CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding

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SOURCE: Australia

TITLE: Flexible Spatial Resolutions

PURPOSE: Proposal

Abstract

In this document the implications of a range of flexible picture formats are discussed. Flexible spatial resolutions[1], which lie within some maximum resolution limits, allow the coding system to be used in a wider range of applications and *do not significantly impact on codec complexity.*

1. Introduction

The Experts Group is developing a video coding system for B-ISDN which should be useful in a wide range of applications. A large number of potential applications have already been identified [AVC-109] and it is recognised that others will emerge in the future. In a codec intended for a range of applications, flexibility in certain picture format parameters is essential. Introducing limited flexibility does not have a significant impact on codec complexity.

2. Spatial Resolutions

In previous documents Australia has indicated that it supports the concept of flexible spatial resolutions for coding. This capability is essential for dealing with a range of applications. A set of maximum resolutions should be defined for each service class[2]. These resolutions represent the capabilities of the *decoder*. Coders can then use any resolution, from an appropriately defined subset, within this maximum. The resolution which is used by the coder should be signalled to the decoder in the bit-stream. Figure AVC-219/1 illustrates the concept.

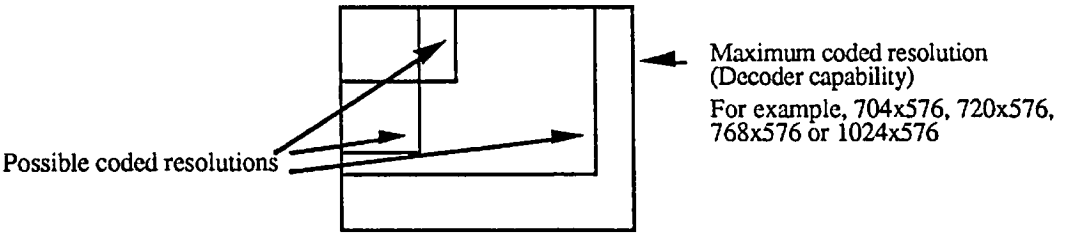

Figure AVC-219/1. Illustration of the flexible coder formats proposal.

This capability has the following advantages over the fixed resolution option:

- It provides a greater flexibility to trade resolution for bit-rate.
- The resulting system will be suitable for a wider range of applications.
- The system will not require format conversion to code source material which does not fit precise sizes (e.g. different aspect ratios), hence reducing delay and complexity.

We note that the Experts Group have raised a number of questions regarding the disadvantages of introducing flexibility. These focus on the possible additional complexity and delay which will be introduced in the decoder and/or Multi-point Control Unit (MCU). Australia emphasises that:

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[1]In this document spatial resolution is used to mean the number of horizontal and vertical pixels.

[2]The service classes which are currently being considered are defined in AVC-106R, Annex 3.

- Providing decoders with the ability to decode at some resolution less than their maximum resolution capability will not increase complexity. Note that the MPEG 1 algorithm has this feature.
- Additional complexity and delay in the decoder or MCU is only incurred if the sequence is converted from the coded format to some other format (e.g. SCIF) by interpolation. This interpolation is unnecessary since the picture will most commonly be displayed within a window on the terminal. Interpolation may be included as an option in some terminals for re-scaling pictures.

In addition to these points, the question of suitable maxima and suitable subsets for the flexible spatial resolution option has been raised. Australia makes the following points:

- The maximum resolution chosen in the 601 class depends on whether wide-screen TV is included and on the choice of a pixel shape. The following maximum resolutions are suitable for a square pixel format which retains the maximum number of lines in CCIR Rec. 601:

  768x576 (4:3 aspect ratio)

  1024x576 (16:9 aspect ratio)

- The chrominance/luminance sampling patterns proposed for SCIF imply that it will be straight-forward to code/decode sequences with resolutions less than the maximum having dimensions which are multiples of 16.

3. Conclusion

Australia proposes the concept of flexible spatial resolutions. This capability is essential if the coding system developed is to be suitable for a wide range of applications. It has been argued that providing flexible spatial resolutions *need not increase the complexity of codecs or MCUs significantly.*