Protocols

Graphical programming for Icy

a.k.a. programming, for the rest of us
Foreword: Reproducible Research

- Quote: "Results aren't much if they can’t be reproduced!" (your boss, your reviewers, your colleagues, you!)
Foreword: Reproducible Research

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- Fact: Most journals now reject papers without proper quantification. 
  [...] Image quantification was carefully conducted using Photoshop. [...]

Foreword: Reproducible Research

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- Conclusion: Image quantification is a protocol in its own right...
Foreword: Reproducible Research

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Foreword: Reproducible Research

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- Icy makes these protocols easy to read / write / use / adapt
  - **Design** a protocol once, run on thousands of images
  - **Upload** your protocol and share with the world (within publications)
  - **Download** other protocols, run them out-of-the-box
  - **Extend** any protocol to meet your needs and share/publish again

  all in just a few clicks, no programming knowledge required.
Protocols in Icy

- A protocol is a workflow linking processing blocks together

http://icy.bioimageanalysis.org/protocol/Extract_channels
Protocols in Icy

- Standardised design: all blocks look the same
- Strong modularity: one block = one task

- Run protocol until this block (inclusive) and stop
- Block execution priority (starts at 0, click to prioritize)
- Collapse
- Delete block
- "Drop zones" (link from other blocks)
- "Drag zones" (link to other blocks)
- Input parameters (0 or more)
- Output (0 or more)

Arbitrary color code indicates parameter types
Protocols in Icy

- The protocols editor: [http://icy.bioimageanalysis.org/plugin/Protocols](http://icy.bioimageanalysis.org/plugin/Protocols)
Protocols in Icy

- Blocks are organised by groups

More ideas on how to tidy things up? Let us know!

- all available plug-ins
- user input (values, images, files, etc.)
- sequence manipulation
- operations on regions of interest
- (read files from / save data to) disk
- interact with ImageJ (call plugins/macros)
- create loops (for repetitive tasks)
- developer tools (more a sandbox really)
Protocols in Icy

- Question: how would you find the nuclei in this image?
Protocols in Icy

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Outline:

1. Extract the channel of interest
2. Clean the data
3. Find an intensity threshold
4. Threshold the image
5. Extract the regions of interest
6. Quantify

(notice how generic this outline is…)
Protocols in Icy

● Question: how would you find the nuclei in this image?

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Menu: Sequence > Extract Channel

NOTE: channel index starts at 0...
Protocols in Icy

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Menu: Blocks > Gaussian Filter

Diffuses the intensity contained in each pixel (i.e. makes the image look blurry)

Adapt the diffusion to the image noise
Too much diffusion: edges fade away!
Protocols in Icy

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*Menu: Blocks > KMeans Threshold*

Finds the optimal separation(s) between the histogram modes (i.e. intensity classes)

2 modes => 1 threshold (3 => 2, etc.)
Protocols in Icy

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Menu: Blocks > Thresholder

Creates a labeled image by classifying pixel intensities according to the threshold(s)
1 threshold => [0;1] (binary) image
2 thresholds => [0;1;2] (labeled) image etc.
Protocols in Icy

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Menu: Blocks > Label Extractor

Extracts objects from a labeled image using connected component analysis
Protocols in Icy

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Menu: ROI > ROI Statistics

Calculates size, dimensions, intensity statistics, etc.
Protocols in Icy

● Question: how would you find the nuclei in this image?

don’t forget me!
Protocols in Icy

- Question: how would you find the nuclei in this image?

```plaintext
click + drag from here
```
Protocols in Icy

Question: how would you find the nuclei in this image?
Protocols in Icy

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Protocols in Icy

Question: how would you find the nuclei in this image?

click on the run button
Protocols in Icy

- Question: how would you find the nuclei in this image?

if you want to see something...
Protocols in Icy

- How about batch processing?

all results go in a single file
Protocols in Icy

- How about batch processing?

Results go in a specific file for each image
Protocols in Icy

- Most plugins have their corresponding Block
- What if the one you need isn't there (yet)?
  - #1: Leave a comment on the plug-in's page online

KMeans Color Quantization
by Nicolas Hervé

Quantize a color image in any given number of colors.

See technical details
View complete changelog
Tags: quantization - segmentation - clustering

Documentation
This plugin has no documentation.

User reviews

<table>
<thead>
<tr>
<th>Rating</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 star</td>
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<td>0</td>
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<tr>
<td>1 star</td>
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</tbody>
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average rating: 4

Your review: What is a review?

Leave a comment & rating

Score: 1 2 3 4 5

gautier
24 Nov 2012 22:23
Hi! very nice plugin,
I was wondering if it was possible to call it in block editor?
Protocols in Icy

- Most plugins have their corresponding Block
- What if the one you need isn't there (yet)?
  - #1: Leave a comment on the plug-in's page online
  - #2: The "DIY" (Do It Yourself) approach

Your parameters, your code, you control everything!

Interested? We'll be back, after the break!