



IIF Imageserver

a new way to present images on the web

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Referencing images on external sites is difficult!

- each provider has a different implementation
- HTTP-Links (=url's) provide just one version (format, resolution, region)
 - ☞ problem client-side and/or server-side
 - ☞ either: only very few versions available
 - ☞ or: complex handling on server which has to keep many versions
- usually no systematic way to construct URL

IIIF-Solution

- Standard URL which allows to define
 - ▶ image resolution
 - ▶ image region
 - ▶ image format

`{scheme}://{server}/{prefix}/{identifier}/{region}/{size}/{rotation}/{quality}.{format}`

{scheme}://{server}/{prefix}/{identifier}/{region}/{size}/{rotation}/{quality}.{format}

- **scheme**: http or https
- **server**: DNS name
- **prefix**: arbitrary name
- **identifier**: unique identifier of image
- **region**: “full” or region in pixel coordinates
- **size**: “full” or pixels
- **rotation**: angle (degree) and mirroring (“!”)
- **quality**: “default”, “color”
- **format**: “tif”, “jpg”, “png”, “jp2”

http://www.salsah.org/limc/z412_23a/100,400,800,300/pct:50/90/default.jpg

IIIF-Server

- parse URL
- prepare image “on the fly”
 - ▶ cropping
 - ▶ scaling
 - ▶ rotating
- send image using HTTP protocol

SIPi (***s**imple **I**mage **P**resentation **I**nterface*):

- an expanded implementation of a IIF-server (high efficient stand-alone server written in C++)
- Implements the full specification of IIF
- simple configuration
- additional features:
 - ▶ fully scriptable with Lua (pre-flight, in-flight, post-flight) 🖱️ access control, database connection
 - ▶ embedded simple web server (elua = embedded lua)
 - ▶ restricted views “on the fly”: watermarks, resolution restrictions etc.

SIPi (***s**imple **I**mage **P**resentation **I**nterface*):

- ▶ supports uploads, import and format conversions (controlled by Lua scripts)
- ▶ master images stored in highest resolution (size, bit-depth) as JPEG2000
- supports CORS (Cross-Origin Resource Sharing)
- uses kakadu-JPEG2000 library (***license required!***)
- preserves all metadata (TIFF-tags, EXIF, IPTC, XMP and ICC color profiles)
- supports tiled viewers (e.g. openseadragon) for high-resolution image viewing on the web
- open source (GNU Affero General Public License), on github (<https://github.com/dhlab-basel/Sipi>)

What is JPEG2000

- **NOT** an enhancement of JPEG
it's a completely new compression method
- based on **wavelets**
- a **standard** with a lot of options and variants (*which makes it difficult to master from time to time...*)
- base for the IIF compatible Imageservers

Wavelets: e.g. Gabor-Filters

With ϕ denoting the rotation angle

$$u(x, y) = x \cdot \cos(\phi) + y \cdot \sin(\phi)$$

$$v(x, y) = -x \cdot \sin(\phi) + y \cdot \cos(\phi)$$

We get the filter pair with a given σ_x, σ_y and frequency ν

$$G_e(x, y, \phi) = \cos(\nu) \cdot e^{-\frac{1}{2} \left(\frac{v}{\sigma_v} \right)^2} \cdot e^{-\frac{1}{2} \left(\frac{u}{\sigma_u} \right)^2}$$

$$G_o(x, y, \phi) = \sin(\nu) \cdot e^{-\frac{1}{2} \left(\frac{v}{\sigma_v} \right)^2} \cdot e^{-\frac{1}{2} \left(\frac{u}{\sigma_u} \right)^2}$$

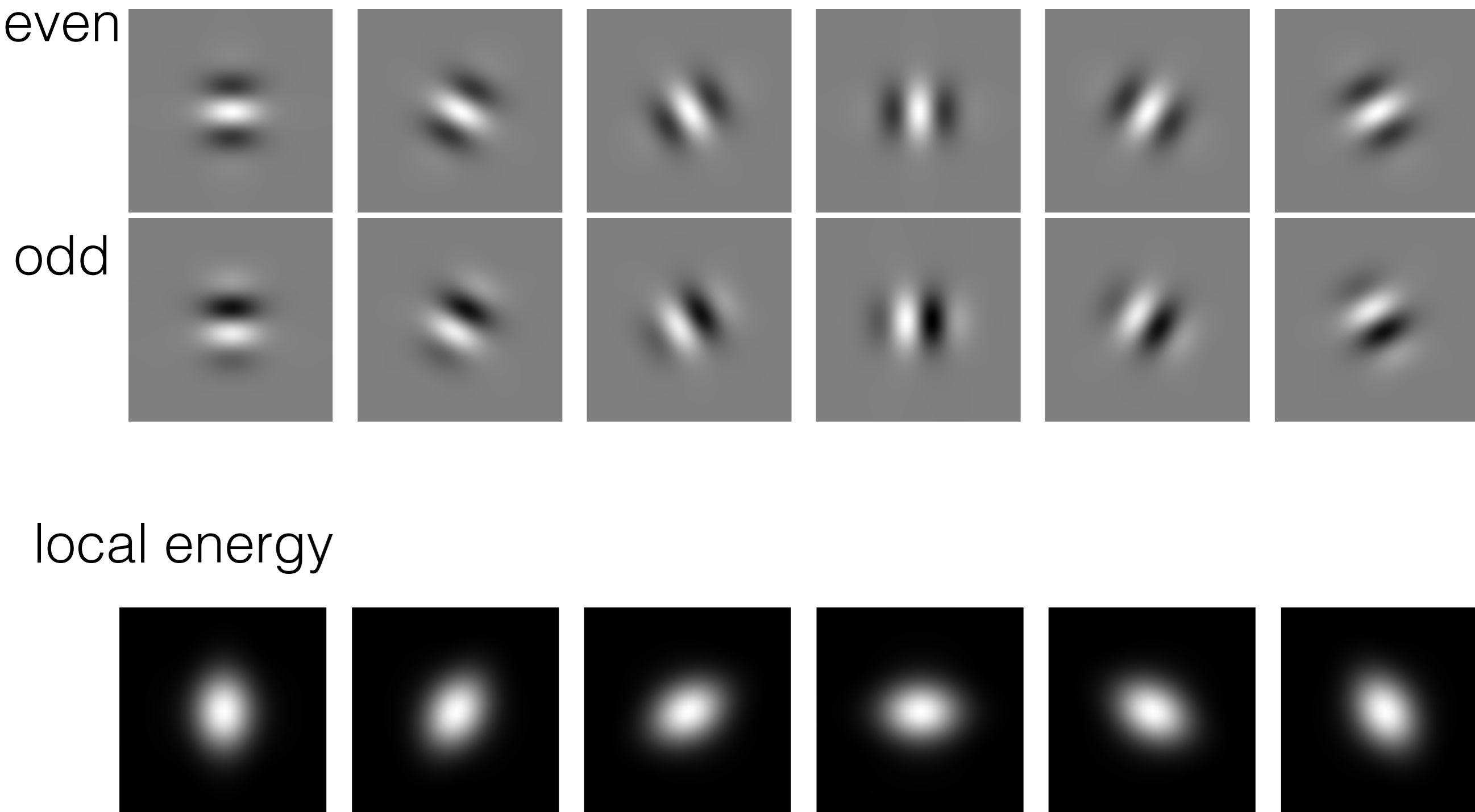
„local energy“

$$A(x, y, \phi) = \sqrt{G_e(x, y, \phi)^2 + G_o(x, y, \phi)^2}$$

- Response to an optimal line or edge

$$l(x, y) = e^{-\frac{1}{2} \left(\frac{x}{\sigma_v} \right)^2}$$

Visual



Brain equivalent

- even and odd Gabor => „*simple cells*“
 - respond to lines **or** edges
 - orientation selective
- „local energy“ => „*complex cells*“
 - respond the same to lines and edges
 - orientation selective

Wavelets...?

- are „***natural***“ because the vision and segmentation process of the brain is based on wavelets (visual cortex V1 & V2)

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F. Heitger, R. von der Heydt, E. Peterhans, L. Rosenthaler, O. Kübler: "*Simulation of neuronal contour mechanisms: representing anomalous contours*", in: Image and Vision Computing 16 (1998), pp. 407-421

http://iiif.io