Supporting Visual Parameter Analysis of Time Series Segmentation with Correlation Calculations

Problem statement: Identify parameters and parameter values that strongly influence the segmentation of time series

Approach: Computing and emphasizing correlations between parameters and outputs

Determining Correlations

1. **Feature vectors** to characterize each segmentation output by
   - Number of segments \( c \) for each segment type \( S_1 \ldots S_n \)
   - Average segment length \( l \) for each segment type \( S_1 \ldots S_n \)

2. **Correlation calculation** between parameters and components of the feature vectors
   - Pearson correlation coefficient
   - Subspace search to identify correlations in subsets of the segmentation outputs
   - Dynamic programming to ensure efficient calculations

⇒ Correlation values signify parameter dependencies

Correlation Visualization

Emphasizing Dependencies:
   - Sorting of rows by involved parameter values and by output similarity
   - Lowering the saturation and dimming of uninvolved segments

⇒ Parameter Space Analysis

Parameter Analysis

Input \( x \) \( \Rightarrow \) (Feature Vectors \( \{ F_1, F_2, F_3 \} \)) \( \Rightarrow \) Parameters \( \{ P_1, P_2, P_3 \} \) \( \Rightarrow \) Output \( \{ O_1, O_2, O_3 \} \)

Interactive Exploration

User interface:
   1. Sorted list of correlations.
   2. Involved parameters and segmentation types to filter displayed correlations.
   3. Visualization of parameters and segmentation outputs.
   4. List of segmentation types.

Exploration strategies:
   - **Parameter first**: Selection of filters (2) is used to show only correlations (1) of a certain parameter (or segmentation type). This helps users to visually investigate (3) the influence of selected parameters.
   - **Segmentation first**: The visualization (3) is used to manually selected regions and segment types (4) with interesting observations. Only correlations with matching segments are shown (1) to explain the observations.

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