IMPACT OF DATA QUANTIZATION ON EMPIRICAL MULTIFRACTAL ANALYSIS

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SUMMARY

Multifractal Analysis

- Commonly used in real-life data analysis, involved in standard signal processing tasks such as detection, identification or classification.
- In a number of situations, in particular in Image Processing, the data available for the analysis severely quantized

GOAL

Analyzing robustness of standard multifractal estimation procedures against quantization

RESULTS

- Community against quantization: restricting range of scales involved in multifractal parameter estimation to the largest ones
- Wavelets transform robustness against quantization when increments do not

Example 1: Image

- High acquisition rate for video capture: start of image resolution
- Wavelets: Analysis of coarse details of boundaries

Example 2: Signal

- Sampling in amplitude

REFERENCES


MULTIFRACTAL ANALYSIS

Multifractal Analysis and Multiresolution Quantities

Scale Incurrence

Multiresolution Quantities

Empirical Multifractal Analysis

Log-Cumulants and Estimation

Log-Cumulants

Estimation Procedures

Quantization and Monte Carlo Simulation

Quantization

Performance Assessment and Simulation Setup

QUANTIZATION IMPACTS

Distributions of ln(\tilde{X})/2^n

Quantization leads to statistical effect of distributions of \tilde{x}_n

Impact on \tilde{x}_n from the coarse scale to the increments

Meaningful MRA initialization for discrete time

Deterministic, Fractional Brownian Motion

Figure 1: Impact of data quantization on empirical multifractal analysis.