

HDR Images via IIIF Image API

Use cases and further steps



Introduction: What is HDR?

Incomplete and greatly simplified

- HDR images using tone mapping are around since 3 decades
 - Composed of different exposure levels
 - Images for display still have 8 bit colors (colors are "warped")
- We are talking about HDR display using a 10 bit color space
 - Tone mapping might be still applied
 - Generated either by HDR capable imaging sensors, composed or artificial.



Current and future developments

High level (user / consumer) view

- HDR video
 - Currently best known and supported in the browser for example on YouTube
 - Supported by TV sets
 - Can be created by mobile phones
- - © Can be created by modern mobile phones
 - Supported by some browsers
 - Different level of support by different formats
- HDR images as Textures (for 3D models)
 - Supported by modern game engines
 - Browser support experimental (Three.js)



Current limitations

Soft- and hardware (as of November 2024)

- You need a HDR-capable monitor / screen
- © Operating system level support inconsistent
 - Mac OS is certainly best
 - Windows support need to be enabled explicitly (but it's solid enough for gaming)
 - Linux support currently experimental
- Browser support (~95% for HDR images)
 - Firefox only has partial support for HDR video
 - Chromium-based browsers might need additional flag for all features (see demo)
- OSS support in development / experimental
 - VIPS, ImageMagick etc.



Formats using gain maps

These formats offer a fallback by storing the lighting information separately

- Separation between SDR and HDR components
- Gain map holds "differences" to create HDR image
- HDR gain map saved in image metadata
- Available for JPEG, AVIF, JXL and HEIF specification (ISO 21496-1) currently settling, multiple vendors have implementations (November 2024)
- **Benefits**
 - Fallback for SDR-only soft- and hardware
 - Efficient storage by subsampled gain map



But why?

For those, not deceived by the looks: Use cases

- Presenting artifacts with enhanced colors
 - Immersive effects
- Image analysis
- Mixing different channels (wave lengths) in as gain maps
- Examples focused on presentation of cultural artifacts (from libraries and museums) for education and communication



Use cases II

Other ideas (for other communities)

- Scientific visualization
 - Like bioluminescence, multispectral / false-colour images etc.
- Highlighting / contrast enhancements (as optional image operations) in VREs
- Not necessarily limited to web browsers



Demo

Currently only working in Chromium-based browsers

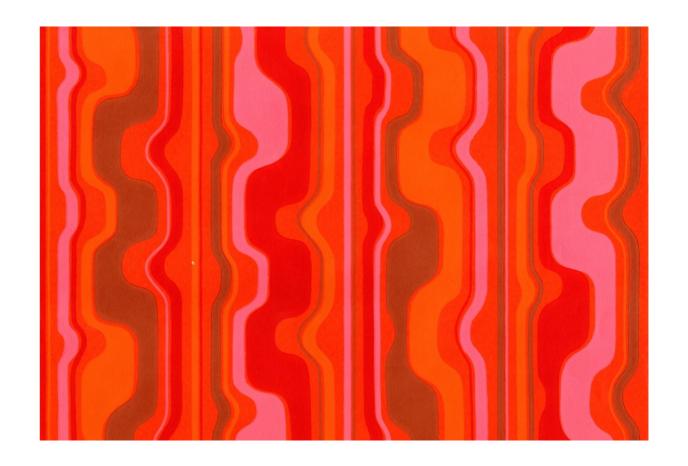
- The effect isn't really presentable yet tone mapping will be applied automatically
- Besides from having the required hardware and a properly operating system you might need to configure your browser accordingly
- Chromium based browsers might need to have enableexperimental-web-platform-features enabled in chrome://flags/
- If your Setup supports the requirements, you might open the following URL in your browser:

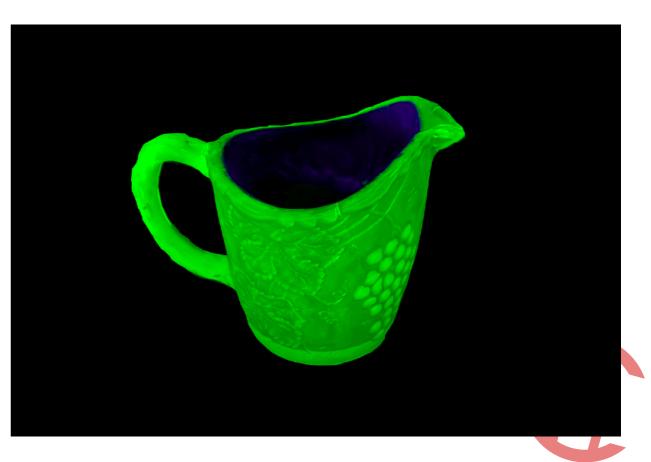
https://christianmahnke.de/en/post/iiif-online-meeting-2024-slides

Demo placeholder I

Images not in HDR due to technical limitations

- This slide is just a placeholder for the demo
- The first image shows a HDR Image of a 70s wallpaper
- The second image shows a 3D model of a milk pourer made of uranium glas, digitized under UV light

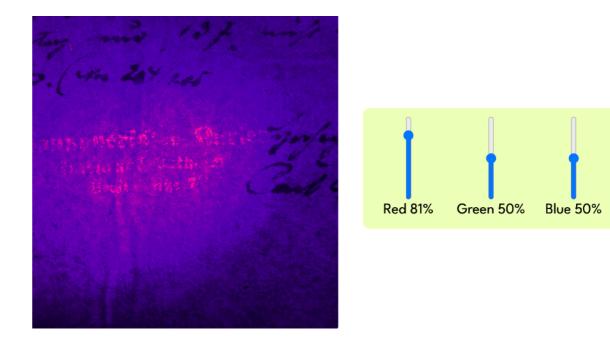




Demo placeholder II

Images not in HDR due to technical limitations

- This slide is just a placeholder for the demo
- The first image shows a image analysis color enhancement example
- The second image shows a painting with contrast enhanced by bright areas in a radiography of itself





Next steps

What should we do as a community?

- Standardization!
- Where? Image API, Presentation API? IIIF/api#2312
 - How generic should it be? 3D as well?
- Who will join?



Thanks for your time!

Any questions?

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