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#### ACCEPTED MANUSCRIPT

## On exact and optimal recovering of missing values for sequences

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#### Abstract

The paper studies recoverability of missing values for sequences in a pathwise setting without probabilistic assumptions. This setting is oriented on a situation where the underlying sequence is considered as a sole sequence rather than a member of an ensemble with known statistical properties. Sufficient conditions of recoverability are obtained; it is shown that sequences are recoverable if there is a certain degree of degeneracy of the Z-transforms. We found that, in some cases, this degree can be measured as the number of the derivatives of Z-transform vanishing at a point. For processes with non-degenerate Ztransform, an optimal recovering based on the projection on a set of recoverable sequences is suggested. Some robustness of the solution with respect to noise contamination and truncation is established.

**Key words**: data recovery, discrete time, sampling theorem, band-limited interpolation.

### 1 Introduction

The paper studies optimal recovering of missing values for sequences, or discrete time deterministic processes. This important problem was studied intensively. The classical results for stationary stochastic processes with the spectral density  $\phi$  is that a single missing value is recoverable with zero error if and only if

$$\int_{-\pi}^{\pi} \phi(\omega)^{-1} d\omega = -\infty.$$
(1)

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