Spike2

Life sciences data acquisition & analysis system

BP and ECG with generated MAP

Graphical sequence editor

Cardiac action potential analysis

Cardiovascular

Spike2 includes built-in and custom features for cardiovascular research. It can record pulsatile signals using a CED 1401 interface with simultaneous pacing and stimulating and can detect, measure and react to waveform features such as R-waves in real-time. In addition, it can carry out comprehensive data analysis on-line with further analysis off-line. If you need to process data recorded with other systems, Spike2 can import a wide range of third-party file formats.

Common applications

- Heart rate variability studies
- Cardiac action potentials repolarisation latencies
- Waveform complex identification and measurement such as QRS
- Organ bath/Langendorff studies, including pressure-volume loops
- Exercise physiology
- Baroreceptor sensitivity analysis

Data capture

Spike2 records waveform, time-stamp and marker data. Waveform channels can be captured at different sampling rates, with synchronised stimulus and pacing pulses logged as time-stamp data to the same file. Text comments placed in the record during data sampling are easily located for review and analysis of experimental stages.
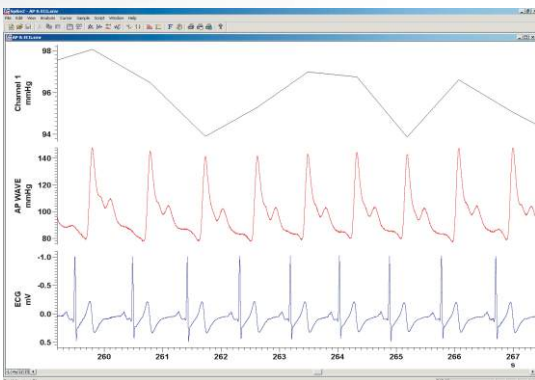
Stimulation

The CED 1401 interface generates pacing pulses and stimulus amplitude values via Spike2's built-in sequencer. A graphical editor with drag-and-drop interaction allows fast and easy creation of stimulus protocols. For more complex output and control requirements, a text editor enables direct access to the sequencer code. Further on-line control of the outputs is available through script interaction.

- Output pulse trains, variable amplitude pulses, ramp, sine and arbitrary waveforms during sampling
- Responds in real-time to changes or features in the sampled data
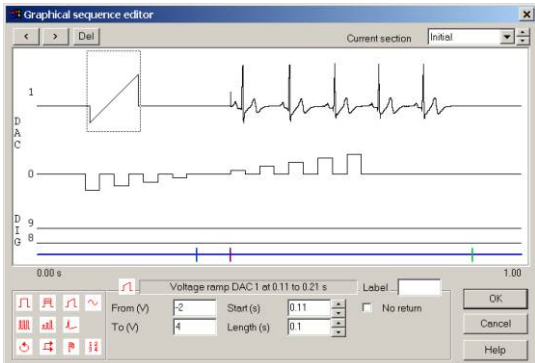- Switch between different output protocols with a single mouse-click

Analysis

Spike2 has built-in detection of waveform features, measurements of latencies, amplitudes and areas as well as average and trend plots. Further custom analysis functions can be applied via a script language.
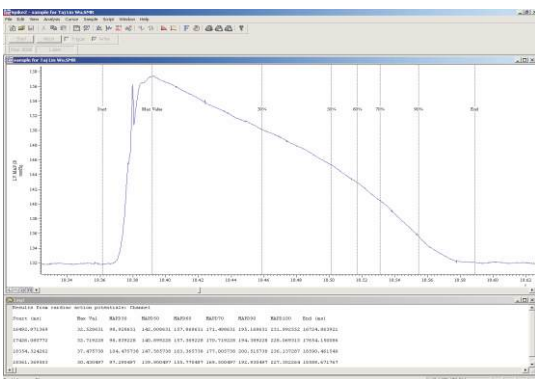
- Generate tachogram channels based on detected waveform complex segments, such as ECG R-waves for heart rate variability studies
- Locate repolarisation percentages and measure latencies from cardiac action potentials
- Measure systolic and diastolic blood pressure on a beat-by-beat basis. Use detected peaks and troughs to calculate and plot mean blood pressure
- Mark and measure responses to drug applications

Cambridge Electronic Design Limited

Est. 1970

CED

Active cursors

Active cursors search for features in waveform data and latch to time-stamps. You can also position cursors with "expressions", such as , Cursor (1) +5 to force a second cursor five seconds in advance of the first for comparative area measurements.

- Search for features including peaks, troughs, threshold crossings, slope measurements, percentage repolarisation and event markers on multiple data channels
- Use up to ten active cursors in a data file view

Measurements

Results from cursor positions, correlations, averages and script driven functions can be plotted and exported for further analysis, if required.

- Available measurements include: mean waveform value, slope, curve area, ratios, differences, and peak-to-peak amplitude
- Take multiple measurements based on cursor positions
- Plot results to new channels in the data file or XY scatter plots
- Export results to spreadsheet

Waveform processing

Spike2 can apply channel processes (for example, rectification and smoothing) on-line and off-line to aid with the detection and measurement of waveform features. Virtual channels allow inter-channel arithmetic, such as calculating the third lead in Einthoven's triangle.
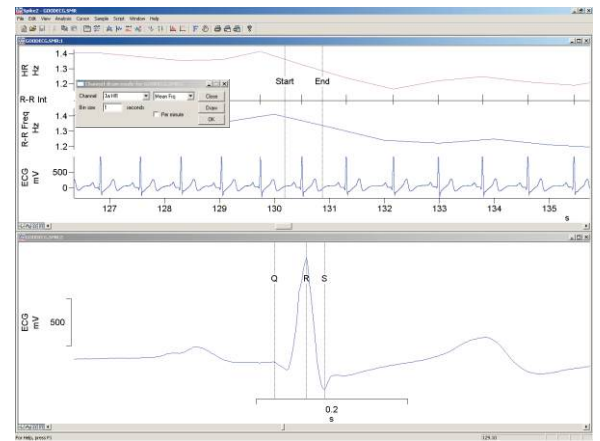
- Locate and mark points of interest in processed data. Use these reference markers to take measurements from the original signal.
- Data processing options include digital filtering and smoothing to reduce noise and unwanted frequencies, differentiation to enable detection of hard to find components, and DC remove to normalise the signal and minimise baseline drift
- Applied processes only affect the displayed data, not the original data file
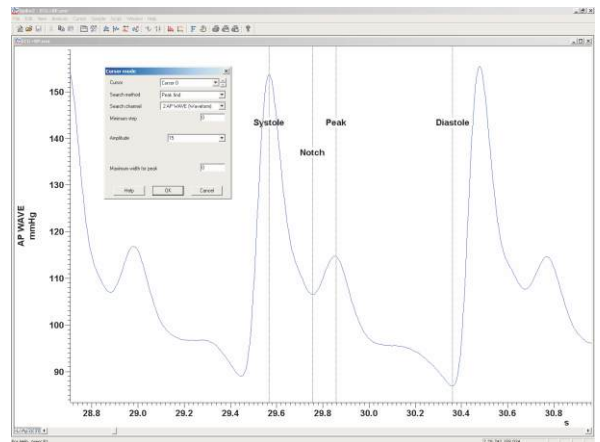- Create duplicate channels to show raw and processed data simultaneously

Import data

Spike2 includes a large import library that allows the conversion of text and binary files from other programs, as well as common formats used in life science research.
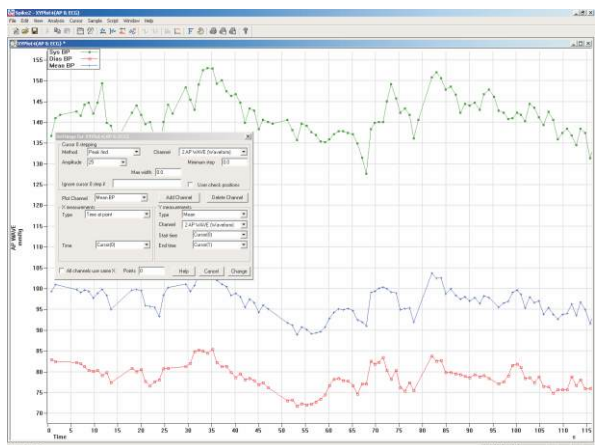
Script programming language

Although Spike2 provides many of the analysis features required by most users, it can also be further enhanced with the use of scripts. The script programming language allows the user to create custom analysis routines or automate repetitive tasks. A number of example scripts for customized display, on-line and off-line analysis and experimental control are available to download from the CED website.

QRS complex identification

Active cursors finding waveform features

Trend plot of multiple measurements

www.ced.co.uk