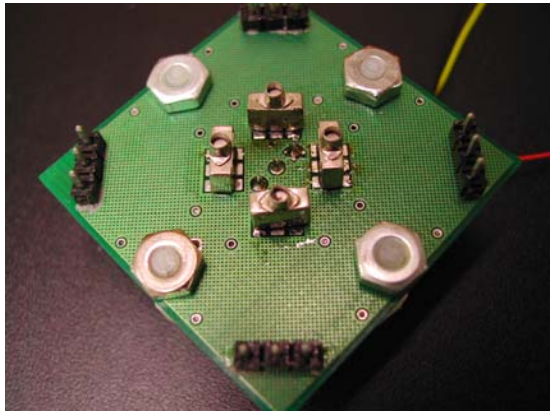
Key References

A.Gore, A.Fazel, S. Chakrabartty*, Far-field Acoustic Source Localization and Bearing Estimation using Sigma-Delta Learners, IEEE Transactions of Circuits and Systems I, (To appear 2009)

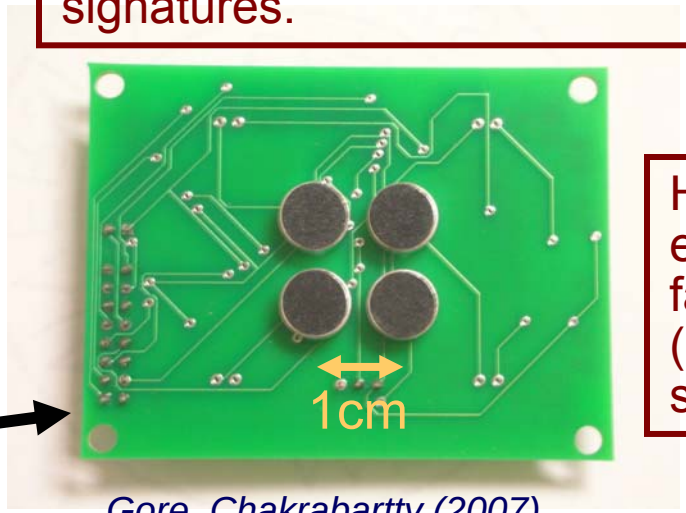
S. Chakrabartty and A. Gore, "Sigma-Delta Analog to LPC Feature Converters for Portable Recognition Interfaces", to appear in IEEE International Symposium on Circuits and Systems, Taipei, Taiwan, 2009.

Acoustic Target Identification

Autonomously search and identify acoustic targets of interest – speakers, animal species, vehicular signatures.



Configure



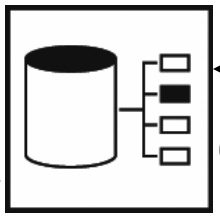
Gore, Chakrabartty (2007)

High Energy efficiency and low false rejection rate (FRR) are the key specifications.

Train

-Determine recognition templates

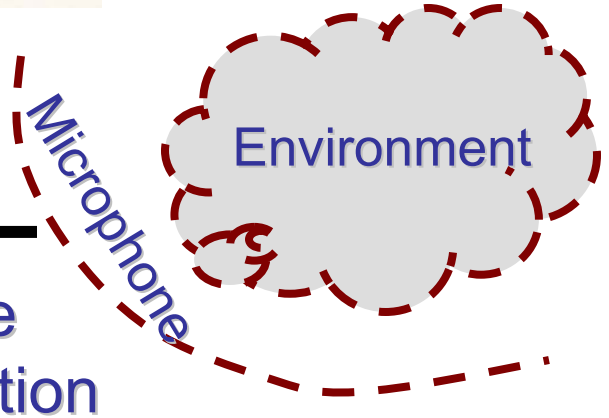
-Parameter optimization



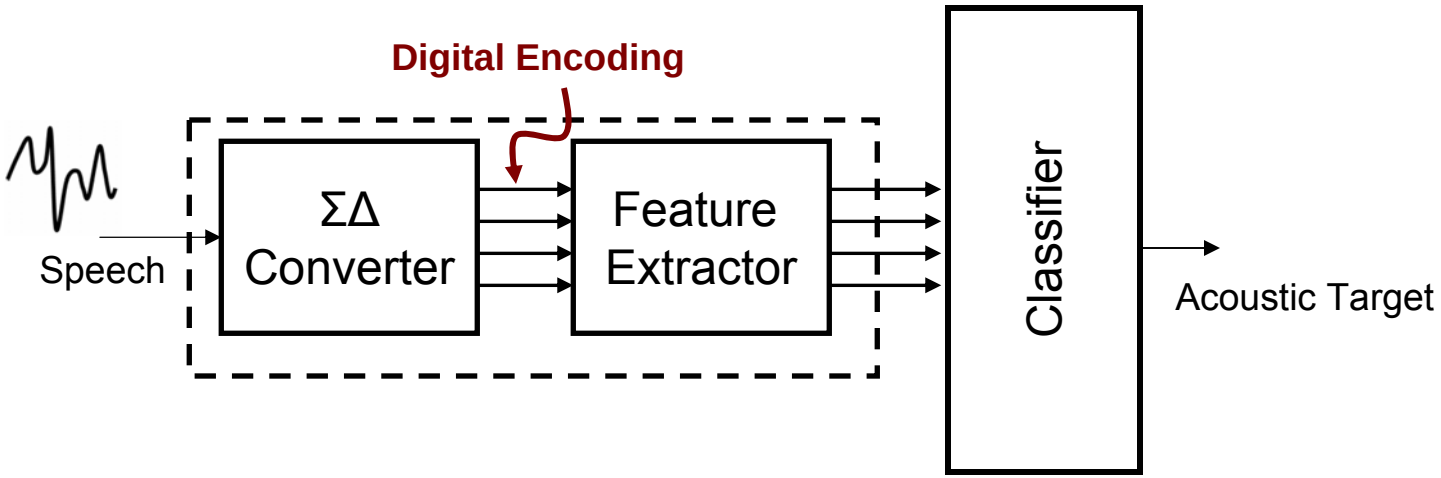
Training Data

-Target specific enrollment data

Offline collection

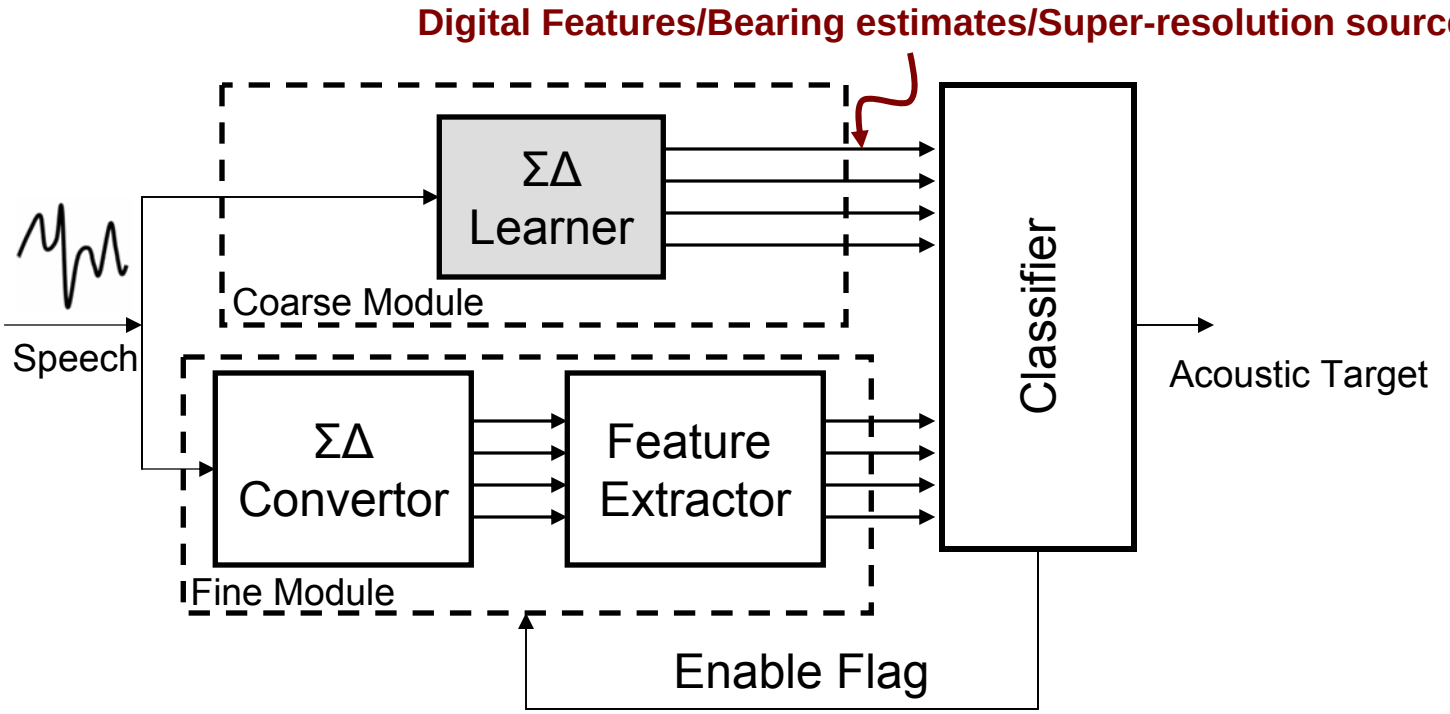


Conventional Architecture



- Consists of an Analog-to-digital converter, followed by a feature extractor and a classifier – implemented on a DSP.
- Can achieve very low false rejection rate but at the expense of low energy efficiency.
- **ADC and Feature extractors are the most power hungry sub-systems.**

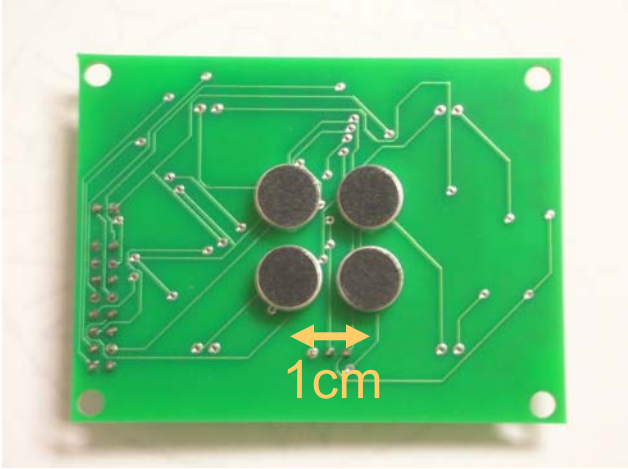
Coarse-Fine Architecture

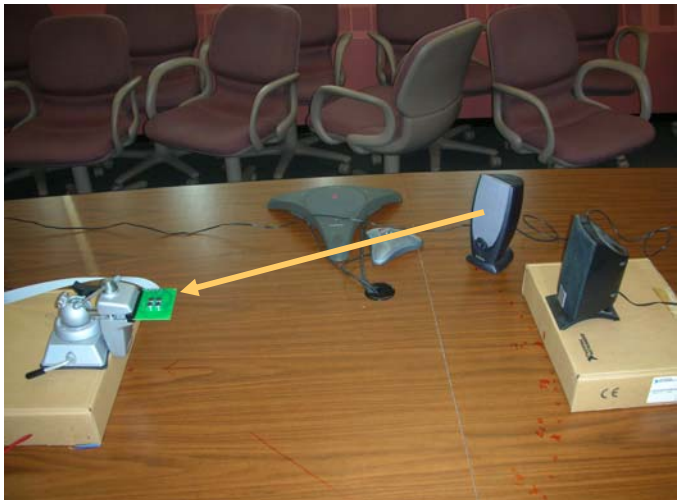


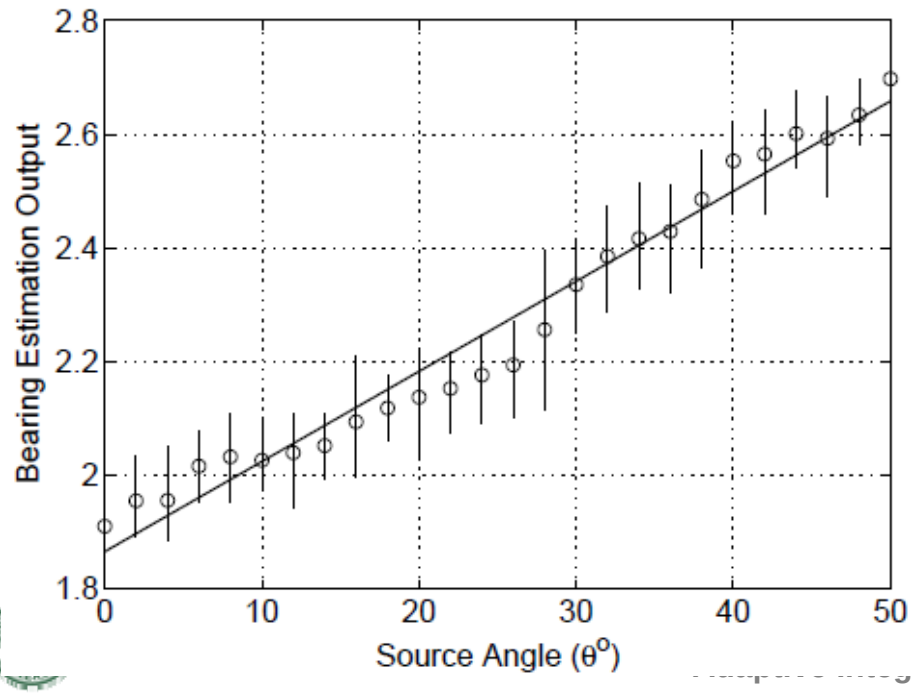
- Analog-to-feature converter directly produces digitally encoded features without an intermediate data conversion step.
- Coarse but low-power feature extractor which can be used with a more accurate but power hungry A/D converter + DSP approach – similar to attention based signal processing
- More energy efficient without sacrificing performance (FRR).

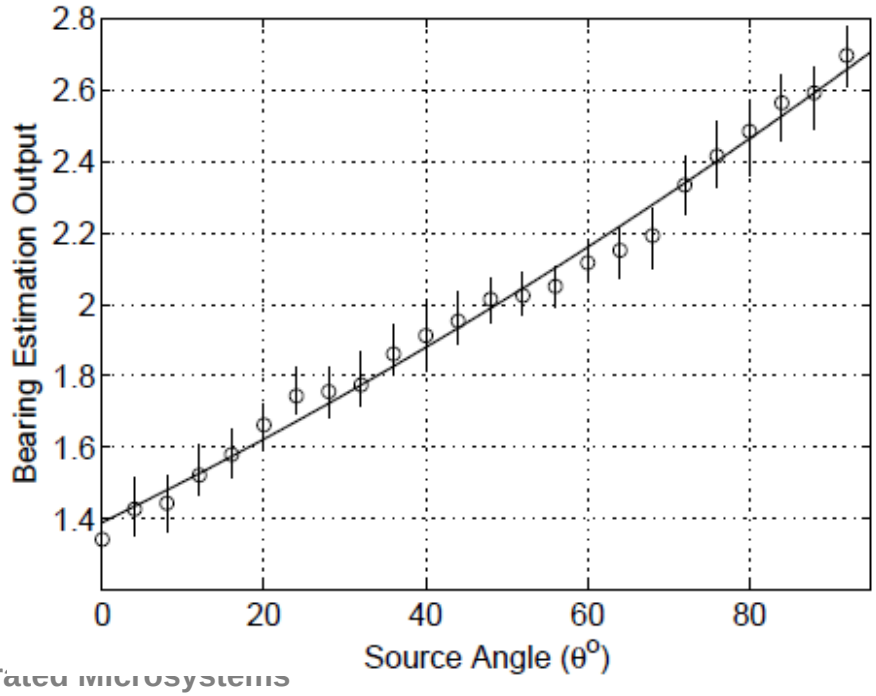
Source Localization

Gore, Fazel, Chakrabartty (TCAS-I 2009)



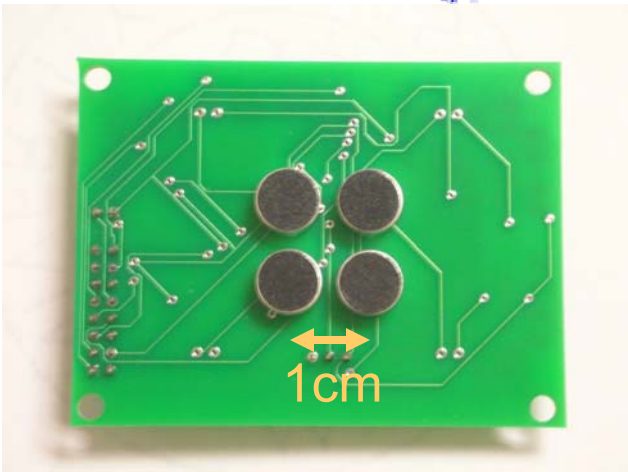


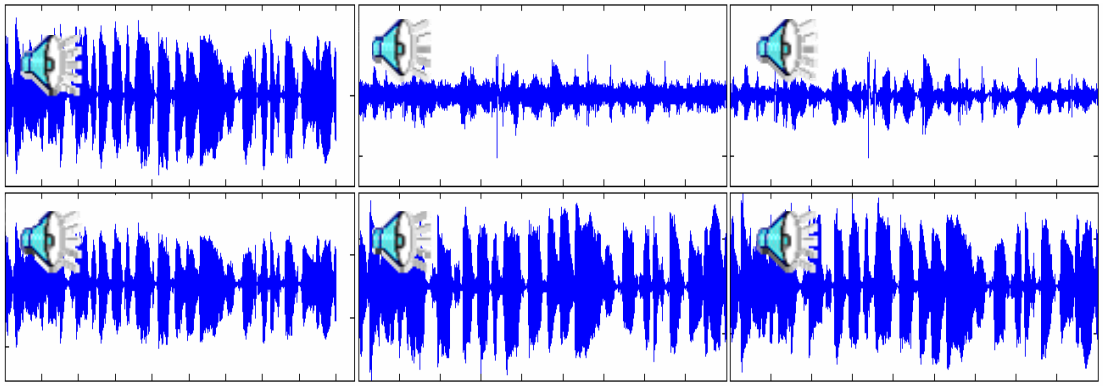


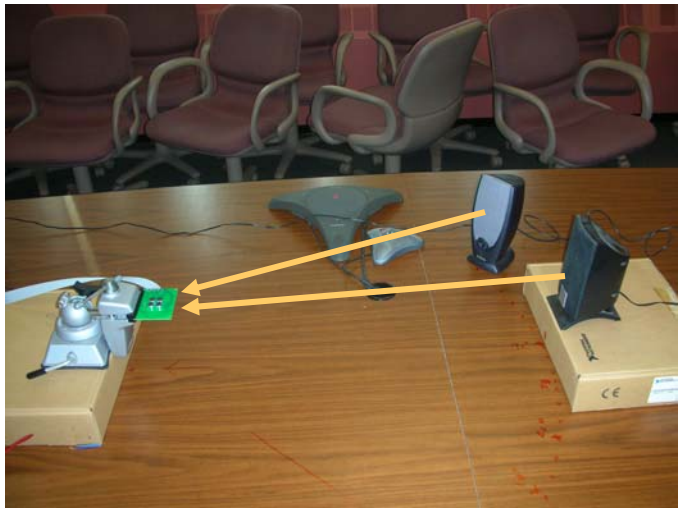


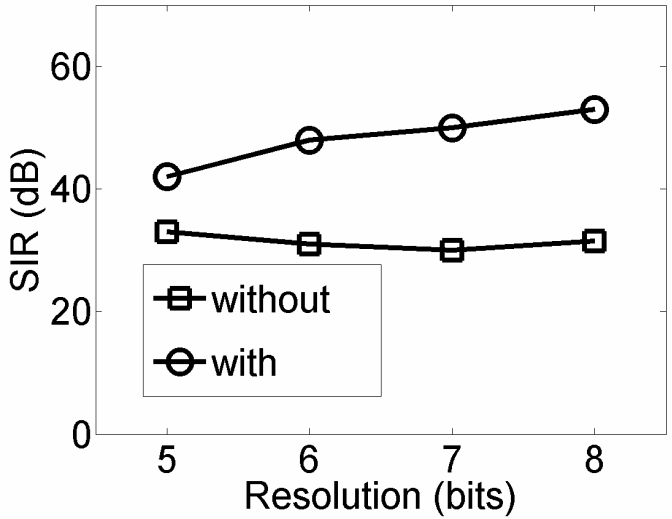
Source separation

Gore, Fazel, Chakrabartty (TSP 2009)

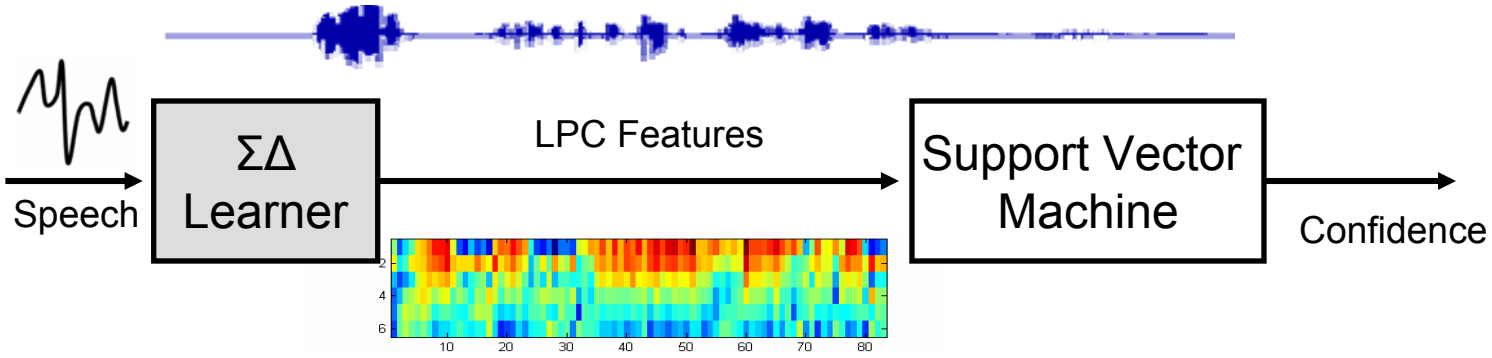


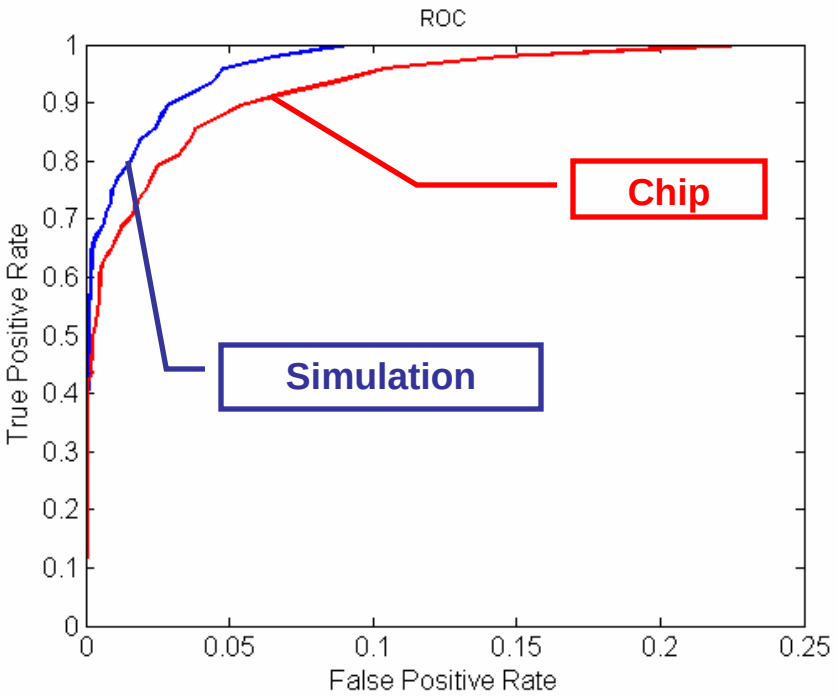






Source Identification





- YOHO speaker verification corpus.
- 10 speakers were chosen and an SVM was trained on the features.
- Speech played through NI data acquisition card to the ΣΔ converter.
- Comparison metric EER: when false positive rate equals true negative rate