UNIVERSITY OF THE WEST of SCOTLAND

UWS

QUALITY EVALUATION OF DIFFERENT CODING STANDARDS FOR FULL HD AND ULTRA HD VIDEOS

Naeem Ramzan

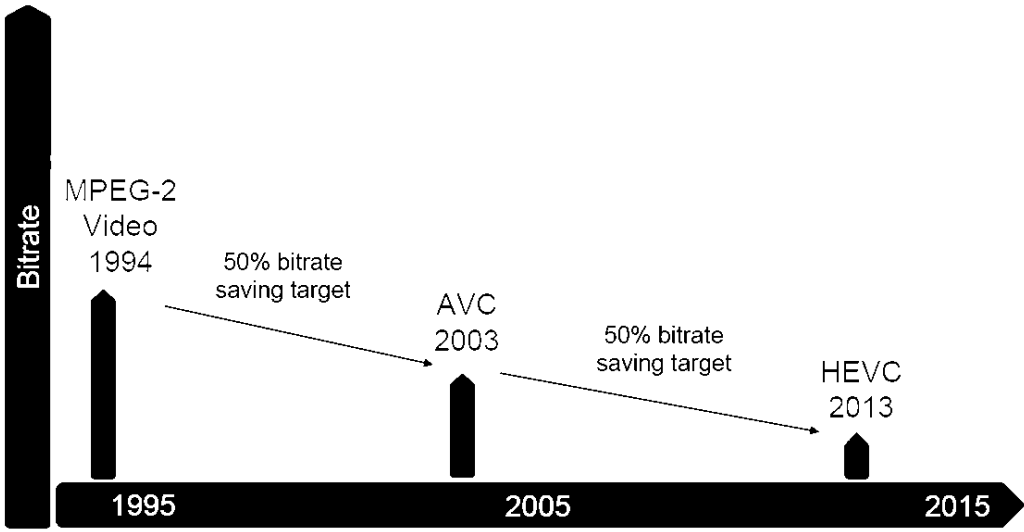
Reference: Naeem Ramzan, Zeeshan Pervez, Abbes Amira, “Quality of Experience Evaluation of H.265/MPEG-HEVC And VP9 Compression Efficiency”, in the proc. of **26th IEEE ICM**, Doha, Qatar, Dec. 2014.

Outline

- Motivation
- Codecs and configurations
- Dataset
- Test
  - Methodology
  - Session
  - Environment
- Results
- Conclusions

Codecs

- JCT-VC (MPEG and ITU)
- H.264/MPEG4 (AVC)
- H.265/MPEGH (HEVC)
- WebM data format
  - VP8
  - VP9



- **Comparison of three latest video encoders subjectively and objectively**

Encoding

- Standard codecs
  - JM 18.6 (AVC)
  - HM 16.0 (HEVC)
- Configurations
  - Random access
  - GOP size 8
  - Intra period 1sec.

Configuration\Codec	AVC	HEVC
Encoder	JM 18.6	HM16.0
Profile	High	Main
Reference Frames	4	4
R/D Optimization	Enabled	Enabled
Motion Estimation	EPZS	TZ search
Search Range	128	64
GOP	8	8
Hierarchal Encoding	Enabled	Enabled
Temporal Levels	4	4
Intra Coding	1 sec	1 sec
Deblocking Filter	Enabled	Enabled
Coding Unit Size/Depth	-	64/4
Transform Unit Size (Min/Max)	-	4/32
8x8 Transform	Enabled	-
Internal Bit Depth	8	8
Rate Control	Disabled	Disabled

- VP9
  - IntraPeriod2 1sec.

```
--good --cpu-used=0 –threads=0 –profile=0
--aq-mode=0
--fps=< FrameRate >
--end-usage=3 --cq-level=< QP >
--kf-max-dist=< IntraPeriod > --kf-min-dist=< IntraPeriod
>
--minsection-pct=0 --maxsection-pct=2000
--auto-alt-ref=1
--arnr-maxframes=7 --arnr-strength=5
--codec=vp9 -v -t 0 -w < Width > -h < Height > -p 2
```

Dataset

- HD (1920x1080)

SVT15

UnderBoat1

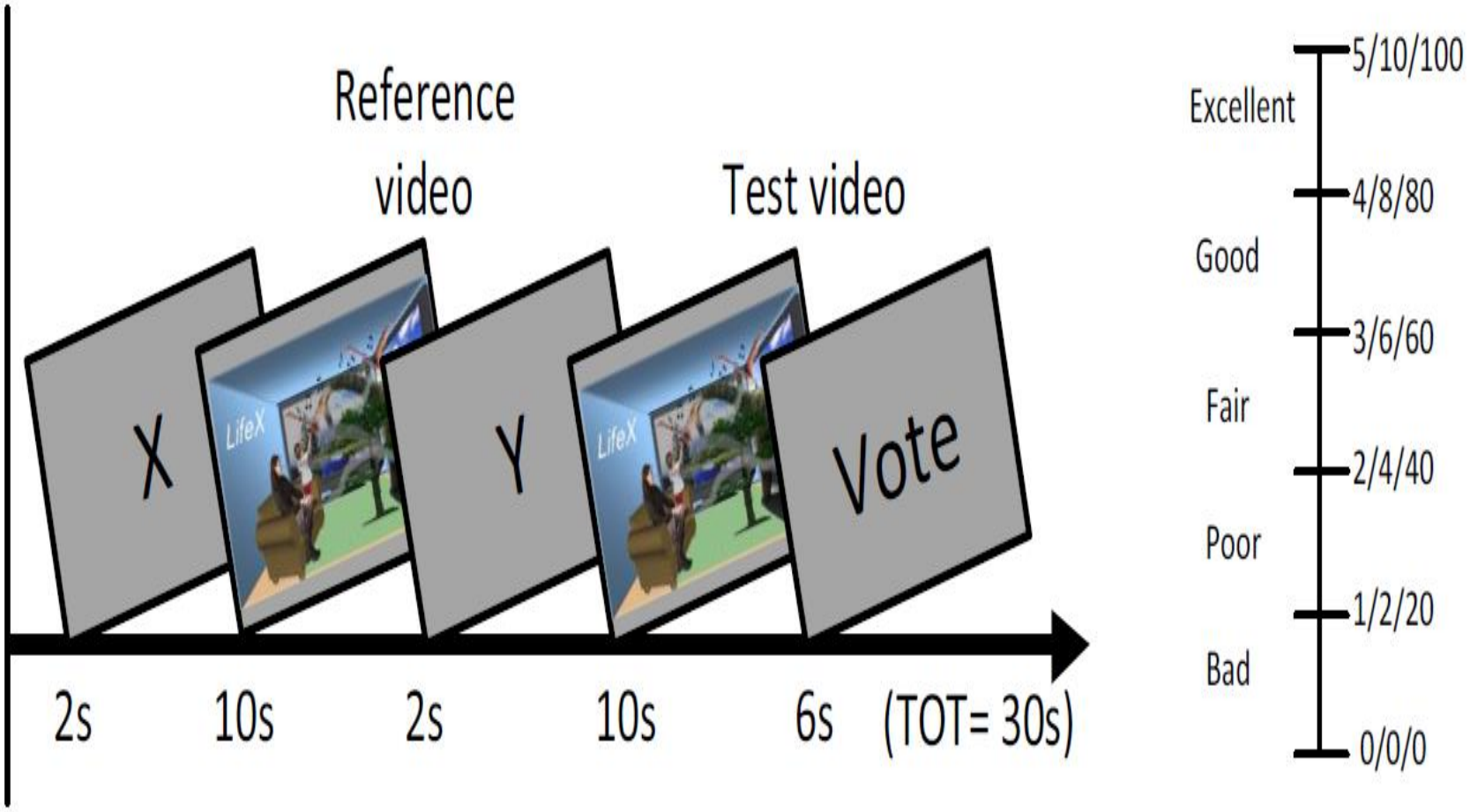
- UHD (3840x2160)

Traffic Flow

Tree Shade

Test - Methodology

- Double Stimulus Impairment Scale (DSIS)



Test - Session

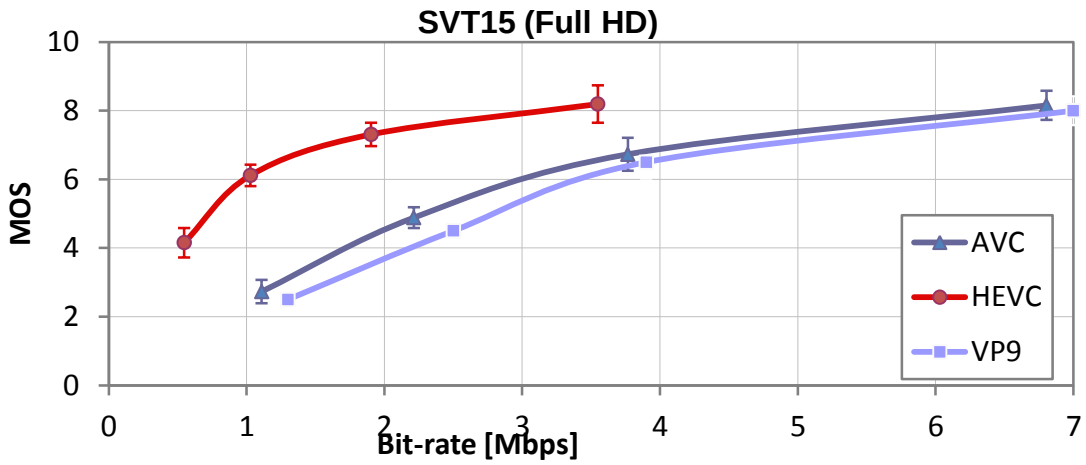
- ITU BT.500
  - One test session should not last more than 30 minutes
  - Alternate as many content as possible
- 10s sequences – requires a lot of attention for evaluation
  - Test sessions (4 sequences * 4 bitrates * 3 codecs)
  - Each session followed by resting phase
- Further details
  - Randomization to effect possible effect of content presentation order
  - Never the same content in same presentation order
  - Dummy sequences
  - Reference vs. reference

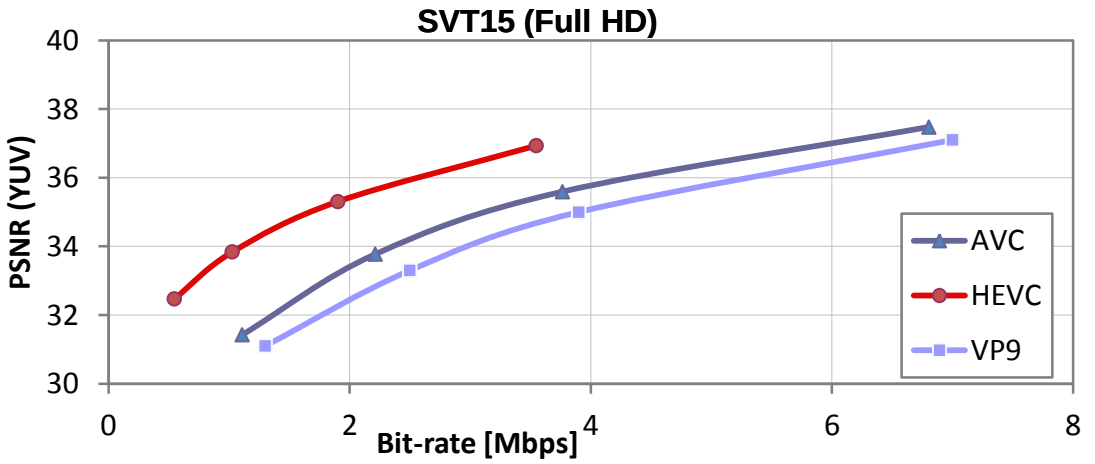
Test - Environment

- PC sever
  - SSD based solution to rad and play ultra HD sequences (~400 MB/sec)
  - Alternate as many content as possible
- 55” Sony 4K TV (consumer grade)
  - Post processing disabled/neutralised
- ITU-R BT.500 complaint environment
  - Mid grey walls
  - No direct light, etc
- Pre-test screening
  - Snellen + Ishiara chart
- Subjects
  - 20 (6F/14M) of average age 27 years

Results – SVT15

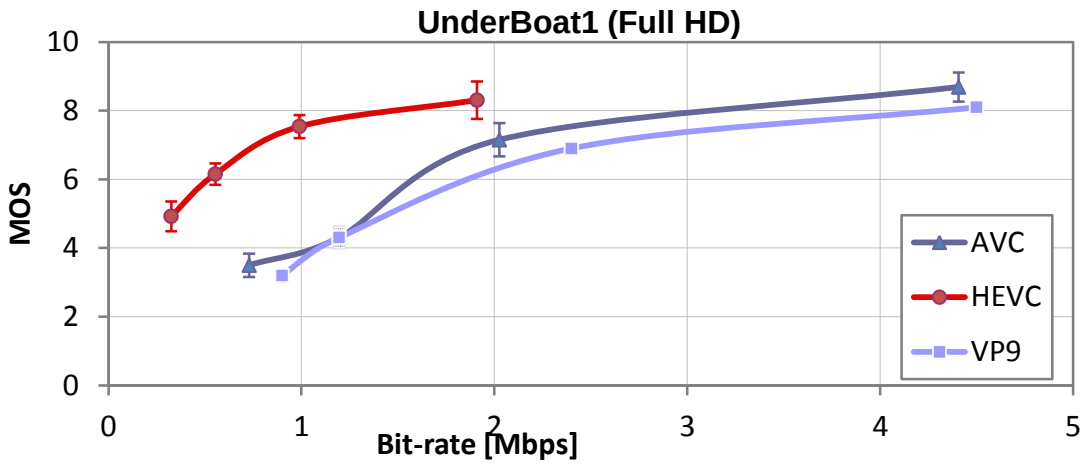
- HEVC vs AVC
- VP9 vs AVC
- HEVC vc VP9

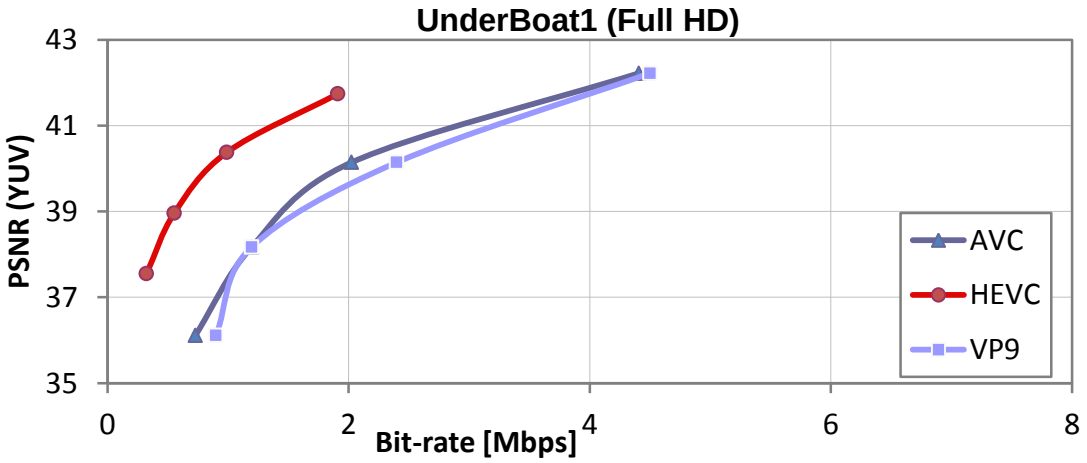




Results – UnderBoat1

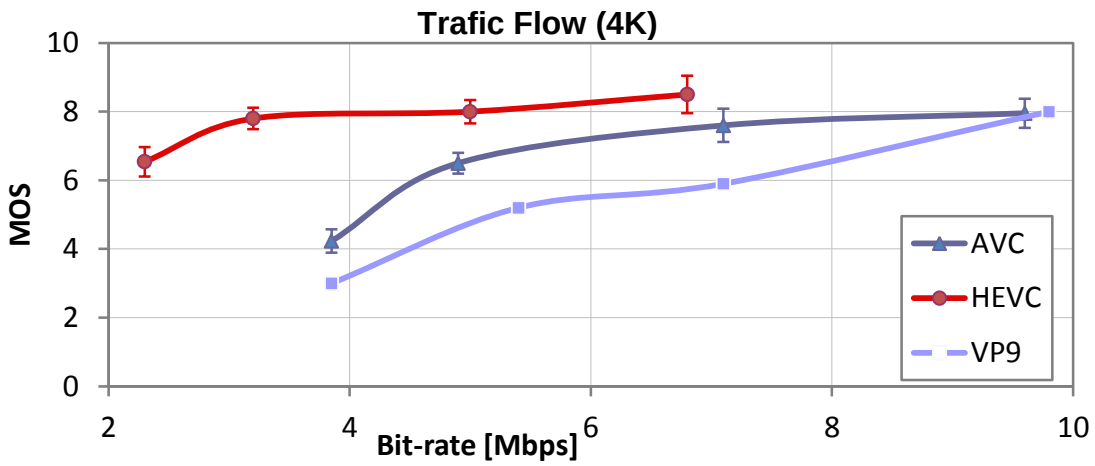
- HEVC vs AVC
- VP9 vs AVC
- HEVC vc VP9

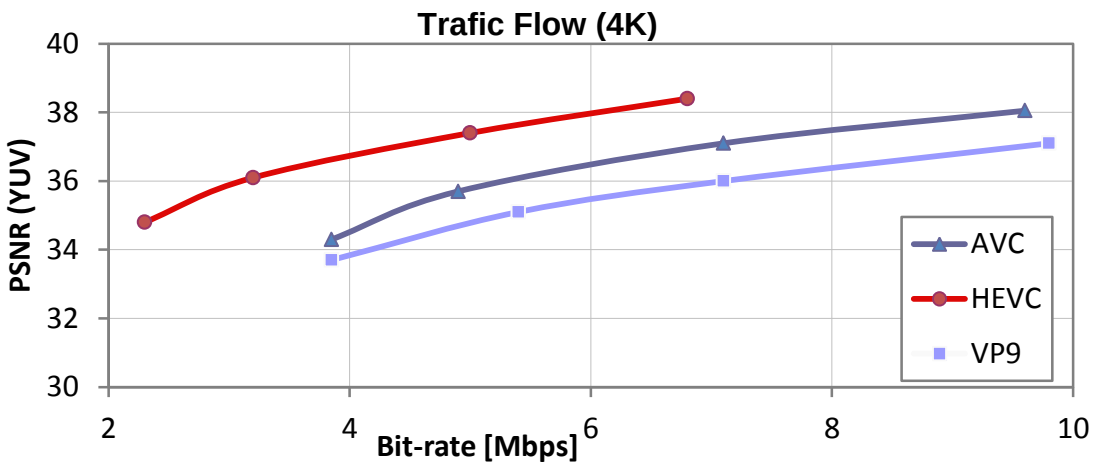




Results – Traffic Flow

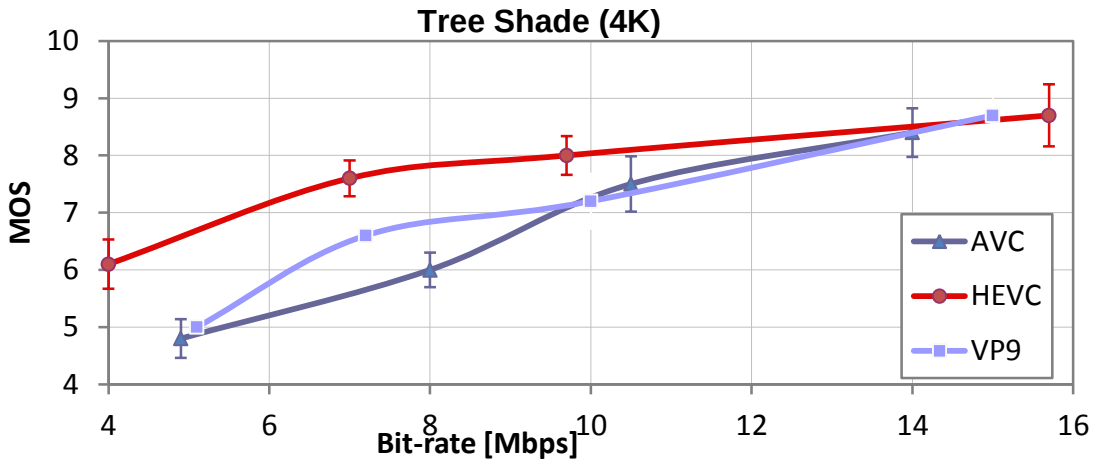
- HEVC vs AVC
- VP9 vs AVC
- HEVC vc VP9

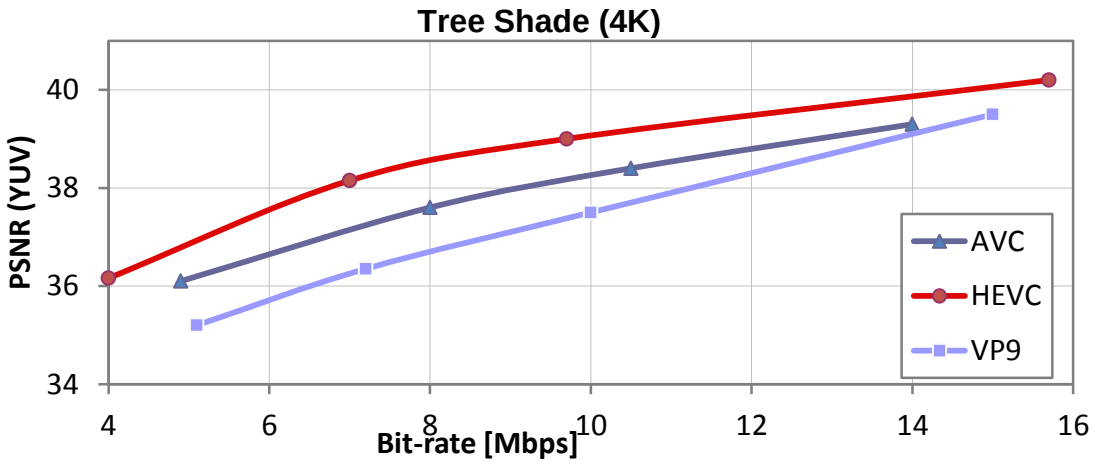




Results – Tree Shade

- HEVC vs AVC
- VP9 vs AVC
- HEVC vc VP9





Conculsions

- Comparison for broadcasting scenario
- Subjective and objective evaluation
- Variability in codecs performance
  - Depending on coding and contents
- AVC and VP9 have comparable performance
- HEVC and VP9 performance comparison
  - HEVC outperforms VP9 for low to high bitrates

- Future directions
  - Verify the results with more test sequences
  - Comparison of HEVC and AVC in Internet streaming