

# Perceptual Encoder Optimization

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# CODECs

- Video codecs have reached a very high level of sophistication
- We have two mathematically "orthogonal" mainstream approaches:

1. DCT with motion estimation & F/B prediction (*MPEG* family)
2. Wavelet based schemes (*JPEG2000*)

We observe 'similar' quality as function of target bit-rate & frame rate:

# CODECs

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DCT:

Wavelet:

Coding

Transmission




dates

# CODECs

- The currencies for achievable quality are:
  - Encoder usage: 1-pass vs. n-pass
  - Target Bitrate, frame size & frame rate
  - Network behavior (BER, PLR, Latency, Jitter)

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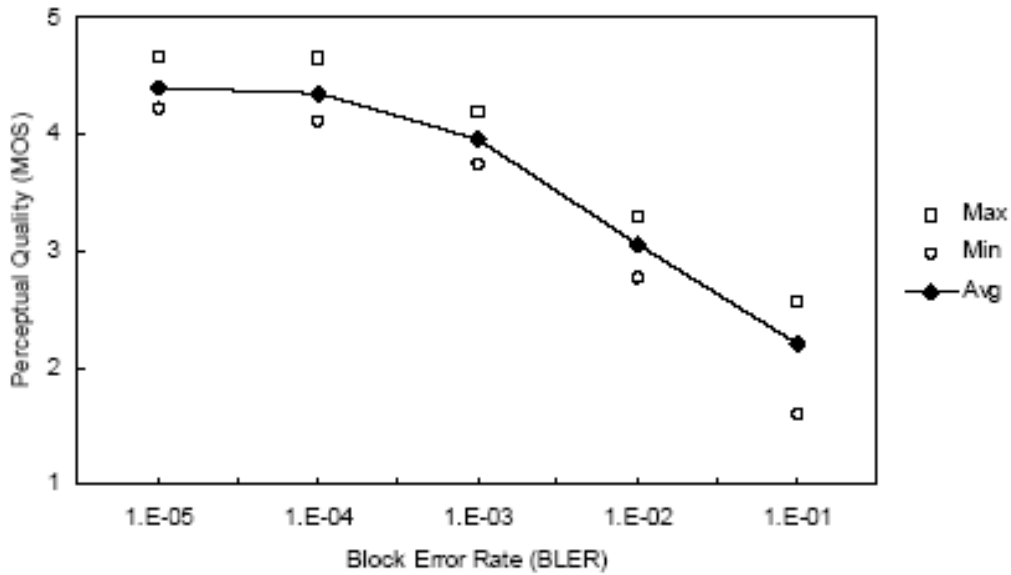
BLER
vs.
Perceived Quality



# CODECs

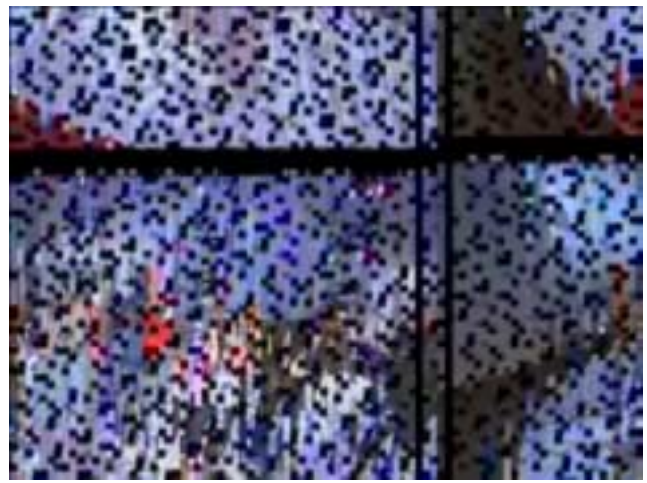
Encoders have many(!) configuration parameters…

➔ HOW TO CHOOSE OPTIMAL SETTINGS?

# CODECs

- CODECs are designed to handle ‘expected’ content well:
  - Sports; Movies; News; Nature; …
- They fail for ‘unexpected’ content:

Tape noise



Tape drop-out

# CODECs

Encoders are optimized for ‘mainstream’ content

➔ HOW TO HANDLE ‘OUTLIERS’?

# The Bottom-Line

- The customer does not care what technology is used

- The customer has expectations which depend on his setting & experience:

  - IPTV / PPV / … ➔ Broadcast TV
  - Mobile / Wireless ➔ Internet streaming
  - Personalized ➔ High tolerance

Does the consumer feel he is getting good value for money?!

# The Bottom-Line

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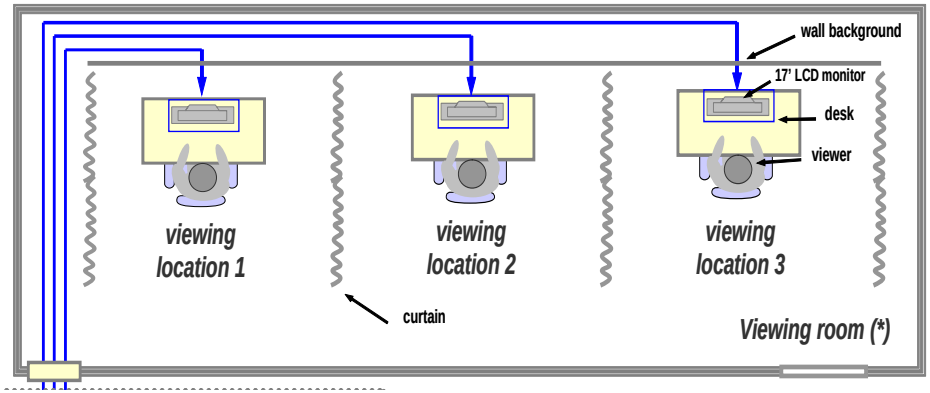
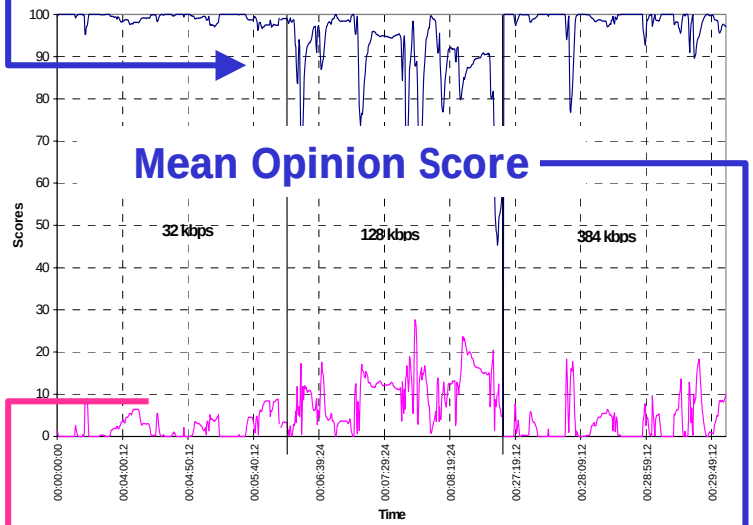
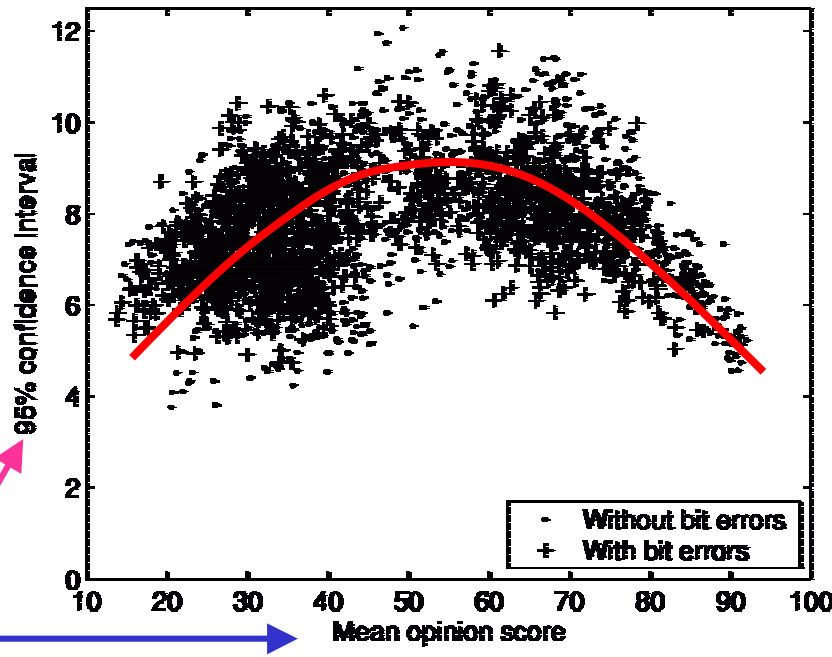
- There is an ‘industry’ which has developed around codec performance assessments (e.g. VQEG):

  - ➔ (Subjective) Test methodologies
  - ➔ Quality algorithms
  - ➔ Statistical procedures
  - ➔ Vested interests

# Subjective testing



# Methodologies

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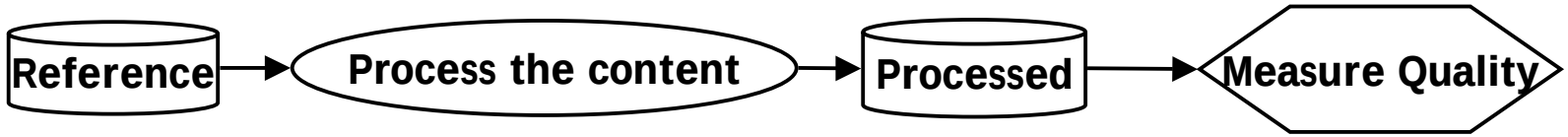
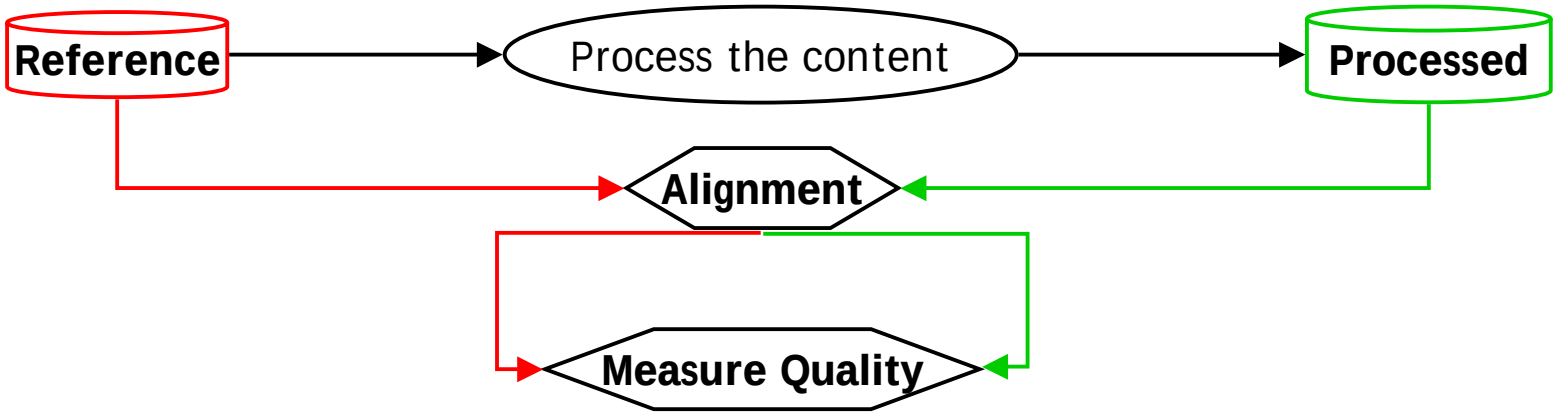
***No Reference: Measure subscriber perceived quality***




***Full Reference: Measure relative degradation***



# Video Quality Metrics

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## No Reference:

- Blur
- Jerkiness
- Blockiness
- Colorfulness

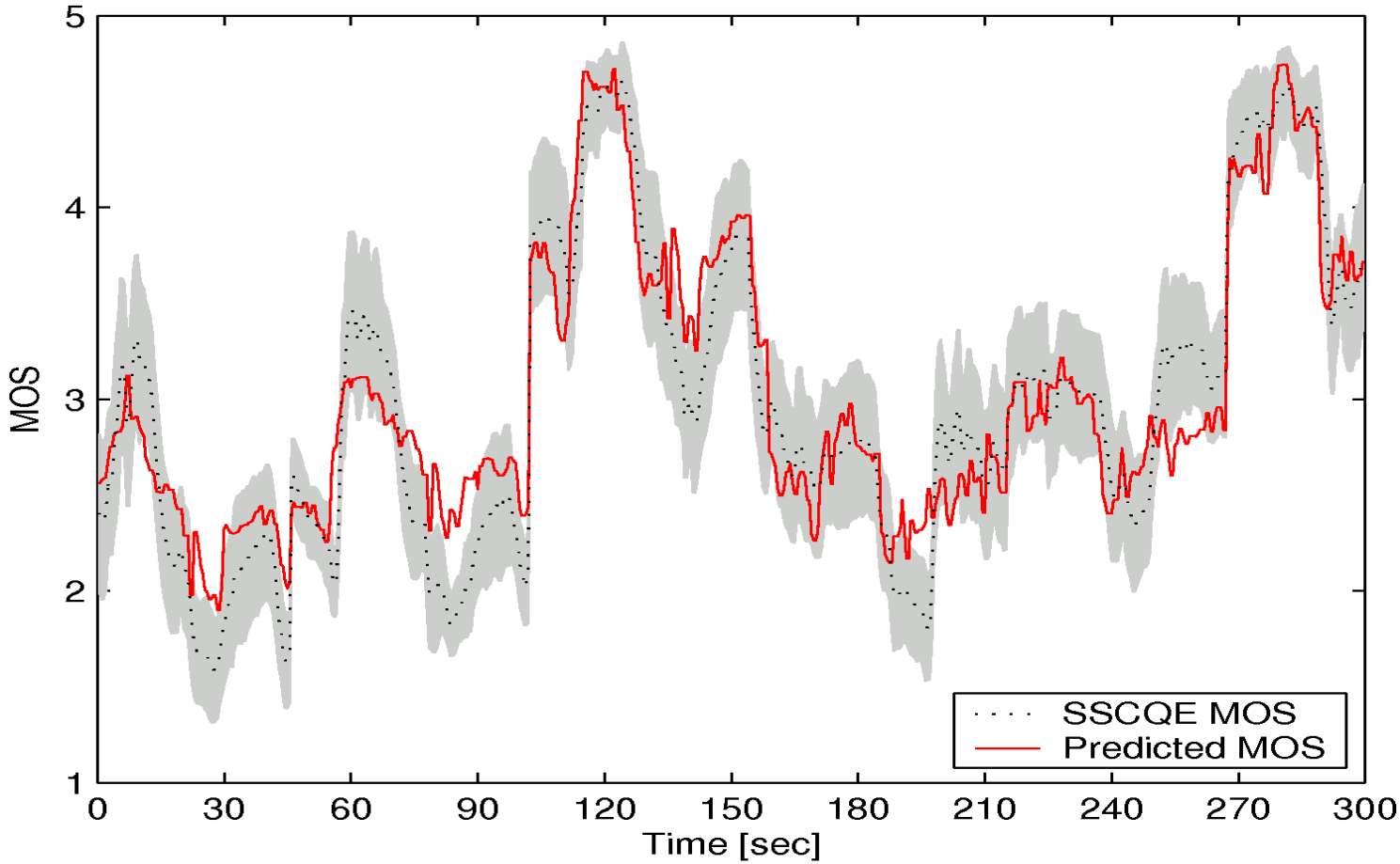
- MOS

## Full Reference:

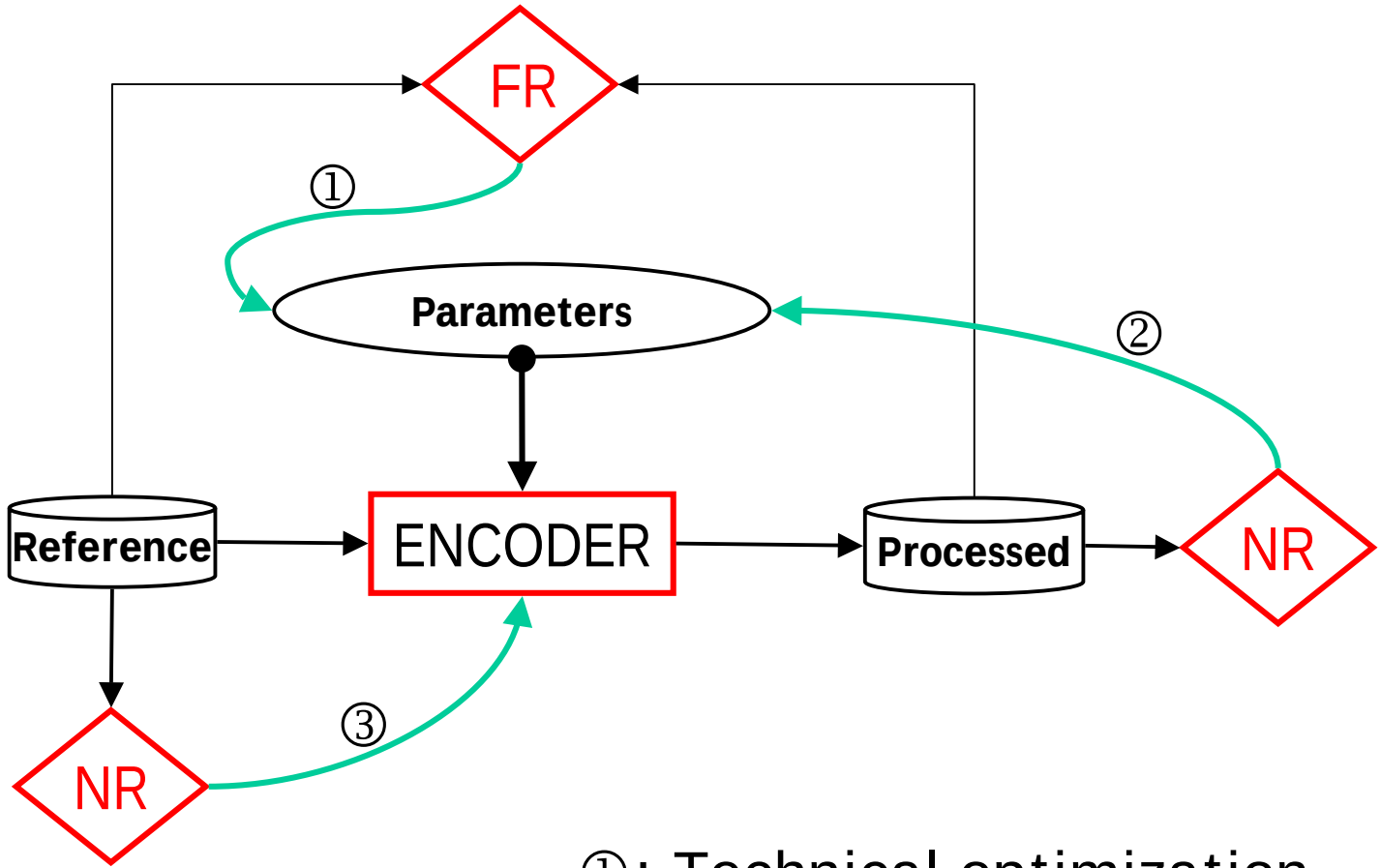
- Blur
- Jerkiness
- Blockiness
- Colorfulness
- Noise
- ANSI metrics
- PSNR

- MOS

# NR-MOS: Predictive Power



# Encoder Optimization




①: Technical optimization
②: Service optimization
③: Content optimization

# There is Really a Difference!

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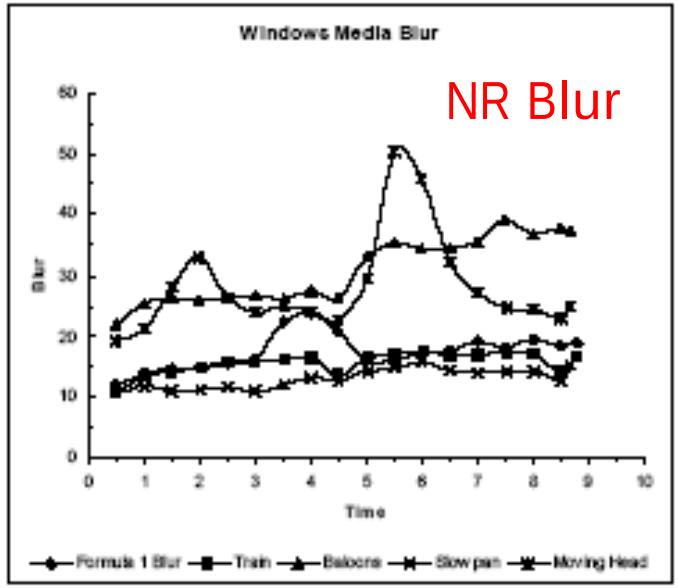
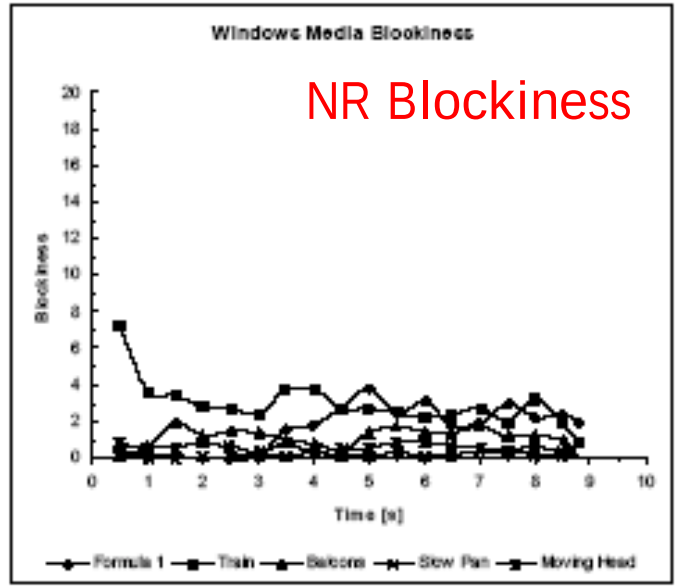
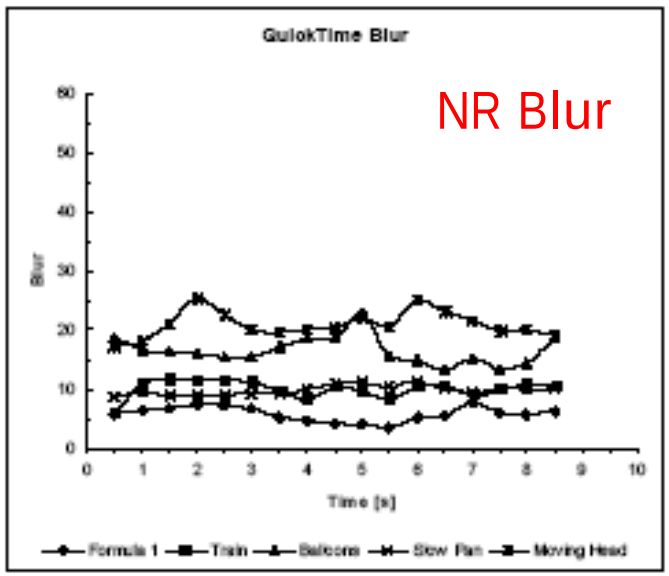
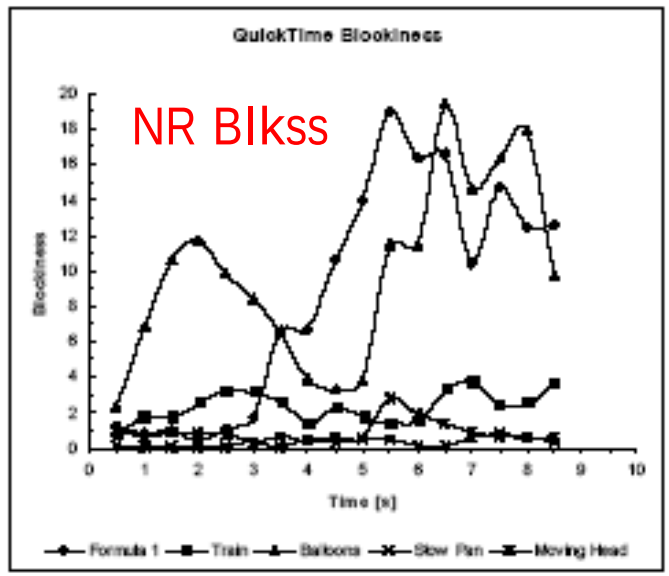
Windows Media




Apple Quicktime



# Conclusions

- ‘Good’ Perceived quality is the key to successful media services
- Encoders are mature and are reaching asymptotic performance limit
- Video content is highly variable
- User expectations are highly variable

- Provide cost-performance optimized services - Need to integrate:
  - Knowledge of content
  - Knowledge of user perception & expectation
  - Knowledge of encoder implementation