QUAREP-LIMI WG10 - 4th meeting - 23/02/2021

Attendees:

Thomas Guilbert, Ulrike Boehm, Martin Stöckl, Alexia Ferrand, Steve Ogg, Jeff LeDue, Michael S. Nelson, Perrine Paul-Gilloteaux, Peter Bajcsy, Rodrigo Roberto Bammann, Ali Gheisari, Santosh Podder, Gerhard Holst, Erika Wee, Julia Fernandez-Rodriguez (17 participants)

Agenda:

1. Welcome new participants
2. Agreement on minutes of the last meeting and about the recording of the meeting
3. Feedbacks - Evaluation of the breakout rooms sessions. Can we better structure them?
4. Defining the first goal: writing a white paper defining at least 6 parameters to IQ evaluation for random WF and confocal images
5. Image Dynamic Range (IDR)
6. Lateral Sampling Rate (size of the image pixel) and Axial Sampling Rate (size of the z step)

Minutes:

1. Welcome new participants
   Jeffrey LeDue & Erika Wee

2. Agreement on minutes of the last meeting and about the recording of the meeting
   Done and Done

3. Feedbacks - Evaluation of the breakout rooms sessions. Can we better structure them?

4. Defining the first goal: writing a white paper defining at least 6 parameters to IQ evaluation for random WF and confocal images
   - Suggestion has been perceived positively

   Comments by the group:
   - Marin Stoeckl: Let's focus on parameters that we can directly get out of the image
   - Gerhard Holst: What is an image? Which formats do we allow?
   - Perrine: the format should be uncompressed/lossless image
   - MN : I agree with RAW data - non irreversibly damaged by JPEG compression etc. Lossless.
   - RN: bio-format readable
   - Erika Wee: I think the white paper will be very helpful, I am also part of a group working on SNR and PSF analysis in 3D -
   https://www.abrf.org/light-microscopy-lmrg-

- UB: Slack is now open for all QUAREP members, maybe we could use it more often, at least as a try

5. Image Dynamic Range (IDR)
    - We go over the DR register of the Excel sheet
    - Discussion: see recording and chat (posted below)

    General theme:
    - The "goodness" of the DR also strongly depends on the experimental setup (i.e., a high background is not necessarily a bad thing, strong saturation might also not be a bad thing)
    - Multiple parameters are interlinked and determine in the end overall IQ of an image

    - Perrine: Let's test the parameters on test images -- Group agreed to her suggestion

6. Lateral Sampling Rate (size of the image pixel) and Axial Sampling Rate (size of the z step)
    Delayed to the next meeting

Next meeting: March 9 at 10:30 am (ET) / 4:30 pm (CET)
oom link:
https://hhmi.zoom.us/j/9220286547?pwd=OGRWNTFyWjBzMEI5QkZrWUU4TitVdz09

Content of the chat:

De Perrine Gilloteaux à tout le monde: 04:30 PM
hello :)
De moi à tout le monde: 04:30 PM
Hello Perrine :)
De Ulrike Boehm à tout le monde: 04:30 PM
The link to the minutes is here:
https://docs.google.com/document/d/1df1dTg3Zwrejxho8eTZyxiAxIJXPcpPL8yIk5SpC7zo/edit?usp=sharing
Please indicate your participation
De moi à tout le monde: 04:31 PM
https://docs.google.com/document/d/1df1dTg3Zwrejxho8eTZyxiAxIJXPcpPL8yIk5SpC7zo/edit?usp=sharing
Please indicate your participation
De Ulrike Boehm à tout le monde: 04:38 PM
Please type in your name in the meeting's minutes:
https://docs.google.com/document/d/1df1dTg3Zwrejxho8eTZyxiAxIJXPcpPL8yIk5SpC7zo/edit?usp=sharing
The folder with the tables is here:
https://drive.google.com/drive/folders/1XykhjZhl-tAuEMFxAjD2Ln8sUdxMWz89?usp=sharing
De Perrine Gilloteaux à tout le monde: 04:41 PM

Regarding the goal I agree aiming to publish the definition certain number of IQ parameters is a good goal: there were no such sources of data and that would be useful for the Community, and as Ulrike and Thoams said: the first stone. So + 1 on the first goal

De Michael Nelson à tout le monde: 04:51 PM

I agree with RAW data - non irreversibly damaged by JPEG compression etc. Lossless.

De moi à tout le monde: 04:53 PM

sorry for that, I have to take 5

De peter bajcsy à tout le monde: 04:54 PM

Could we initially present the white paper as an overview of existing definitions for the chosen six parameters?

De Erika Wee à tout le monde: 04:57 PM

I think the white paper will be very helpful, I am also part of a group working on SNR and PSF analysis in 3D

https://www.abrf.org/light-microscopy-lmrg-

De moi à tout le monde: 04:57 PM

Thank you Erika

De Erika Wee à tout le monde: 04:58 PM

Maybe we can work together to use the data we have collected

De moi à tout le monde: 04:59 PM

For PSF analysis, let's connect with the WG dedicated to this topic

De Perrine Gilloteaux à tout le monde: 04:59 PM

I agree with @peter,   in any case, if we agree on one favorite definition for each parameter, we will have to give the other existing ones, and give their values on example images

De Ulrike Boehm à tout le monde: 05:01 PM

The table is located here:

https://docs.google.com/spreadsheets/d/1qpZGoxVQjtKt6Bwqcy4KhGPuGaDZ7RNzkLcu6n vkkDQ/edit?usp=sharing

De Michael Nelson à tout le monde: 05:02 PM

Dynamic range is "per channel", yes? Do we assume IDR is always going to be "worse" for negative controls?

De Perrine Gilloteaux à tout le monde: 05:04 PM

indeed

De Michael Nelson à tout le monde: 05:06 PM

I feel like the dynamic range should be different than saturated/missing/blank pixels... It is quality, but hard to use to calculate "range"

De Rodrigo Bammann à tout le monde: 05:07 PM

If the dynamic range is the difference between pixel values, then would the different bit levels of images make it hard to compare between images?

De Michael Nelson à tout le monde: 05:08 PM

Yes, unless normalized

Regarding using the maximum range of the detector: that only works for the brightest sample

De peter bajcsy à tout le monde: 05:08 PM

Yes, unless normalized

De Michael Nelson à tout le monde: 05:10 PM

I have had users max their range, and then their next sample was brighter... which saturates. IDR across an entire experiment would be... tricky, though.

De Elton REXHEPAJ à tout le monde: 05:11 PM

Could it be helpful to have a dynamic range focused on min, max, and a second capturing a dynamic range avoiding saturated pixel and background noise
De Michael Nelson à tout le monde: 05:13 PM
Yep, that's what I was aiming for. Or a sub-value. IDR(1-5, min/max, %sat+0+missing)
De Elton REXHEPAJ à tout le monde: 05:13 PM
yes
De Michael Nelson à tout le monde: 05:18 PM
Should biological background be handled in non-RAW images?
As part of processing
De Alexia Loynton-Ferrand à tout le monde: 05:18 PM
It could be counted as a nonspecific signal
De peter bajcsy à tout le monde: 05:19 PM
The background should be defined in the context of the detector and in the context of the imaged sample.
De Alexia Loynton-Ferrand à tout le monde: 05:20 PM
I agree
De peter bajcsy à tout le monde: 05:20 PM
People have different definitions/interpretations of background
De Michael Nelson à tout le monde: 05:20 PM
Yes, and dangerously so at times ^_^
De Gerhard Holst à tout le monde: 05:23 PM
Could we use Background for the "noise" Level in the sample Image while using a dark Image for the Image without light?
De Michael Nelson à tout le monde: 05:24 PM
And is the saturation in areas you are concerned about
Exactly
De peter bajcsy à tout le monde: 05:25 PM
Regarding saturated pixels, one should be aware of so-called hot and dead pixels. These are defects that will always be in images but the source is different from "saturated" pixels.
De Michael Nelson à tout le monde: 05:25 PM
They would still be "missing data" though.
De Gerhard Holst à tout le monde: 05:26 PM
@Peter yes, but usually you hardly are able to see them, since they are "pre-calibrated" and replaced by the neighborhood average.
De Alexia Loynton-Ferrand à tout le monde: 05:27 PM
Do you want to add weight on the various Image quality parameters to give a final score? ponderated score?
De moi à tout le monde: 05:28 PM
Yes Alexia, absolutely
De Rodrigo Bammann à tout le monde: 05:28 PM
We do have to be careful about which parameters to use. Some of them are regarding the WG2 - detection system performance.
De Elton REXHEPAJ à tout le monde: 05:28 PM
One idea is to consider all parameters as features and model the quality a function of these parameters for specific applications
De Gerhard Holst à tout le monde: 05:28 PM
The dynamic range that we are discussing when coming just from the Image is more the contrast range in the imeg and Maybe not the dynamic range.

De Rodrigo Bammann à tout le monde: 05:29 PM
Agree with Gerhard.
De peter bajcsy à tout le monde: 05:31 PM
I have to go to another meeting. Great discussion!
De Perrine Gilloteaux à tout le monde: 05:31 PM
thanks all I also have to go!
De Elton REXHEPAJ à tout le monde: 05:32 PM
thanks all