Extensions to Temporal Motion-constrained tile sets SEI message

JCTVC-P0051

S.Hattori, O.Nakagami, T.Suzuki

Introduction

- Background
  - The idea was proposed in Vienna (JCTVC-N0117) and Geneva (JCTVC-O0063).
  - The functionality of indicating the level information for each motion-constrained tile set was agreed to be useful.
  - This contribution further clarifies the specification text on the definitions of bitrate level constraints for motion-constrained tile sets.
  - Notes from Vienna: *"It was generally agreed that such functionality would be useful. Additional semantic text would be required to more fully describe how to apply a level calculation to a tile rather than a coded picture. Further study encouraged to better define what a level indicator means for a tile."*
  - Notes from Geneva: *"Further study, especially regarding how to express the bitrate level constraint on the tile set."*
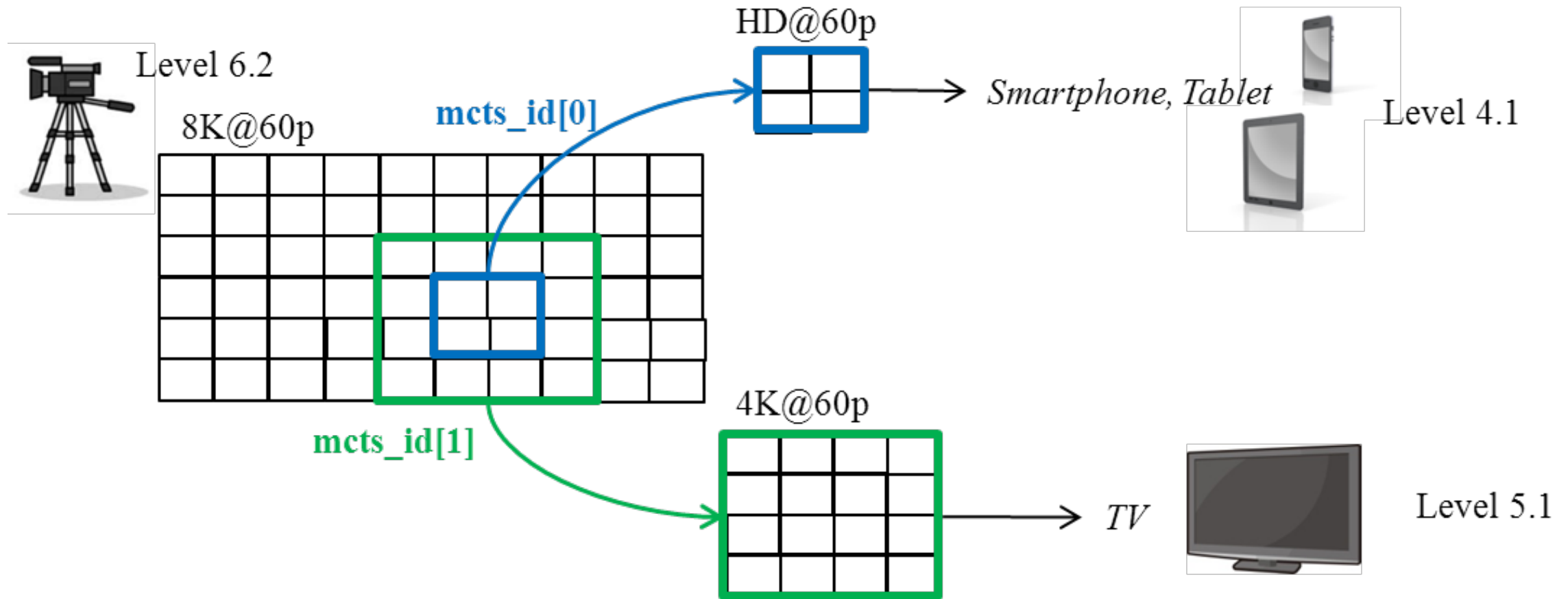
- Proposal
  - This contribution proposes an extension to a temporal motion-constrained tile sets SEI message to indicate the level information for a decoder to decode each defined motion-constrained tile set.

- Motivation
  - To utilize HEVC tile structures for Tiled Streaming application
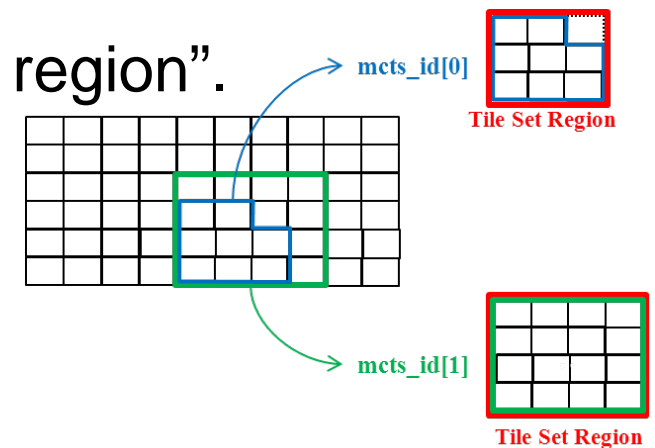
Tiled Streaming Application

Proposal

Problem statement

Current HEVC specification defines level constraints in **picture based** concept, hence the current level constraints cannot directly apply to motion-constrained tile set – since tile set is **partial region in a picture**.

Proposal

This contribution proposes to define a new concept of partial region in a picture for motion-constrained tile set as ***"tile set region"***.

And apply a "picture based" level constraints to a "tile set region".

mcts_id[0]

Tile Set Region

mcts_id[1]

Tile Set Region

Picture based Level constraints

Picture based level constraints defines following four main elements:

①**Picture size**

The picture based level constraints for the size of picture with *PicSizeInSamplesY*.

②**Number of tile columns and rows**

The picture based level constraints for number columns and rows with *MaxTileCols* and *MaxTileRows*.

③**Bitrates**

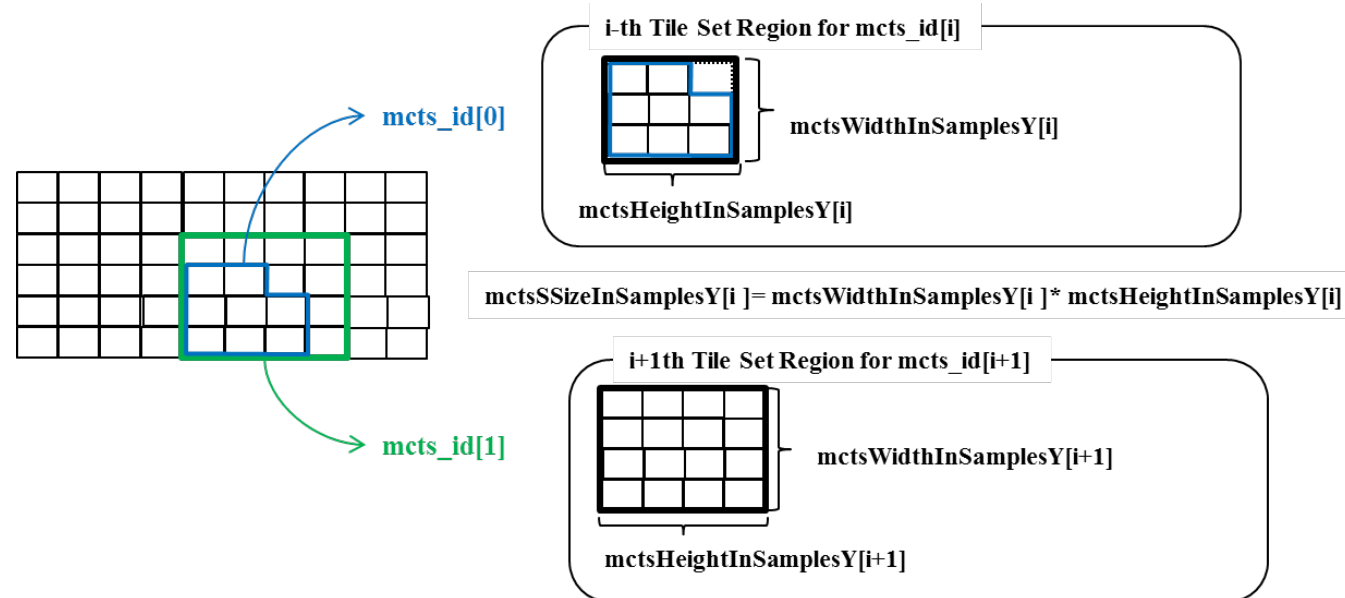The picture based level constraints for bitrate with *MaxSliceSegments*, *MaxLumaSr* and *MaxBR*.

④**Minimum Compression Ratio**

The picture based level constraints for bitrate with *MinCr*.

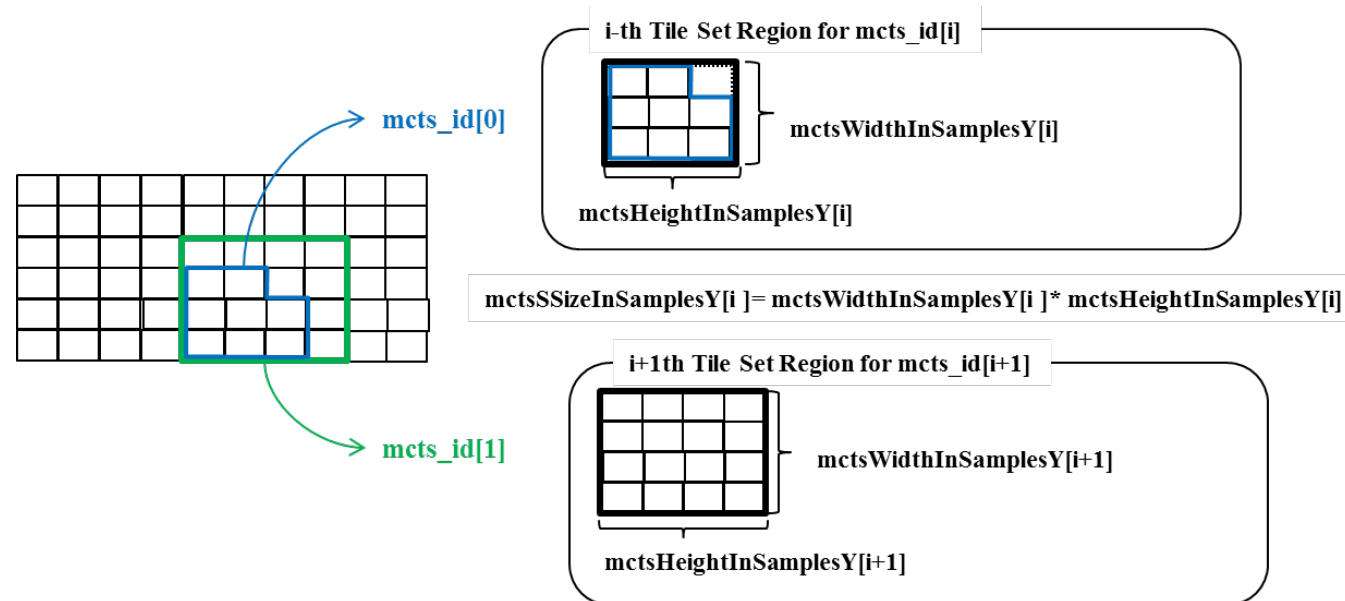# Tile set region based Level constraints

① Picture size

- The picture based level constraints for the size of picture with PicSizeInSamplesY.
- The contribution proposes to define variables for these constraints in tile set based region as follows:
  - mctsSizeInSamplesY[i] derived as follows:
    - mctsSizeInSamplesY[i] = mctsWidthInSamplesY[i] * mctsHeightInSamplesY[i]
  - mctsWidthInSamplesY[i] is equal to the width of the i-th tile set region, corresponding to the i-th motion constrained tile set in units of luma samples.
  - mctsHeightInSamplesY[i] is equal to the height of the i-th tile set region, corresponding to the i-th motion constrained tile set in units of luma samples.

mcts_id[0]

i-th Tile Set Region for mcts_id[i]

mctsWidthInSamplesY[i]

mctsHeightInSamplesY[i]

mctsSSizeInSamplesY[i]= mctsWidthInSamplesY[i]* mctsHeightInSamplesY[i]

i+1th Tile Set Region for mcts_id[i+1]

mctsWidthInSamplesY[i+1]

mcts_id[1]

mctsHeightInSamplesY[i+1]

Tile set region based Level constraints

② **Number of tile columns and rows**

- The picture based level constraints for number columns and rows with MaxTileCols and MaxTileRows.
- The contribution proposes to define variables for these constraints in tile set based region as follows:
  - NumTileColumnsInMCTS[i] is equal to the number of tile columns in the i-th tile set region, corresponding to the i-th motion constrained tile set.
  - NumTileRowsInMCTS[i] is equal to the number of tile rows in the i-th tile set region, corresponding to the i-th motion constrained tile set.

mcts_id[0]

mcts_id[1]

i-th Tile Set Region for mcts_id[i]

mctsWidthInSamplesY[i]

mctsHeightInSamplesY[i]

mctsSSizeInSamplesY[i]= mctsWidthInSamplesY[i]* mctsHeightInSamplesY[i]

i+1th Tile Set Region for mcts_id[i+1]

mctsWidthInSamplesY[i+1]

mctsHeightInSamplesY[i+1]

Tile set region based Level constraints

③ **Bitrate**

- The picture based level constraints for bitrate with MaxSliceSegments, MaxLumaSr and MaxBR.
- The contribution proposes to define variables for these constraints in tile set based region as follows:
  - mctsMaxSliceSegments[i] is equal to the number of slice segments in the i-th motion constrained tile set.
  - mctsMaxLumaSr[i] is equal to the number of samples per second in the i-th motion constrained tile set.
  - mctsMaxBR[i] is equal to the number of bits per second in the i-th motion constrained tile set.

④ **Minimum Compression Ratio**

- The picture based level constraints for bitrate with MinCr.
- The contribution proposes to define variables for this constraint in tile set based region as follows:
- mctsMinCr[i] is equal to the minimum compression ratio of the i-th motion constrained tile set.

Tile set region based Level constraints

- A tile set region based level is constrained as specified in Annex A with the following additions.
    - The variable PicSizeInSamplesY is replaced with the variable mctsSizeInSamplesY[i].
    - The variable MaxTileCols is replaced with the variable NumTileColumnsInMCTS[i].
    - The variable MaxTileRows is replaced with the variable NumTileRowsInMCTS[i].
    - The variable MaxSliceSegmentsPerPicture is replaced with the variable mctsMaxSliceSegments[i].
    - The variable MaxLumaSr is replaced with the variable mctsMaxLumaSr[i].
    - The variable MaxBR is replaced with the variable mctsMaxBR[i].
    - The variable MinCr is replaced with the variable mctsMinCr[i].

SONY