Zoomable Interactive Time Series Visualization
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Problem
• concurrent visualization of multiple time series datasets in the browser
• interactive, zoomable, minimal data transferred to the browser, support for huge datasets

Motivation
• Internet of Things time series datasets are becoming more and more common
• sensors networks, citizen science measurements with mobile devices
• huge datasets, but trend of moving everything into the cloud
• comparison between data, but data is big, even one dataset can be incomprehensible and visualisation crowded
• loss of information when zooming out

Related work
• imMens: Real-time Visual Querying of Big Data
• Nanocubes for Real-Time Exploration of Spatiotemporal Datasets
• Horizon Graphs
• Stack Zooming for Multi-Focus Interaction in Time-Series Data Visualisation

Initial view
Initial view. Time series navigator below for selecting. Two parallel time series on each chart, three charts in parallel.

Design principles
• in the browser
• interactive, mouse interface
• scalable, RESTful API
• minimization of “operation mode” switching
• no need to understand the technical background of the underlying system

Approach
• three components
  – server side time series storage (Python + MongoDB)
  – HTTP RESTful interface (Python + Django)
  – client visualization (JavaScript + Highstock)
• layered downsampling datapoints at various granularity levels
  – both value and time downsampling operators
  – multiple downsampling operators at once
  – user gets data from the granularity levels most suitable for the time-span requested
• derived time series from another time series
• selecting, panning, zooming, highlighting
• parallel inter-locked series on one chart, parallel inter-locked charts

Future work
• client performance improvements
• other types of values supported
  – graphs
  – discrete events
• sharing of visualisation – unique URL for each visualisation configuration
• other types of visualising time series data
  – stacked graphs
  – areas
  – background color regions
• analyzing time series properties (auto-correlation) and exposing them

Detail

Zoomed view
Highest detail zoom without range information.

Range view
Range around the mean, but no highlighting enabled.