TITLE: Draft Call for Contributions on Subjective Image Quality Assessment

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Call for Contributions on Subjective Image Quality Assessment

Summary

This document contains the Proposed Call for Contributions on Subjective Image Quality Assessment Methods. The scope of this call for contributions is to collect new methodologies and best practices w.r.t. subjective image quality assessment methodologies that target a range from high quality to near-visually lossless quality. All contributions will be considered in the development of the standard, that will be carried out by consensus among the JPEG experts following a collaborative process approach from the very beginning.
Call for Contributions on Subjective Image Quality Assessment

1. Introduction

The JPEG Committee has launched a new activity on Assessment of Image Coding, also referred to as JPEG AIC. This activity is a continuation of the previous standardization efforts (AIC-1 and AIC-2) and aims to develop a new standard, known as AIC-3. The new standard will be focusing on the methodologies for assessment of images with the quality levels in between the range where ITU-Rec. BT.500 [1] is suitable and the range where AIC-2 [2] is suitable.

![Diagram showing the range of image quality between high quality and near visually lossless]

This range is not well-covered

AIC-1 / BT.500
Side-by-side comparison, appeal-oriented impairment scale
With BT.500, these are already "visually transparent", so indistinguishable.
With AIC-2, these are "clearly not visually transparent", so indistinguishable.

AIC-2
Flicker test, fidelity-oriented, visually lossless

Thanks to the increasing storage capabilities and internet speed, modern image codecs have made very high-quality images possible and desirable. However, the existing standardized assessment methodologies (summarized in [3]), e.g. BT.500 [1], that are described in AIC-1 [4], are more suitable for evaluating the visual appeal of images (how obvious and/or annoying the artifacts are) than for evaluating their visual fidelity (how true the images are to the original).

This problem has been exacerbated by appeal-oriented improvements in modern image codecs—i.e., codecs have become good at “hiding artifacts”, causing BT.500 evaluation methodologies to saturate at a lower bitrate but also at a lower fidelity level. In a side-by-side comparison, images can become indistinguishable from the original at a bitrate as low as 0.5 bpp. However, the visual fidelity of those images can be relatively low at that bitrate. Thus, it is not necessarily the case that the tested image is also visually indistinguishable from the original image in a flicker test.

For example, a subtle tone shift of the background color can be impossible to see in a side-by-side comparison, but in a web use case it can lead to a visible discontinuity at the border where the image is supposed to match the background color of the surrounding page or of an adjacent image. Another example is loss of detail in subtle textures, which can be hard to spot in a side-by-side comparison but which is still problematic for an e-commerce website selling clothes online where it is important that prospective customers can see the details of the fabric with a fidelity as close as possible to the experience of a physical store.
The methodology described in AIC-2, on the other hand, approaches the problem from the other end: it is based on a very sensitive flicker test that will catch even the slightest visual distortion. While this leads to extremely high fidelity, the bitrates needed to ‘pass’ such a test tend to be as high as 5 bpp or more. For somewhat lower fidelity targets and more economical bitrates, the AIC-2 test cannot be used.

2. **Scope**

The scope of this call for contributions is to collect new methodologies and best practices w.r.t. subjective image quality assessment methodologies that target a range from high quality to near-Visually Lossless Quality.

High quality, here, is defined as the lowest visual quality level where artifacts are not noticeable by an average non-expert viewer in a side-by-side comparison as in BT.500 [1]. Near-Visually Lossless Quality, here, is defined as the quality with the smallest amount of artifacts where a flicker test [2] consistently detects flicker.

The contribution should aim at evaluating the detectability of specifically compression artifacts, not necessarily other kinds of distortions like capture/sensor artifacts.

3. **Use Cases and Requirements**

Use cases and requirements related to this call are available in Sections 4.1 and 4.3 of the document N100162 “Use Cases and Requirements for Image Quality Assessment 2.0” [5].

4. **Evaluation Conditions and Processes**

This call is asking for contributions to the standardization process that will be collaborative from the very beginning. In practice, this means that there will be no related call for proposals. In this context, all received contributions will be considered in developing the standard by consensus among the JPEG experts.

Contributions may address a subset of the requirements and not necessarily all the requirements as defined in the document N100162 “Use Cases and Requirements for Image Quality Assessment 2.0” [5]. During the collaborative phase, elements of complementary contributions may be combined into a single coherent specification.

Contributors are not required to be accredited JPEG members at the time of submission. Contributors are expected to present their contributions at the 97th JPEG Meeting, 24-28 October 2022 and to participate in the following discussion. Contributors are expected to engage with JPEG as a part of the collaborative development of the standard.

5. **Timeline**

The following schedule is planned for the Call for Contributions on Subjective Image Quality Assessment:
6. Contribution Composition and Requirements

6.1. Contribution Elements

A contribution may consist of one or more of the following elements:

1. Subjective assessment methods addressing one or more requirements in Section 4.1 [5].
   1.1. Description of the method.
   1.2. Detailed explanation of which requirements are addressed and how.
2. Any supporting evidence for the methods above including a detailed description of the performed experiments and associated results.
3. Test material that includes original and/or decoded images associated or not with the relevant experiments above.
4. Interchange format solutions and considerations addressing the requirements in Section 4.3 [5].
5. Software implementation of methods and protocols, e.g., test protocol, score screening, score analysis, etc.
7. Additional relevant use cases and requirements.
8. Any other relevant evidence or literature.
6.2. Contribution Registration and Delivery

No pre-registration is required. However, interested parties are encouraged to express their intent in advance as early as possible by sending an email to all the experts listed in Section 10 of this document.

All contributions must be uploaded to the ISO SD platform following the normal input document submission procedure. This should be done by the contributors themselves if they have access or by contacting one of the experts listed in the Section 10 of this document if they don’t have access. In any case, all contributions should be announced by sending an email to all the experts listed in Section 10 of this document.

The title of the contribution documents should start with “AIC3_Contribution_<ContributorName>”.

6.3. IPR Conditions (ISO/IEC Directives)

Contributors are advised that this call is being made in the framework and subject to the common patent policy of ITU-T/ITU-R/ISO/IEC and other established policies of these standardization organizations. The persons named below as contacts can assist potential contributors in identifying the relevant policy information.

6.4. Contribution to Standardization

Contributors are informed that based on the submitted contributions, a standard specification will be created. If they submit a contribution and (part of) the proposed technology is accepted for inclusion in the standard, they will be expected to attend subsequent JPEG meetings and contribute to the creation of the different standard documents. Within this process, evolution and changes are possible as several technologies may be combined to obtain a better performing solution.

7. Free and Open Source Encouragement

Contributors are welcome and encouraged to develop and provide free and open source implementations as well as tools (frontend, backend, test set generation, etc.) to conduct evaluation experiments and data analysis specified in the standard.

8. Royalty-free Goal

The royalty-free patent licensing commitments made by contributors to previous standards, e.g. JPEG 2000 Part 1, have arguably been instrumental to their success. JPEG expects that similar commitments would be helpful for the adoption of new standards.

9. Participation

The Ad Hoc Group on Image Quality Assessment was established at the 92nd JPEG meeting to continue developing standards in relation to image quality assessment. All interested parties are encouraged to register to the email reflector of the AhG (E-mail reflector: jpeg-aic@jpeglists.org).
To subscribe to the email reflector, please visit http://listregistration.jpeg.org; in case of problems, please contact lists@jpeg.org.

10. Contacts

The following contacts are available for clarifications regarding this Call for Contributions and are responsible for receiving submissions:

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References


