

› POLYPHASE SUBSAMPLED SIGNAL FOR SPATIAL SCALABILITY

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TNO innovation
for life

ON SCALABILITY

- › Scalability was a question mark for next generation coding standard.
- › Experts expressed their support for some sort of scalability

“Scalability should be investigated and if possible incorporated from the ground up - i.e. at nominal additional cost in terms of complexity - to achieve device ubiquity.”

w35771 - Netflix on Future Video Coding, February 2015

“There seems to be at least one way (as outlined on the previous slide) that does not require the allegedly onerous aspects of spatial scalability”

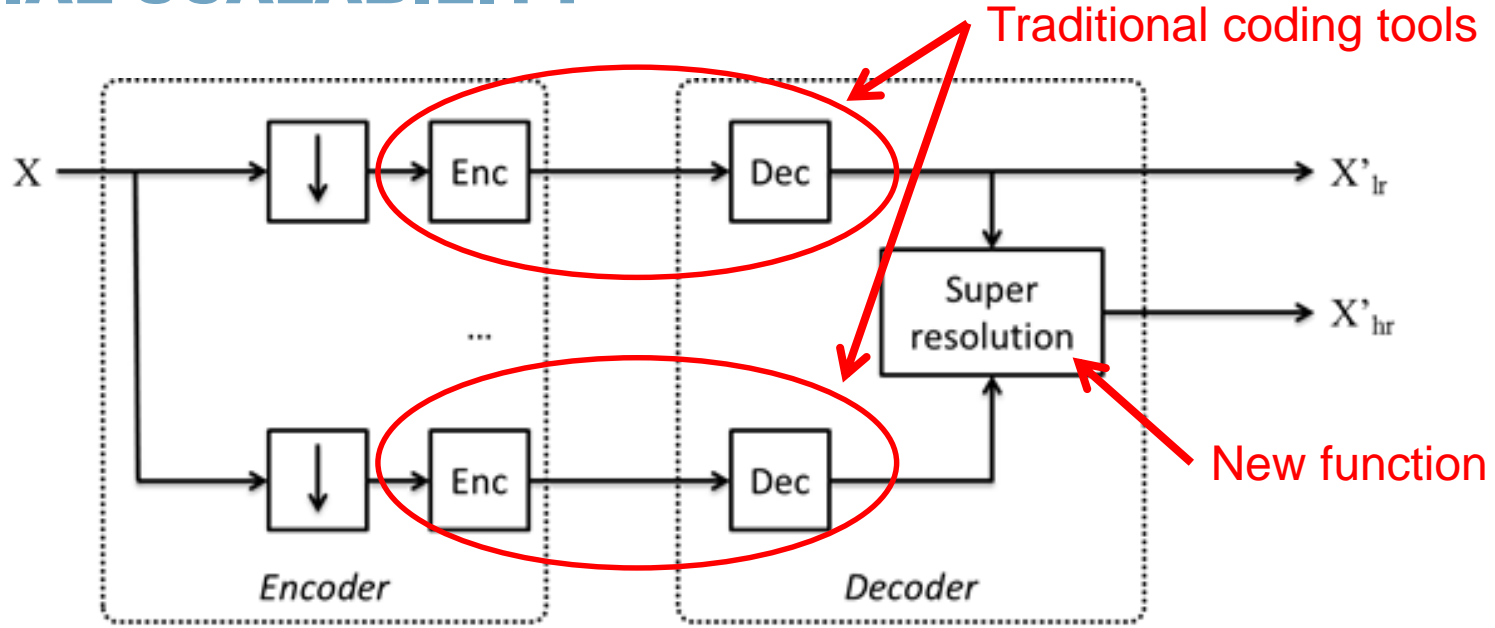
N15902 - The case for scalability support in version 1 of Future Video Coding, Stephan Wenger, November 2015

• There may be others, let's be inventive :-)

MAKING SPATIAL SCALABILITY MORE SIMPLE

- › What operational service would need n enhancement layers ?
 - › More probably 2, maybe 3 ...
- › Should any resolution be supported while a very limited set are actually used in practice ?
 - › Full HD, 4K. Maybe another one ?
- › Hardware implementation
 - › How to reuse as much implementation blocks as possible from non-scalable bitstream decoding ?

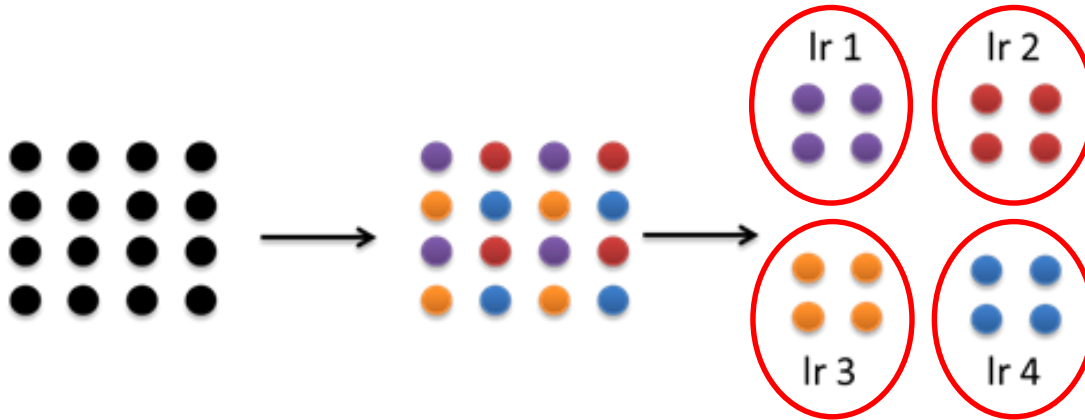
A SUPER-RESOLUTION BASED SCHEME FOR SPATIAL SCALABILITY



EXAMPLE PRACTICAL IMPLEMENTATION

1. Polyphase decomposition of the input signal

4 resolution components

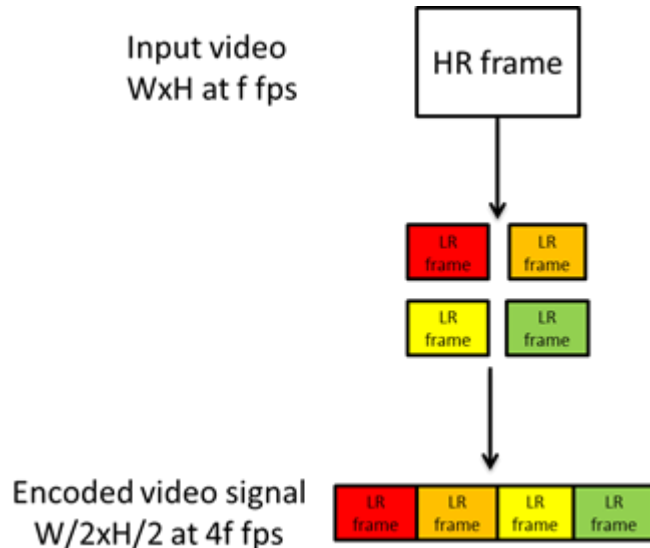


Note : This is a reversible operation

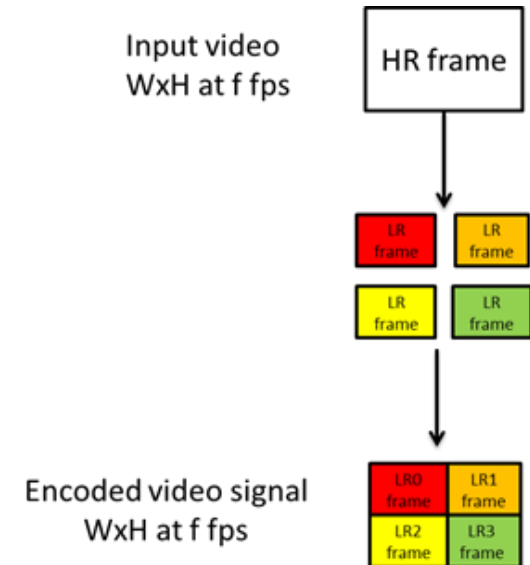
EXAMPLE PRACTICAL IMPLEMENTATION

2. Prediction between resolution components

Temporal multiplexing



Spatial multiplexing



EXAMPLE PRACTICAL IMPLEMENTATION

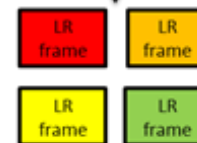
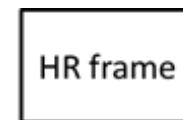
3. Coding one resolution component independently

The red samples are :

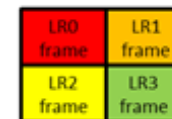
- Independently decodable
- Proper for being displayed

Spatial multiplexing

Input video
 $W \times H$ at f fps



Encoded video signal
 $W \times H$ at f fps



DISCUSSION

- › The main technical aspects of this technique are:
 - › Parallel decoding of resolution components possible (e.g. reusing HEVC tiles concept)
 - › No upscaling operations is performed (e.g. between enhancement and/or base layers)
 - › The “base and enhancement layers” are regular video bitstream, reuse of existing coding tools. Maybe slight adaptations needed.

DISCUSSION

- › This technique requires further study including aspects on:
 - › Impact of polyphase decomposition on visual quality
 - › Number of resolution components
 - › Inter prediction performance between resolution components

PROPOSAL

- › We suggest that :
 - › the described technique is further investigated within the exploration or possibly within a Core Experiment in an appropriate group