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Innovative Approaches for Baroreflex Sensitivity(BRS) Measurements

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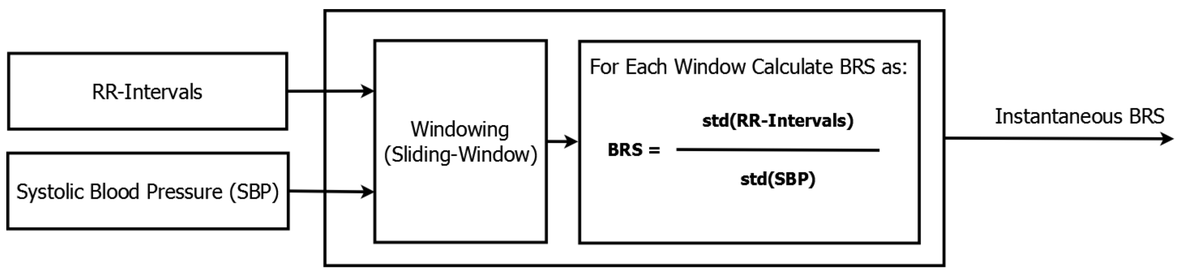
Motivation

- **Importance of BRS:**
  - ✓ Baroreflex contributes to the reciprocal reduction of parasympathetic activity and increase of sympathetic activity which is associated with the development and progression of cardiovascular diseases.

  The analysis of BRS is a source of valuable information in the clinical management of cardiac disease patients.
- **Current BRS Methods:**
  - ✓ Time Domain: Spontaneous Trends of Continuous RR-BP.
  - ✓ Frequency Domain:
    - RR-BP Power Ratio in Low- and High-frequency Bands.
    - Transfer Function: the average of SBP-RR Cross-spectrum.
- **Limitation**
  - ✓ All Methods Calculate BRS in a Block-based Manner.
- **The Idea**
  - ✓ Propose a Measure of Instantaneous BRS.
  - ✓ Investigate the Frequency Content of the Calculated BRS.

Instantaneous BRS

- **Sliding-Window Standard Deviation Method**



  - Sliding-Windows with lengths of 15, 30 and 60 Seconds Were Considered.

Frequency Content Analysis

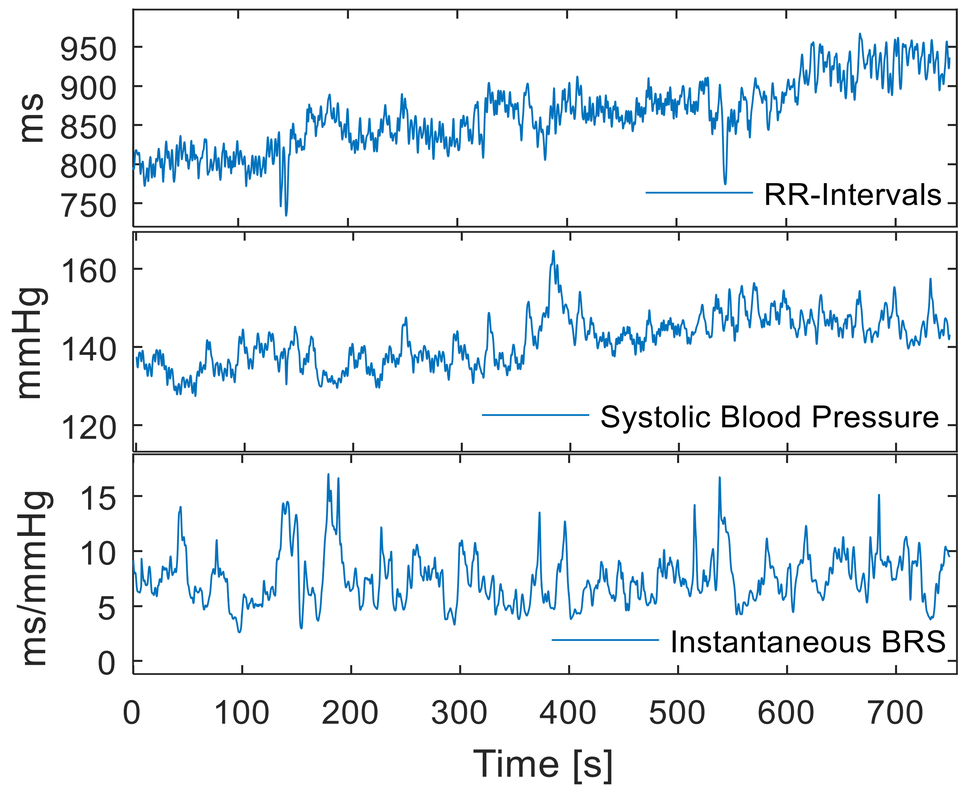
- **Parametric Power Spectrum Analysis**
  - Autoregressive Method with an Order of 15.
  - Study of Total Power in Different Frequency Bands.
  - Study of the Peak of the Power in Frequency Bands.

Dataset

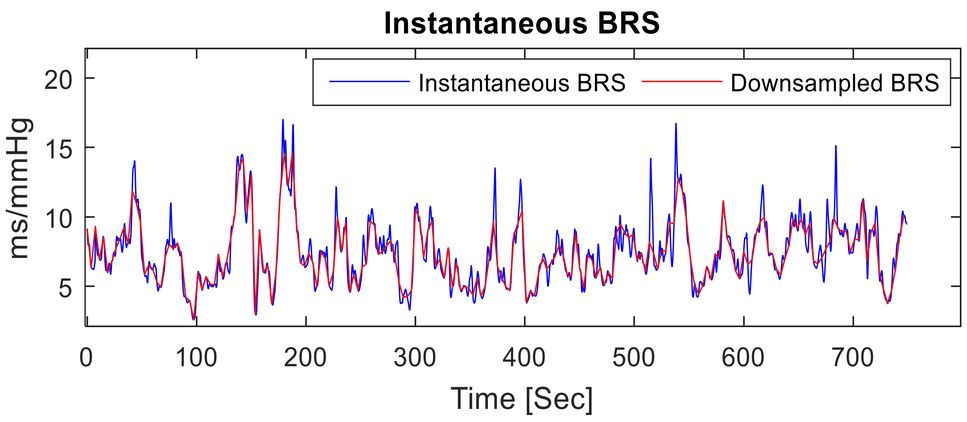
- **Publicly Available EUROBAVAR dataset.**
  - 21 Patients (Age 20-68 Years; 4 Men).
    - ✓ Recordings of Healthy and Unhealthy Subjects.
  - 10-12 Minutes Recordings.
    - ✓ Standing and Supine Positions.
  - RR-Intervals and SBP Time Series Available.

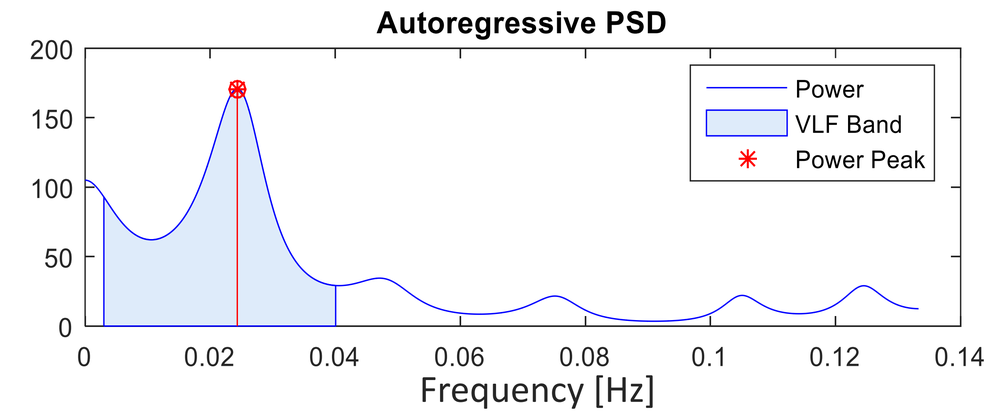
Results

- **Instantaneous Baroreflex Sensitivity:**



- **Frequency Content Analysis:**





Conclusion

- **Advantages of the Proposed Method**
  - ✓ Simply Defined and Computed.
  - ✓ Enables the BRS Frequency Content Analysis.
- **Observations**
  - BRS Presents Quasi-periodical Fluctuations.
  - The Average Frequency Peak at 0.0193 ± 0.008 Hz.
  - The Percentage of Total Power :
    1) Ultra-Low Frequency Band [0.0Hz – 0.003Hz]:
       - 15 ± 10 % of Total Power.
    2) Very-Low Frequency Band [0.003Hz – 0.04Hz] :
       - 71 ± 9 % of Total Power.