Docket #: S19-360

N-path Spectral Decomposition in Acoustic Signals for Sound Identification

The Murmann lab has developed a method for an extraction information from acoustic signals that utilizes low power consumption. N-path filters are used to decompose the original acoustic signals' waveform before downconverting to lower their Nyquist-rate bandwidth. This allows the system to be implemented in the analog domain, and thus only requires low power consumption. Once decomposed, signals can be identified using the SS-SVM model. The SS-SVM model requires 10x less training data than current ConvNet models to achieve a 10% identification error rate, and its fewer parameters prevent SS- overfitting the data. As a result, this design is applicable for low-level sound analysis, including background noise filtering, and could allow other high-powered AI systems to "sleep" until triggered.

Stage of Research

- Prototype

Applications

- **Audio signal processing**
- Sensor nodes
- Internet of everything
- Embedded computing
- Wake-up for always-on devices

Advantages

- **Low combined energy of computation and digitization**

- Test error converges 10x faster than deep learning models using 1-3 orders of magnitude fewer parameters
- Maintains classification accuracy despite imposed simplifications

Publications

- Villamizar et al. IEEE International Symposium on Circuits and Systems (2019) "Sound classification using summary statistics and N-path filtering"

Patents

- Published Application: 20210134307
- Issued: 11,763,827 (USA)

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