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Audio, video multimedia systems and equipment – Multimedia e-publishing and e-book technologies – Raster-graphics image-based e-books

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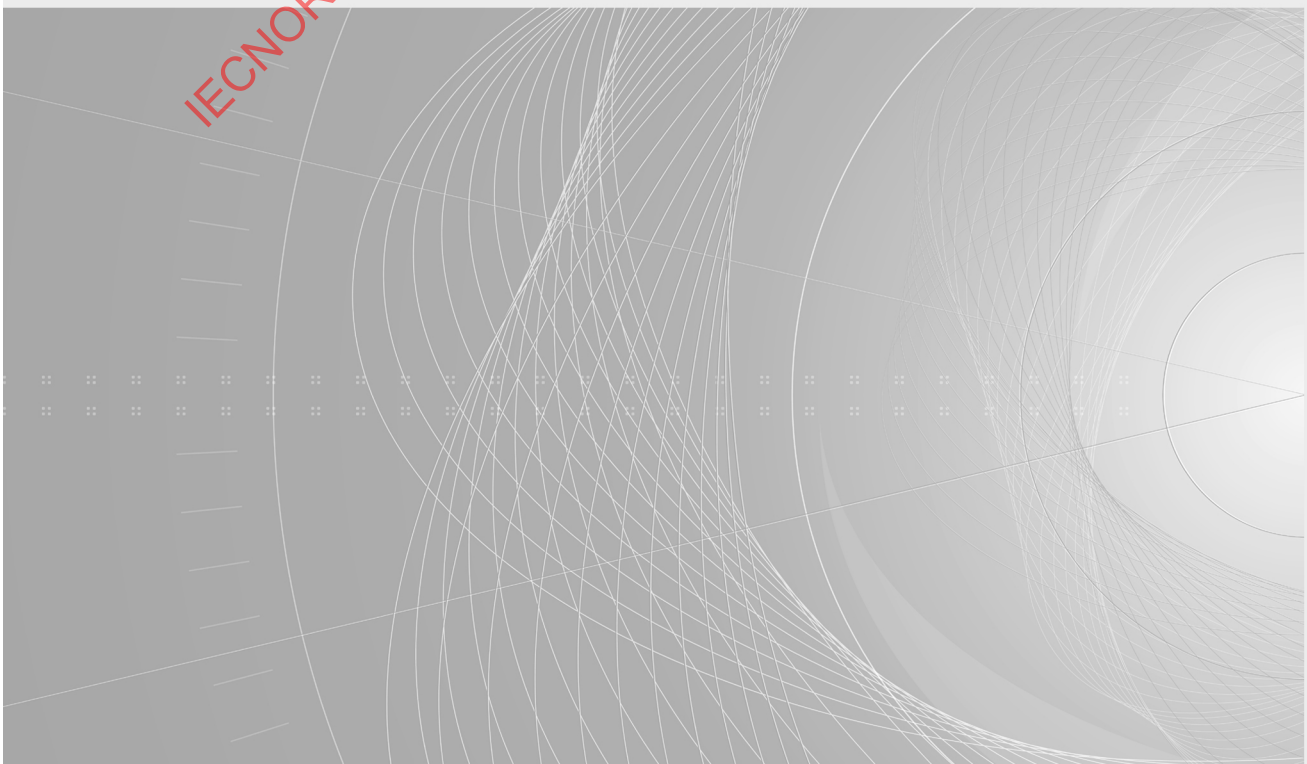

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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AUDIO, VIDEO MULTIMEDIA SYSTEMS AND EQUIPMENT – MULTIMEDIA E-PUBLISHING AND E-BOOK TECHNOLOGIES – RASTER-GRAPHICS IMAGE-BASED E-BOOKS

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The text of this International Standard is based on the following documents:

CDV	Report on voting
100/2817/CDV	100/2918/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

The contents of the corrigendum of January 2018 have been included in this copy.

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INTRODUCTION

Scanning of existing printed books is presently carried out widely to store their content in an electronic format: raster-graphics image-based e-books. The scanning includes number of parameters and sometimes results in poor-quality scanned data due to inappropriate parameter settings.

The scanning devices with storage memory and automatic document feeders enable swift production of raster-graphics image-based e-books with a brief procedure that does not require advanced skills and knowledge.

Scanning schemes can have many attributes which affect to the quality of raster-graphics image-based e-books, such as environmental conditions, sheet cutting/scanning operation, resolution, highlight washout point, tone curve adjustment/black point setup, post-processing and encoding. For example, inadequate selection of the scanning resolution can cause moiré in halftone images and discontinuation of lines in text images. The purpose of this document is to specify a scanning scheme for developing raster-graphics image-based e-books. When conforming to this document, a reasonable quality of raster-graphics image-based e-books is to be expected.

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1 Scope

This document specifies the scanning scheme to develop raster-graphics image-based e-books from existing printed books.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61966-2-1, *Multimedia systems and equipment – Colour measurement and management – Part 2-1: Colour management – Default RGB colour space – sRGB*

ISO 12639, *Graphic technology – Prepress digital data exchange – Tag image file format for image technology (TIFF/IT)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
bitmap image of sourcebook
two-dimensional raster data of each page of a sourcebook that can be aligned in exactly same page order as the sourcebook

3.2
raster-graphics image-based e-book
category of an e-book which consists of the bitmap image of sourcebook

3.3
sourcebook
printed book to be scanned

4 Raster-graphic image-based e-book

4.1 General

The creation sequence for raster-graphics image-based e-books is shown in Figure 1.

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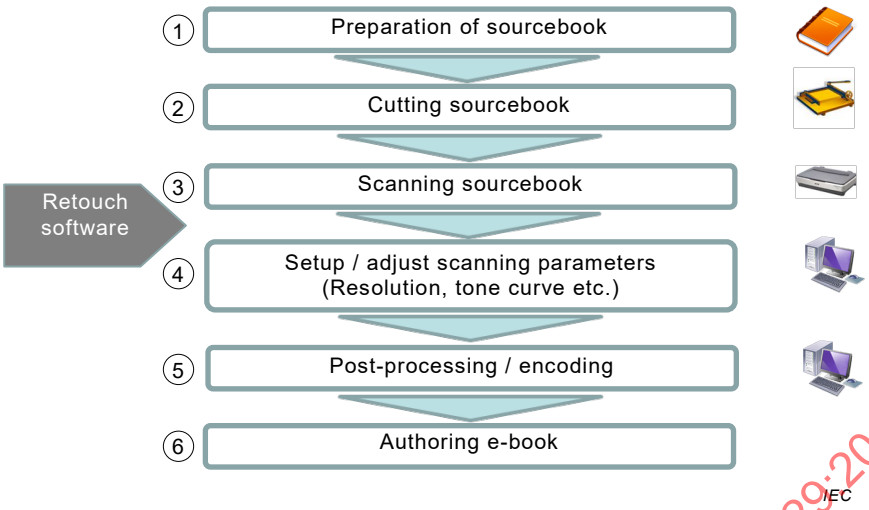

Figure 1 – Workflow for generating e-book from sourcebook

There are six steps to generating an e-book from the sourcebook, such as the preparation of the sourcebook, cutting the sourcebook, scanning the sourcebook, setup/adjustment of image quality related parameters, post-processing/encoding, authoring e-book. The first step is to clean up and to repair the sourcebook so that it becomes as close as possible to its original condition. A flatbed scanner is normally used for the third step, raster-graphics image-based e-books scanning operation, so the second step is to cut the sourcebook to make the scanning operation easier. The fourth step is to setup/adjust scanning parameters such as resolution and tone curve. The fifth step is to adjust and to encode the scanned data for output media. The sixth step is authoring the e-book. This document specifies the second to fifth steps, which form the scanning scheme. Raster-graphics image-based e-books can be categorized as one of the fixed layout e-books.

4.2 Target sourcebook

The sourcebooks to which this document applies are mangas, paperbacks, hard covers, textbooks, magazines, music scores and newspapers.

5 Scanning scheme

5.1 Cutting the sourcebook

To avoid image loss, sheet cutting should be carried out exactly on the perimeter of the binding and the margin. If this is not possible, the cutting line shall be less than or equal to 2 mm from the perimeter of the binding and the margin. The cutting line should be parallel to the edge. To avoid variation of image area position between pages, the margin between pages should be less than or equal to 1 mm.

NOTE See Clause A.1 for a description of image loss.

5.2 Scanning sourcebook

Scanning shall be done in at least 8 bits per pixel, 256 grey levels unless otherwise instructed.

The sourcebook image area in the corresponding scanned image data should not have any tilt. Image tilt adjustment shall be done to achieve tilt angle of less than or equal to 0,5°.

NOTE See Clause A.2 for a description of image tilt.

The scanning of the monochrome original shall be carried out in monochrome scanning mode. Colour original shall be carried out in colour scanning mode.

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NOTE When a black and white original is scanned using colour scanning mode, black text is likely to be greyed or coloured partially, and it can degrade text readability.

The tone curve of an original text image shall be adjusted for legibility.

5.3 Setup/adjustment of image quality related parameters

5.3.1 Elimination of unintended density variation

In general, there are four types of unintended original density variations as follows:

– foreign objects such as dripping coffee, soiling by handling, shading due to bump of correcting fluid on substrate and so on;
– degradation of substrate such as yellowing due to light fading or oxidization;
– show-through of image printed in opposite side of substrate;
– misplacement of original on scanning device leading to unpredictable unintended density variation at the border of the scanned data.

NOTE See Clause A.3 for a description of show-through.

The first three can be eliminated by adjusting the highlight washout point during the scanning operation or by erasing the defects, and the fourth one can be eliminated by trimming during post-processing.

5.3.2 Resolution

It is recommended to adopt a sufficiently high scanning resolution and bit depth in order to avoid line image discontinuity. Graphics and halftone image area may require moiré suppression. If moiré occurred due to too low a scanning resolution, use a higher scanning resolution.

NOTE See A.4 for a description of line image discontinuity and A.5 for a description of moiré.

For a text-based original document, 200 dpi or higher resolution is recommended. For text and low resolution halftone originals, 400 dpi or higher resolution is recommended. For high resolution halftone and graphics originals, 600 dpi or higher resolution is recommended for avoiding moiré. For on-demand printing and on-demand publishing usage, minimum resolution shall be 600 dpi.

The shape of the text is different between alphabets and it requires additional care to choose appropriate resolution and tone settings in order to avoid line image discontinuity. Clause A.4 shows an example of alphabet dependency.

5.3.3 Highlight washout point

The highlight washout point is effective for elimination of unintended density variation (see 5.3.3). But if the highlight washout point is set too high, it may cause discontinuity of line image in text and graphics. So, it is recommended to set the highlight washout point as low as possible. If line image discontinuity occurred after minimizing the highlight washout point, then it is recommended to adopt a higher scanning resolution and higher bit depth (see 5.3).

NOTE See Clause A.6 for a description of highlight washout.

5.3.4 Tone curve adjustment / Black point setup

In order to avoid tone-related issues, such as sleepy image, highlight washout and unwanted shadow clipping, it is recommended to adjust the density range by selecting a proper black point value and to adjust the tone curve shape appropriately for image appearance as shown in Figure 2.

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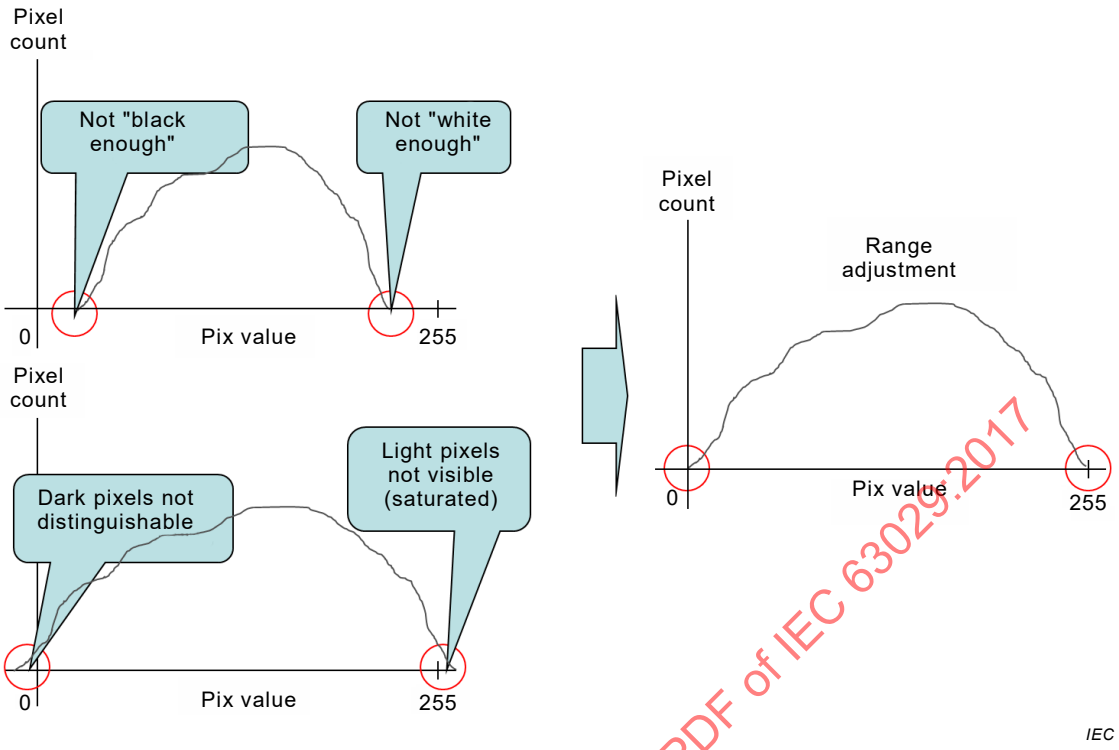

Figure 2 – Tone curve adjustment / Black point setup

NOTE See Clause A.7 for a description of highlight washout and unwanted shadow clipping.

5.4 Post-processing / encoding

5.4.1 Post-processing

If the resolution of the scanned data is higher than the output media resolution, the scanned data resolution shall be converted to match the output media resolution using a resolution conversion method such as the nearest neighbour method, the bilinear interpolation method or the bicubic convolution method.

5.4.2 Encoding

In order to avoid unwanted image noise due to lossy image encoding, such as mosquito noise or block noise, lossless compression shall be used.

For black and white images, the recommended data file format is 8 bits per pixel TIFF/IT as specified in ISO 12639. For colour images, the recommended data file format is 8 bits per pixel sRGB as specified in IEC 61966-2-1 with TIFF/IT.

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Annex A
(informative)

Defect examples

A.1 Image loss

Printed books are normally bound by glue and string. So the horizontal length of the pages inside is shorter than the overall horizontal size of the book. In other words, the inside margin is shorter than the outside margin. As a result, image loss sometimes occurs at the inside margin. By comparison with the image without image loss in Figure A.1, it is clear that a part of the image disappeared vertically right at the centre of the image in Figure A.2. Therefore, special care is required during the sheet cutting process to avoid image loss and image position variation between pages at the inside margin.

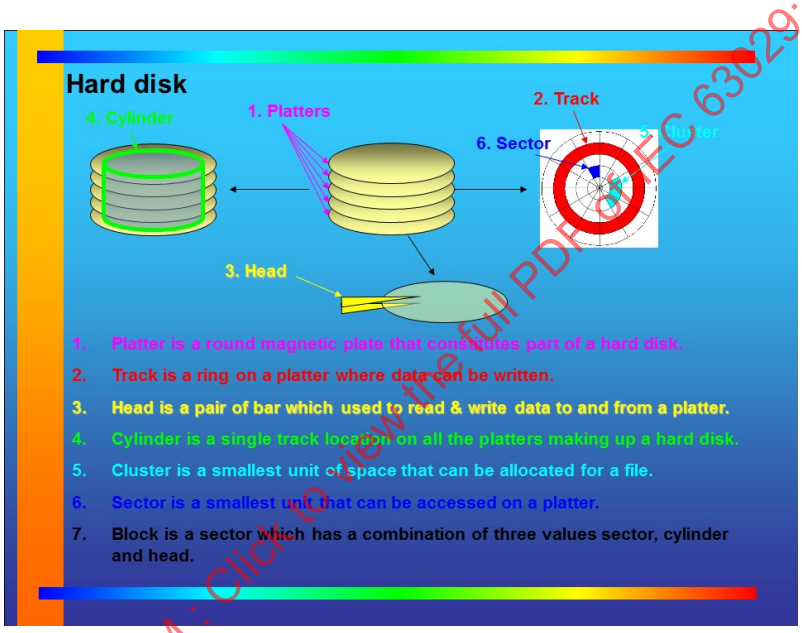

Figure A.1 – An example of the double-page spread without image loss

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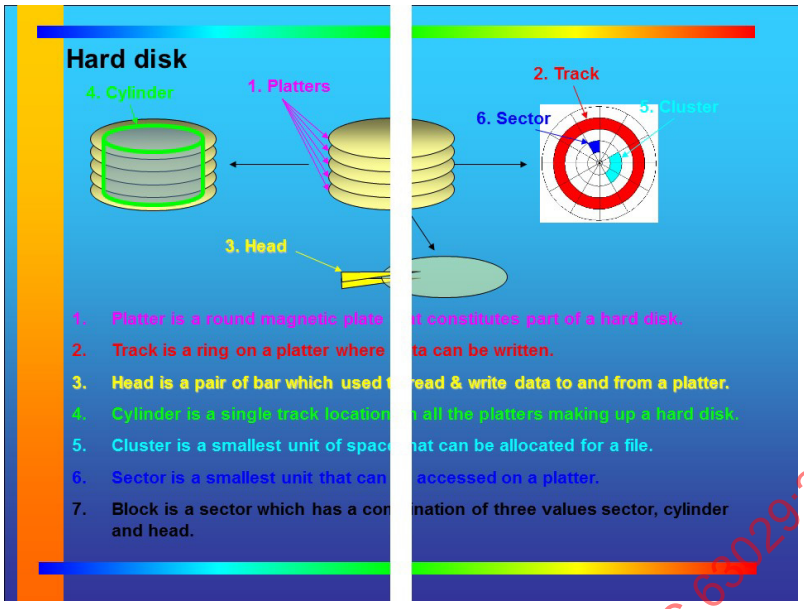

Figure A.2 – An example of the double-page spread with image loss

A.2 Image tilt

The scanned image is tilted when the sourcebook does not properly set with the scanner. By comparison to the image without image tilt in Figure A.3, it is clear that the image is only slightly tilted anticlockwise in Figure A.4 but it significantly degrades the scanned image quality.

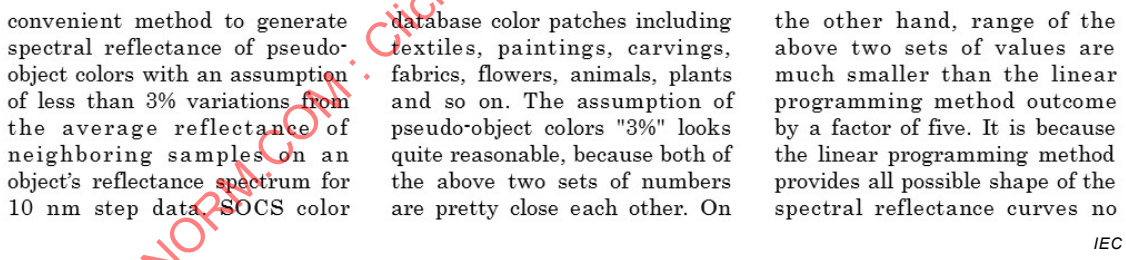

Figure A.3 – An example of the text image without image tilt

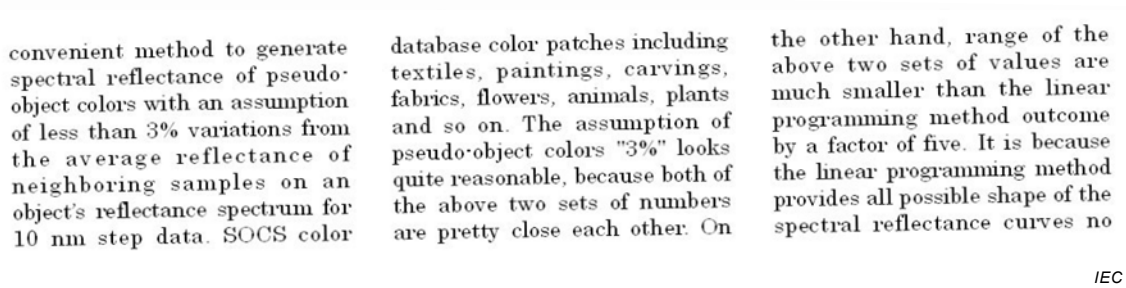

Figure A.4 – An example of the text image with image tilt

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A.3 Show-through

An image printed on the rear side of the page is sometimes visible from the front side of the page. This is called show-through. By comparison with the image without show-through in Figure A.5, it is clear to see the show through which appears as low contrast text flipped horizontally in Figure A.6 and show through, in general, is an obstacle to readability.

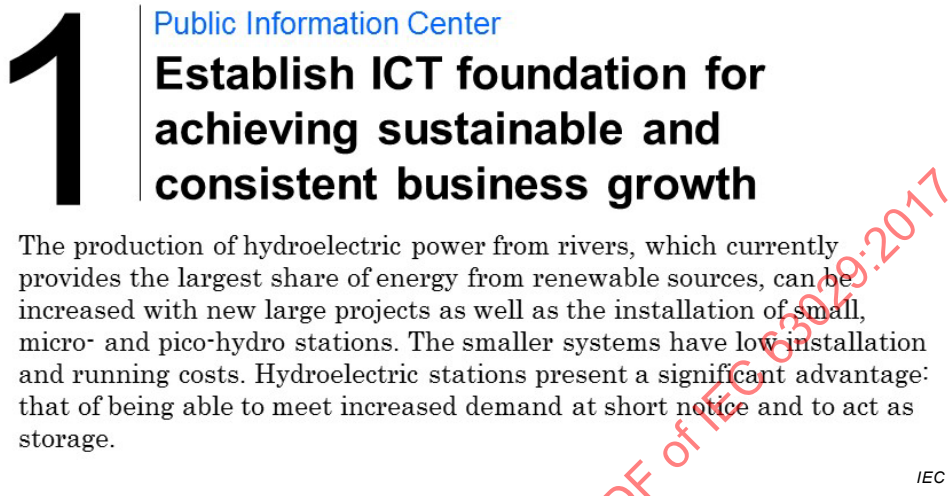

Figure A.5 – An example of the text image without show through

Figure A.6 – An example of the text image with show through

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A.4 Line image discontinuity

Scanning resolution is important for avoiding line image discontinuity and moiré. By comparison with the image without line image discontinuity in Figure A.7, it is clear to see the line image discontinuity in Figure A.8. Line image discontinuity is an obstacle to text readability. In addition, text readability due to line image discontinuity varies according to the alphabet used. As shown in Figure A.8, Japanese text in the bottom half is worse than the English text in the top half. This is because, in general, Japanese text consists of more strokes and therefore a greater number of thinner lines than English text.

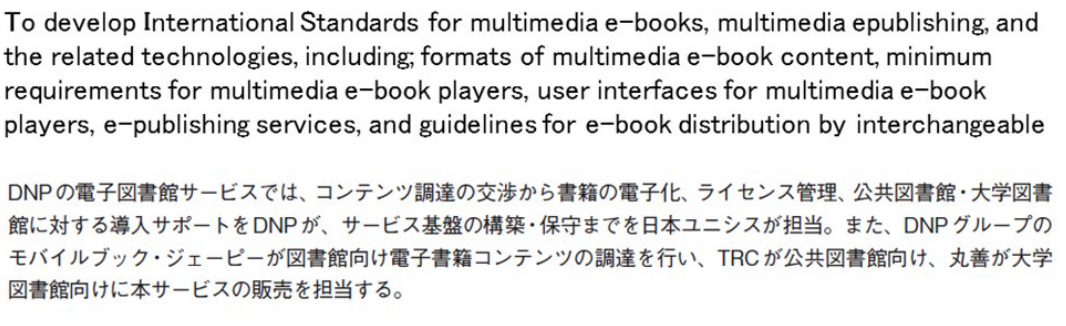

Figure A.7 – An example of the text image without line image discontinuity

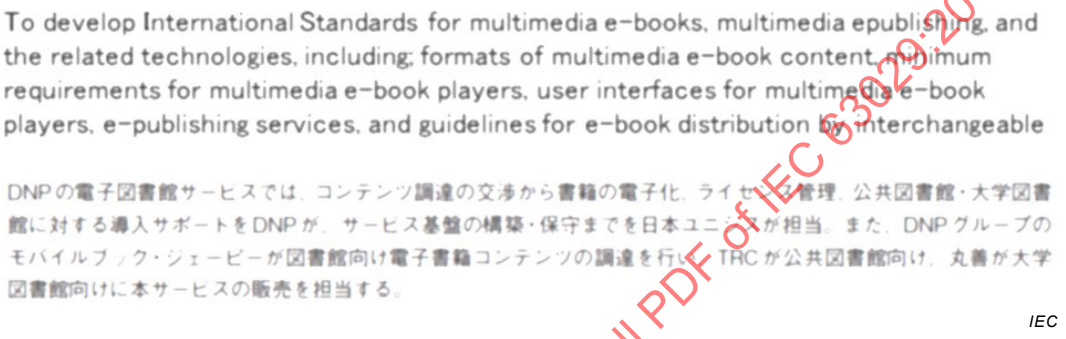

Figure A.8 – An example of the text image with line image discontinuity

A.5 Moiré

Moiré is a relatively low periodic-frequency density-variation pattern, appearing in scanned images, that does not exist in the corresponding high-frequency periodic density-variation pattern in the original images. In other words, moiré is false information in scanned images added by an inappropriate scanning operation. By comparison with the image without moiré in Figure A.9, moiré can be clearly seen on the door of the locker, second from the left in the front row, in Figure A.10.

Figure A.9 – An example of the photographic image without moiré

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Figure A.10 – An example of the photographic image with moiré

A.6 Highlight washout

Highlight washout is due to inappropriate tone adjustment. By comparison with the image without highlight washout in Figure A.11, it is clear to see the highlight washout in Figure A.12 where all the grey shadings have disappeared. In Figure A.11, the grey shading indicates a grouping of red, yellow and blue boxes, but this grouping intention is sacrificed by the disappearance of grey shading in Figure A.12.

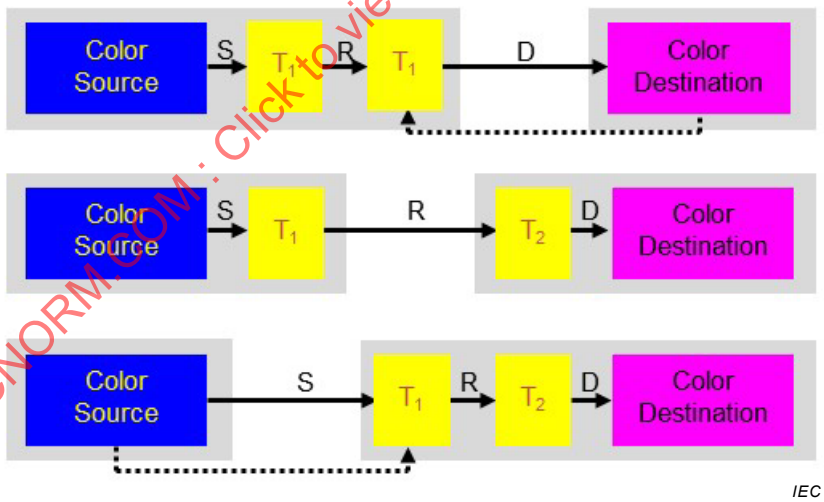

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Figure A.11 – An example of the business graphics image without highlight washout

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