Docket #: S10-178

A noise robust decoder for multiplexing readout channels on an imaging sensor array

Stanford researchers have invented a decoder for multiplexed readouts of imaging arrays that optimizes the signal-to-noise ratio (SNR) of the decoded detector pixel signals. It uses maximum likelihood estimation, which is referred to as “maximum likelihood CS” (ML-CS) decoding. For noisy imaging applications, it can improve the signal-to-noise ratio (SNR) performance of multiplexed readouts for imaging arrays with a practical, affordable implementation. This invention can reduce the cost of an imaging sensor by reducing the number of readout channels. It is applicable to a wide range of imaging applications, ranging from medical imaging to digital cameras.

Stage of Research:
- For positron emission tomography (PET), simulations showed that the invention can improve the SNR of the decoded signal by 3-4 times over compressed sensing techniques on compressed sensing multiplexing topologies.
- The decoder can also be applied to conventional multiplexing topologies to provide a 50% decoded SNR improvement over conventional multiplexing decoders.

Applications

- Medical imaging applications such as planar imaging by X-rays or nuclear medicine, X-ray CT, MRI, PET, and SPECT
- High-speed optical imaging with digital cameras
- Low-light optical imaging with digital cameras
- Time-of-flight imaging for medical and non-medical applications

Advantages

- More robust to noise that previous methods in practice
- Improves the signal-to-noise ratio (SNR) performance
- Computationally feasible to implement
- Lowers cost of imaging by enabling multiplexing under noisy conditions
- Multiplexing reduces the number of readout channels and can improve yield by allowing an imaging sensor to be used with a few "bad" pixels

Publications

- Chinn G. et al. Sparse Signal Recovery Methods for Multiplexing PET Detector Readout. *IEEE Transactions on Medical Imaging*, Vol 32, No 5, May 2013.
- Olcott, PD, Chinn G, Levin CS, “Compressed sensing for multiplexed PET detectors,” IEEE-NSS MIC 2011 Valencia, Spai

Patents

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