Difference imaging in JHelioviewer

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Live Demo first

Previous attempt

- By Helge Dietert https://code.launchpad.net/~helge-dietert/jhelioviewer/runningDiff

- Needed some tweaks to get it running. At first sight it looked ok for a start.

- Occasional problems with locking up the program because the way several threads interact.

- Often “slow” because some the images tend to be out of sync and a re-rendering is necessary in another thread.

Previous attempt

- Computes differences on cpu, not on gpu.

More Issues before starting

- Cannot use the fire-and-forget method to display images was previously done
- Need to cache the previous/base image somehow
- Cannot copy from 2D and forget what happened before (colormap, positioning, …)
- Metadata needed for exact positioning (from metadataview) does not come with the current image

More Issues before starting

- Very cumbersome to dynamically change (parts of) the main image shader. (E.g. conditionally)

- Mixed usage of gl.glProgramLocalParameter4dARB TEXCOORD* variables, some of them being edited as global variables make it hard to understand what to do before starting.

- Problems of metadata: the current frame has the metadata of the previous frame when displayed (threading issue, applies to all JHelioviewer)

Fixing metadata

- Control the rendering using a “display lock”
- Locking immediately after an image is rendered to set new data and metadata, release immediately after.
- Locking immediately before a new render pass to opengl is invoked release immediately after.

Fixing cpu consumption

- Re-render images /re-display images manually

- Put the calls on a queue.

Shading the difference

- The wireframe of the sphere is kept fixed.
- Computation of the texture coordinates and rotation of the sphere vertices is in the vertex shader.
- Two images as input to the fragment shader.

Shading the difference

- Vertex shader: compute the texture coordinate that need to be drawn at the given input vertex by rotating it over its input angles. (For the current and previous/base image)

- Two images as input to the fragment shader, compute the difference and discard frames, if there is no image on top of it.