RP 221-2008

SMPTE RECOMMENDED PRACTICE

Specifications for Extraction of 4 × 3 Areas from Digital 16 × 9 Images for Television Systems

1 Scope

This practice describes how to extract 4 x 3 aspect ratio images from the center of a 16 x 9 aspect ratio television picture from a digital source. This practice is intended primarily for non-scripted or live television productions where it is impractical to use pan and scan techniques to track the areas of interest in the picture. Protecting the 16 x 9 picture for a 4 x 3 extraction is a prerequisite for parts of the picture where action occurs to be preserved in the 4 x 3 cropped picture.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Approved
January 25, 2008

3 Normative References

Normative references are external documents referenced in normative text that are indispensable to the user. Bibliographic references are references made in informative text or are those otherwise not indispensable to the user.

The following standards contain provisions which, through reference in this text, constitute provisions of this Recommended Practice. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

SMPTE 125M-1995, Television — Component Video Signal 4:2:2 — Bit-Parallel Digital Interface

SMPTE 267M-1995, Television — Bit-Parallel Digital Interface — Component Video Signal 4:2:2 16 × 9 Aspect Ratio

SMPTE 274M-2005, Television — 1920 x 1080 Image Sample Structure, Digital Representation and Digital Timing Reference Sequences for Multiple Picture Rates.

SMPTE 293M-2003, Television — 720 x 483 Active Line at 59.94 Hz Progressive Scan Production — Digital Representation

SMPTE 296M-2001, Television — 1280 x 720 Progressive Image Sample Structure — Analog and Digital Representation and Analog Interface

ITU-R BT. 656-4 Interfaces for Digital Component Video Signals in 525-Line and 625-Line Television Systems Operating at the 4:2:2 Level of Recommendation ITU-R BT.601

ITU-R BT.1358 Studio Parameters of 625 and 525 Line Progressive Scan Television Systems

4 4 x 3 Image Area Calculation

The extracted 4 x 3 image area is the same height and has the same center as the image area defined by the applicable specification document of the incoming 16 x 9 image from which the extraction is taken. The image structure and interface standards in section 3 are those standards for which the provisions of this document apply; however this document's applicability may also extend to other image structure and interface standards not listed.

The following formulas shall be used to calculate the width of the 4 x 3 image area for an image area of any size and 16 x 9 aspect ratio.

4.1 Variables Used in Paragraph 4.2 - 4.4 Formulas

H = 16 x 9 Image area horizontal size (pixels)

H_{75} = 4 x 3 image area width (pixels)

P_H = Pixels from 16 x 9 image area edges to side of 4 x 3 area boundaries (horizontal)

4.2 4 x 3 Width (Pixels)

H_{75} = (H x 75%)

The values of H_{75} should be rounded down to the next lesser whole number.

4.3 Number of Pixels between 16 x 9 Image Area Edges and 4 x 3 Area Boundaries

$P_H = (H – H_{75}) \div 2$

The values of the 4 x 3 image area pixel numbers should be rounded up to the next greater whole number on the left side and down to the next lesser whole number on the right side.

4.4 4 x 3 Area Boundaries

Left side boundary

Pixel column number = $(P_H – 1)$

Right side boundary

Pixel column number = $(H – 1 – P_H)$

Annex A (Informative)
Bibliography

ITU-R BT.1379, Safe Areas of Wide-Screen 16:9 and Standard 4:3 Aspect Ratio Productions to Achieve a Common Production Format during a Transition Period to Wide-Screen 16:9 Production and Broadcasting

This reference information describes safe area and safe title apertures of 14:9 aspect ratio that can be used during acquisition and production of 16:9 aspect ratio program material to provide an optimal display of program essence on both 16:9 and 4:3 aspect ratio television receivers.

Note: ITU-R Rec. BT.1379 refers only to SDTV operation.