a fellow of JSME.

In an era of accelerating technological advancement, the demand for sophisticated applications often outpaces the capacity of their underlying hardware. Fields like signal processing, which are fundamental to robotics, autonomous systems, teleconferencing, sound extraction and recognition, have long relied on computationally intensive algorithms. This reliance presents a significant hurdle for deployment on resource-constrained devices, limiting their integration into the burgeoning landscape of the Internet of Things (IoT) and real-time systems (RTS). This issue of Advances in Electrical and Electronic Engineering confronts this very challenge head-on, showcasing a paper that rethinks a classic problem to make it viable for the modern, low-power environment.

The paper's method is a unique combination of beamforming, time difference of arrival (TDOA), and frequency sparsity. By cleverly integrating these techniques, the authors have developed an algorithm that significantly reduces the computational burden by avoiding complex matrix operations, Fourier transforms, and exhaustive Direction of Arrival (DOA) scans. This innovation makes it possible to perform sound source localization with high accuracy on low-resource devices like the ARM STM32 microcontroller. The implementation is lightweight, occupying only 44KB of memory, and achieves a fast average processing time of 20ms, making it highly suitable for real-time applications. This work represents a significant step forward in making advanced signal processing techniques more accessible and practical for a wider range of real-world scenarios.

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