JHelioviewer
Open Source Software for Discovery and Image Access in the Petabyte Age

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JHelioviewer
Open Source Software for Discovery and Image Access in the Petabyte Age

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JHelioviewer is part of the ESA/NASA Helioviewer Project
The Helioviewer Project

Motivation

• Need to tackle huge data sets
  • SOHO: \( \sim 0.2 \) Gbyte/day
  • SDO: \( \sim 1.4 \) Tbyte/day
• Large range of physical length-scales
• Many different data products available
The Helioviewer Project

Motivation

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  • SDO: ~1.4 Tbyte/day
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Goals

• Create discovery infrastructure by
  • Enabling efficient data browsing and visualization
  • Linking data to knowledge bases and automated feature recognition algorithms
AIA takes 16MP images in 10 channels, every 12 sec, 24/7

Challenges:

- Data access & distribution
- Search
- Visualization

Solution:

- With JPEG 2000: Can compress 4k × 4k image to 1 MB
- 10 channels at 36 sec cadence → 24 GB/day = 8.8 TB/year
- Can keep comprehensive data set of browse data online for entire mission (science data: only few months)
What is JPEG 2000?

JPEG 2000 = new wavelet-based compression standard

Advantages:

• **Multiple resolutions**
  [Images at different resolutions are automatically created during wavelet compression process]

• **Random image access**
  [Selected parts + quality layers can be accessed remotely]

• **Flexible file format** [can add metadata]

• **Well-suited for archives**
  [offers lossless mode, “Compress once, decompress many ways”]
Remote Access to Image Data via JPIP

- JPIP = JPEG 2000 Interactive Protocol
- Provides a client–server architecture for interactively transmitting image data over networks
- Can request arbitrary parts and quality levels of image series
JHelioviewer

What is JHelioviewer?

• Client-server solution for browsing large data volumes, using
  • JPEG 2000 compression
  • JPIP for interactive streaming
  • OpenGL for fast rendering
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What can JHelioviewer do for you?

- Interactively generate/play/overlay time series of high-res images with arbitrary cadence
- Perform image processing on-the-fly
- Connect to HEK, overlay markers
- Export to common movie formats
What’s New?

• Serving AIA images at 36s cadence
• Feature tracking
• HEK integration
• Plugin architecture
• RGB channel mixer
• Radial opacity filter
• Versatile movie export
• Save & load states
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JHelioviewer User Interface
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Layer Manager
JHelioviewer User Interface

Layer Manager

- Start Date: 2010/12/06
- Start Time: 06:59:32
- End Date: 2010/12/06
- End Time: 21:57:32
- Time Step: 30 min
- Observatory: SDO
- Instrument: AIA
- Detector/Measurement: 171 Å
JHelioviewer User Interface

Adjustments

Selected Layer: AIA 304
Quality: 8/8
Opacity: 100%
Sharpen:
Gamma: 1.0
Color: SDO–AIA 304 Å
Channels: Red, Green, Blue
JHelioviewer Demo

The image shows a solar activity demonstration using JHelioviewer, an open-source software for studying solar phenomena. The interface includes tools for adjusting the view, controlling movies, and adjusting image layers and settings. The solar disk is prominently displayed, showcasing solar features such as sunspots and flares, with controls for zooming, panning, and adjusting the display quality.
see also poster by V.K. Hughitt et al. (SH23C-1868)
Conclusions

• Make the most out of SDO with JHelioviewer:
  • Interactively play and overlay high-res movies remotely
  • Perform image processing on-the-fly
  • Display HEK events

• JPEG 2000 offers exciting new functionality that enables users to interactively explore petabyte-scale image archives

http://www.jhelioviewer.org
This Software is For You - Get Involved!

- Download it, use it, report bugs
- Does it help you doing science?
- Write your own plugin
- Consider hosting a mirror server

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