Master's or Diploma Thesis:
Reconstruction of Discrete Sparse Signals by Compressed Sensing

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Background

Recently, E. Candès and D. Donoho presented a novel method of signal acquisition called Compressed Sensing (CS) [CW08]. With this new approach, signals can be reconstructed both exactly and efficiently even if the original signal is sampled at a rate well below the Nyquist rate. The only requirement is that the original signal is sparse, which means that the signal of interest is primarily zero. In classical CS scenarios, the sparse signal is assumed to be real-valued, but in many applicatons like peak-to-average power ratio reduction in OFDM or sensor networks, the sparse signal is known to be discrete-valued.

Idea

Classical CS algorithms do not exploit the knowledge about the discrete nature of the signal. For 2ASK signals, some first (discrete) algorithms have been proposed which clearly outperform the classical approaches. However, discrete Compressed Sensing is still a very new field of research and significant improvements can be expected from the development of enhanced algorithms. Besides the design of new algorithms for discrete CS, already proposed strategies which work only for special cases like 2ASK need to be generalized.

Task

We offer up-to-date research topics. If you are interested in working on Discrete Compressed Sensing, please feel free to pass by at my office such that we can find a topic which matches your interests.

Prerequisites

► Lecture *Communications Engineering*, optional *Compressed Sensing / Multiuser Communications and MIMO Systems*.
► Programming experience (arbitrary language) and the interest to work on a scientific topic.

Literature

[CW08]   E.J. Candès, M.B. Wakin.
         An Introduction to Compressive Sampling.
         IEEE Signal Processing Magazine, March 2008.