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Title: Estimating the mode of a unimodal “symmetric” distribution on a circle, with extensions to frequency estimation.

Abstract: If the arg of the mean of a complex-valued random variable is estimated by the sample mean of the observed args, a theoretical bias results from the fact that args are only measured on an interval of length 2π , so that, for example, $-\pi$ and $+\pi$ represent the same arg. Thus if the arg of the mean is say, near π , then the observed args may instead be near $-\pi$. In this talk a least squares estimator of phase is proposed which accounts for this “phase-wrapping”. The estimator is shown to be strongly consistent and its central limit theorem is derived. Two different proofs are given, and the method and one proof extended to the problem of the estimation of the frequency of a noisy complex sinusoid. Different estimation procedures based on circular means are suggested for each problem, and the statistical relative efficiencies evaluated.