HDR Images via IIIF Image API

Use cases and further steps

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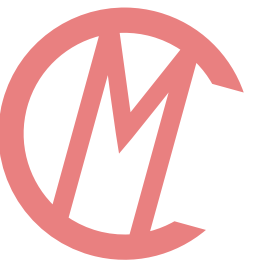
Introduction: What is HDR?

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

☞ HDR images

    ☞ 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 `enable-experimental-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
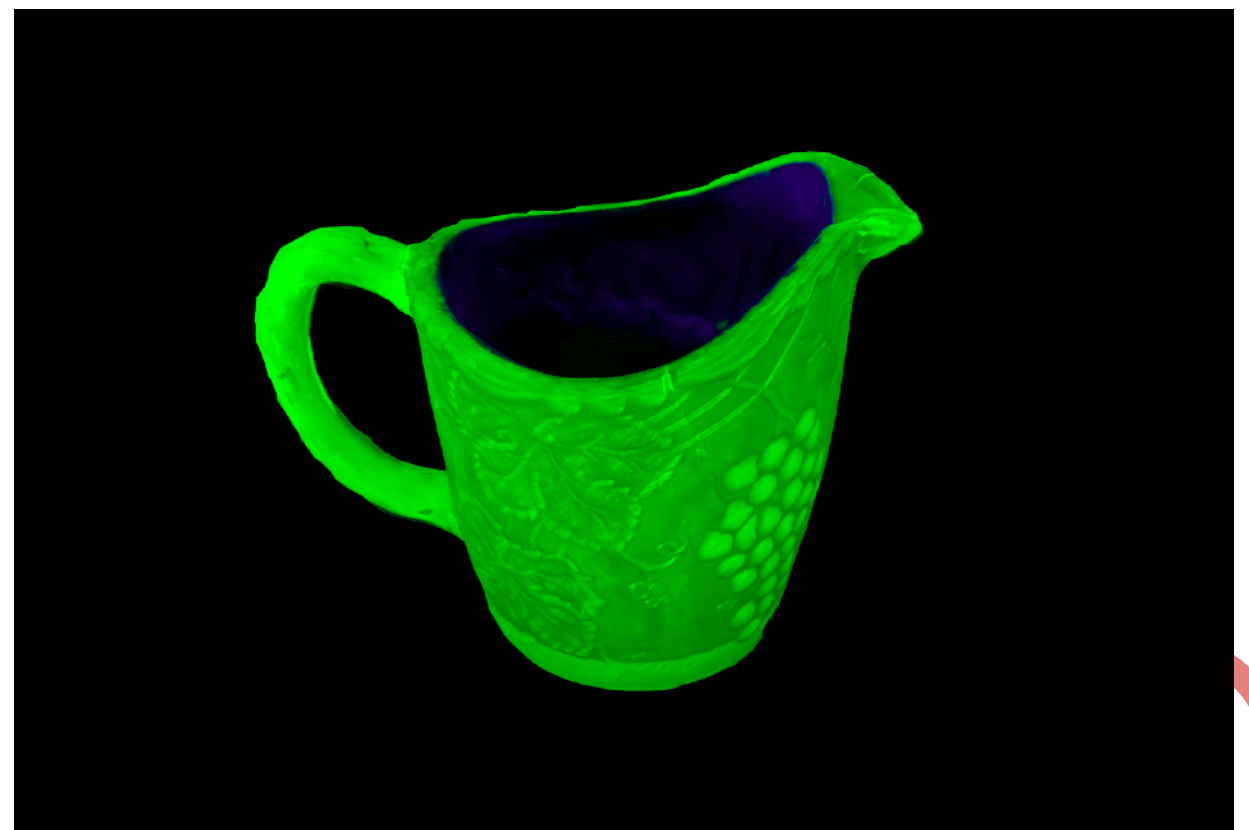
Demo placeholder II

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

Red 81%   Green 50%   Blue 50%
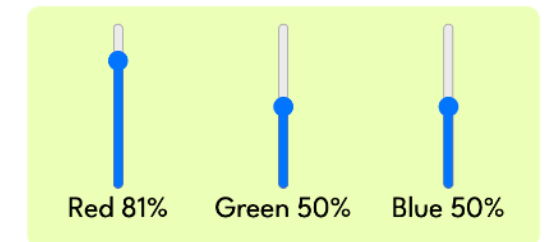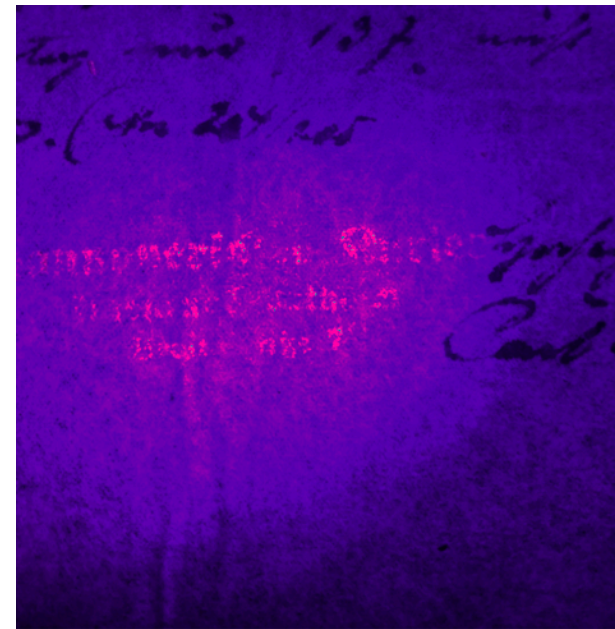
Next steps

What should we do as a community?

☞ Standardization!

☞ Where? Image API, Presentation API? IIIF/api#2312
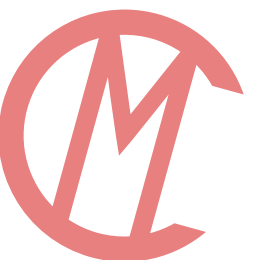
    ☞ How generic should it be? 3D as well?

☞ Who will join?

Thanks for your time!

Any questions?

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