Title: A Data Exploration Tool for Large Sets of Spectra
Authors: Duane F. Carbon (NASA ARC TNF) and Chris Henze (NASA ARC TNE)
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We present an exploration tool for very large spectrum data sets such as the SDSS, LAMOST, and 4MOST data sets. The tool works in two stages: the first uses batch processing and the second runs interactively. The latter employs the NASA hyperwall, a configuration of 128 workstation displays (8x16 array) controlled by a parallelized software suite running on NASA's Pleiades supercomputer. The stellar subset of the Sloan Digital Sky Survey, DR10, was chosen to show how the our tool may be used. In stage one, SDSS files for 569,740 stars are processed through our data pipeline. The pipeline fits each spectrum using an iterative continuum algorithm, distinguishing emission from absorption and handling molecular absorption bands correctly. It then measures 1659 discrete atomic and molecular spectral features that were carefully preselected based on their likelihood of being visible at some spectral type. The depths relative to the local continuum at each feature wavelength are determined for each spectrum: these depths, the local S/N level, and DR10-supplied variables such as magnitudes, colors, positions, and radial velocities are the basic measured quantities used on the hyperwall. In stage two, each hyperwall panel is used to display a 2-D scatter plot showing the depth of feature A *vs* the depth of feature B for all of the stars. A and B change from panel to panel. The relationships between the various (A,B) strengths and any distinctive clustering are immediately apparent when examining and inter-comparing the different panels on the hyperwall. The interactive software allows the user to select the stars in any interesting region of any 2-D plot on the hyperwall, immediately rendering the same stars on all the other 2-D plots in a unique color. The process may be repeated multiple times, each selection displaying a distinctive color on all the plots. At any time, the spectra of the selected stars may be examined in detail on a connected workstation display. We illustrate how our approach allows us to quickly isolate and examine such interesting stellar subsets as EMP stars, CV stars and C-rich stars.