Statistical Analysis of the ABP, CVP, and ICP signals of patient with Traumatic Brain Injury

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Outline

• Introduction
  → Objective & Description of Data
  → Stationary & Ergodicity
• Methodology
• Results
• Conclusion
• Reference
• Question & Comment

Introduction

• Raw data description
  → Data comes from Traumatic Brain Injured patient
  → Simultaneously recorded signals
    ✓ Arterial Blood Pressure ABP
    ✓ Intracranial Pressure ICP
    ✓ Central Venous Pressure CVP
  → Sampling frequency : 125Hz
• Objective
  → Find the relationship before and after an intracranial hypertension.

Stationary an Ergodicity

• Stationary
  → Assumed the data locally stationary(WSS).
• Ergodicity
  → Ergodic in the mean and the correlation
• Not a zero mean process
  → The mean has to be removed from the signal

Methodology

• Segmentation
  → 1min prior to the hypertension
  → 1min after the hypertension
• Time domain analysis
  → Examine Raw signal
  → Autocorrelation
  → Cross-correlation
• Power spectral density
  → Blackmanharris window, 50% overlap
• Transfer function

Signal in Time Domain

• Raw data
Signal in Time Domain

- 1 second data (fs = 125Hz)

Autocorrelation

Cross-Correlation

Power Spectral Density

Transfer Function
Conclusion

- Applied nonparametric estimation technique to evaluate the statistical properties of the biomedical signals
- Changes in the relationship between before and after an acute episode of intracranial hypertension in time and frequency domain
  - Strong correlation after the intracranial hypertension
  - Cardiac cycle changed

Reference

- [1] Statistical and adaptive signal processing/

Question and Comment

- Question and Comment