



AGH UNIVERSITY OF SCIENCE
AND TECHNOLOGY

Evaluation of Quality Retaining Diagnostic Credibility for Surgery Video Recordings

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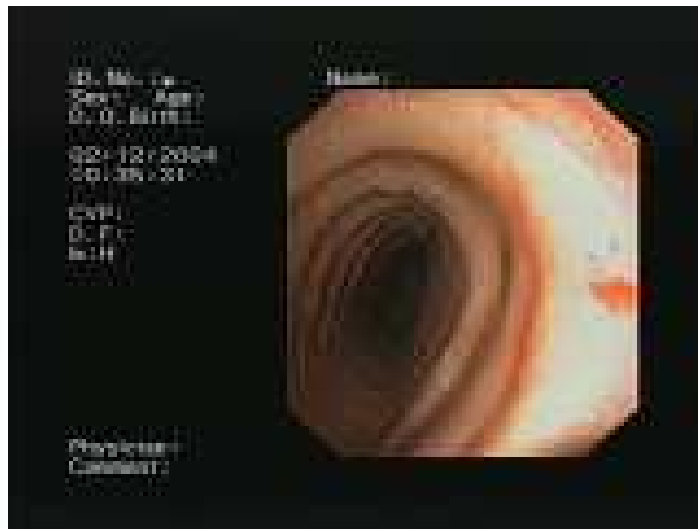


Plan of Presentation

- **Introduction**
- **Subjective and Objective Evaluation of Lossy Codecs**
 1. **Subjective Evaluation of a Reference Codec**
 2. **Objective Evaluation of a Reference Codec**
 3. **Objective Evaluation of Other Codecs**
- **Results of Codec Evaluation**
- **Summary and General Conclusions**

Introduction

- **Significant potential behind platforms allowing to access digital video**
- **Lossy codecs – serious danger of impermissible influence on diagnosis**
- ***“It is possible to use lossy compressed images and video sequences for diagnostic purposes provided the compression has not introduced any quality impairment visible to a panel of physicians”***
- **Targeting video-bronchoscopy**





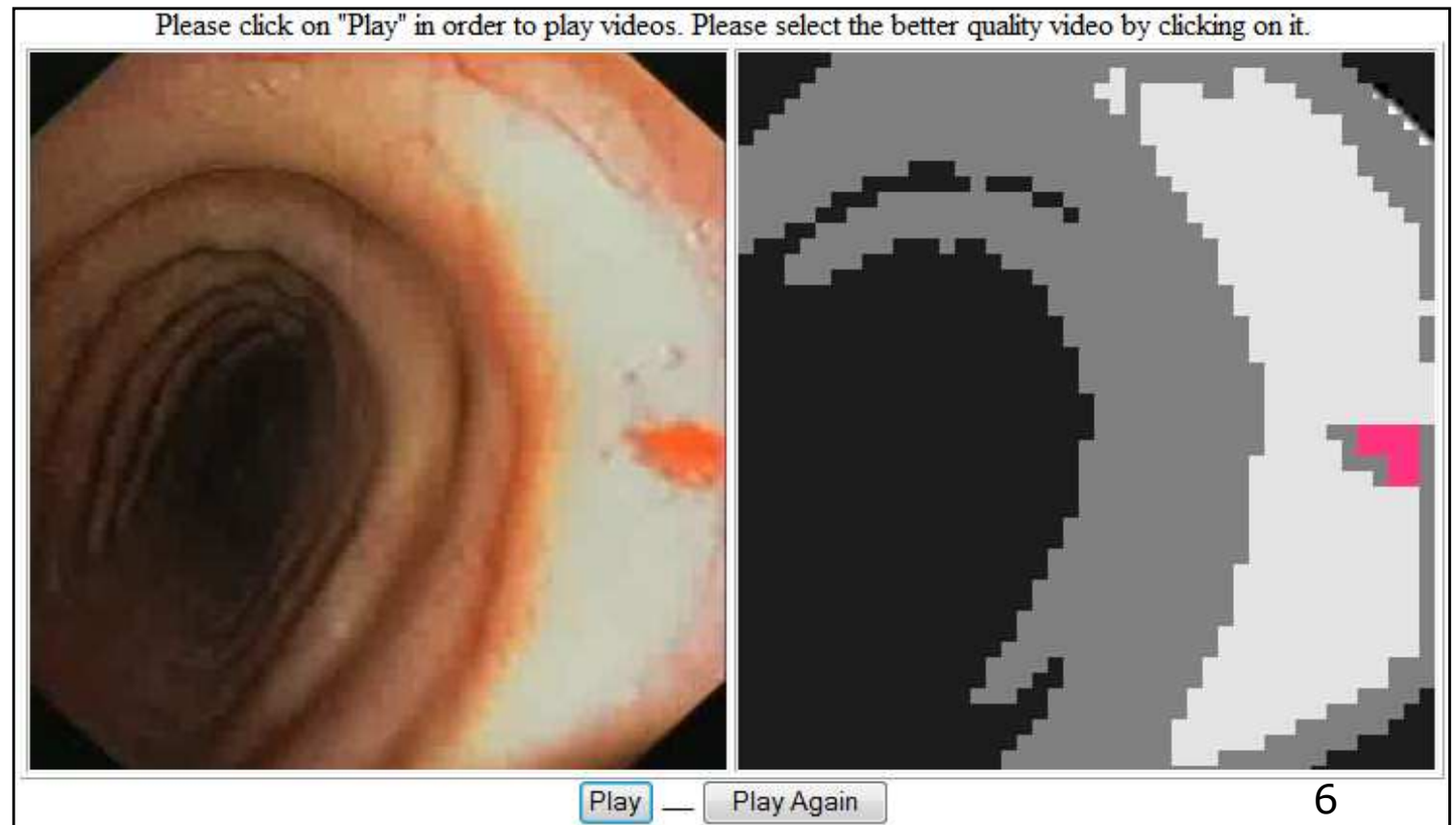
Methodology for Subjective and Objective Evaluation of Lossy Codecs

1. To specify **maximum Compression Ratio** (CR_{max}) still yielding in visually lossless compression for some selected, reference video codec using subjective evaluations supported by physician panel
2. To specify numerically corresponding objective distortion metrics for same video compressed with reference codec at CR_{max}
3. To estimate CR_{max} values for other codecs under consideration at same objective distortion values as for reference codec

Subjective Evaluation of a Reference Codec

- Subjective quality-based, **bubble sorting** towards hierarchy
- Indiscernible videos => diagnostic features
- **3xMPEG-4 Part 2** videos, **8 CRs**, **ASP Profile**
- **Group of physicians**

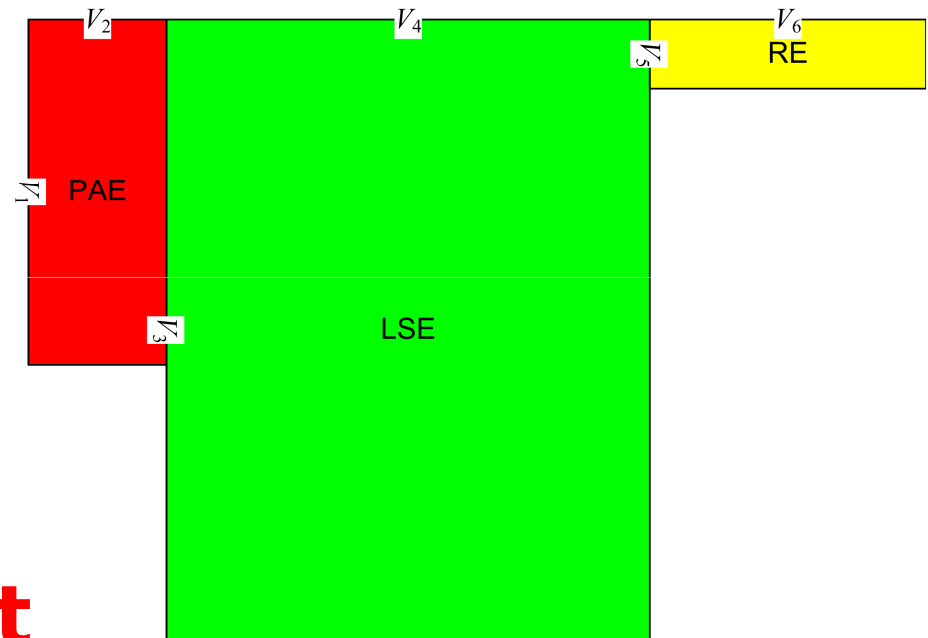
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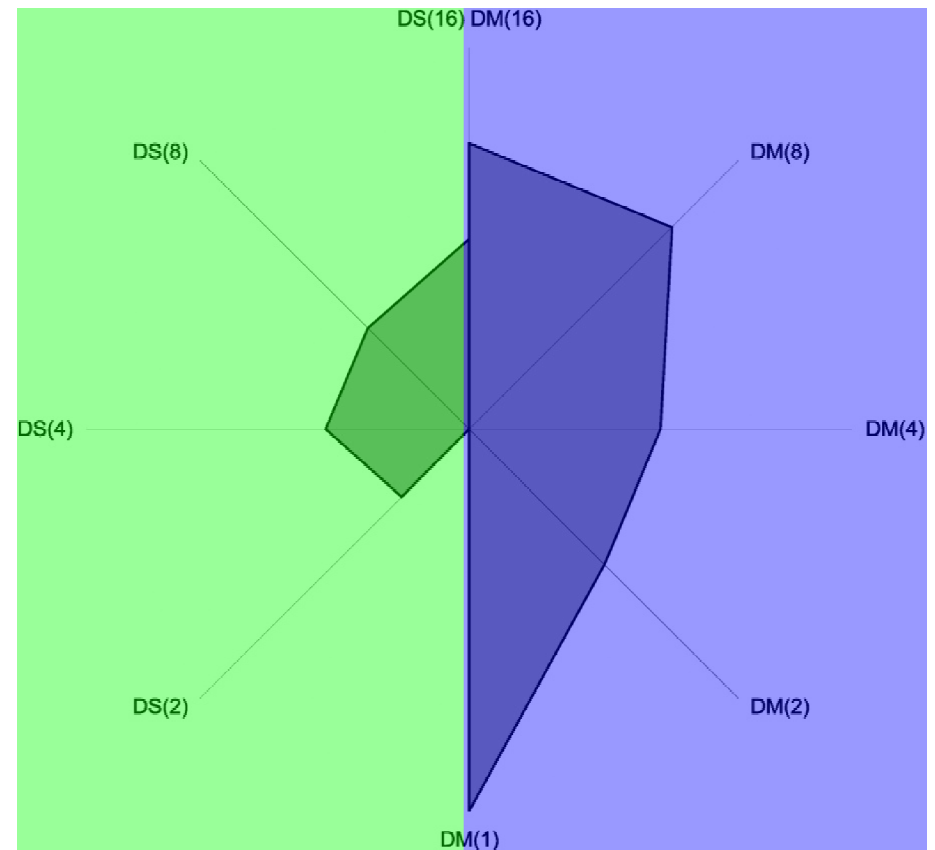
Objective Evaluation of a Reference Codec – Hybrid Vector Measure (HVM)

- Optimized with a subjective tests
- Strong correlation with diagnostic value of medical images previously proved
- Vector of **6 coefficients** measuring various image depreciations
- **3x2** grouping
 - Point Accuracy Errors
 - Local Structured Errors
 - Random Errors
- Σ of areas = **impairment**



Objective Evaluation of a Reference Codec – Hosaka Plots

- **Non-medical metric**
- **Not optimized for medical images**
- **Delivering polygons:**
 - **Fidelity of intensity reconstruction**
 - **Additive noise**
- **In pixel blocks divided into size groups**
- **Area** = measure of **picture impairment**





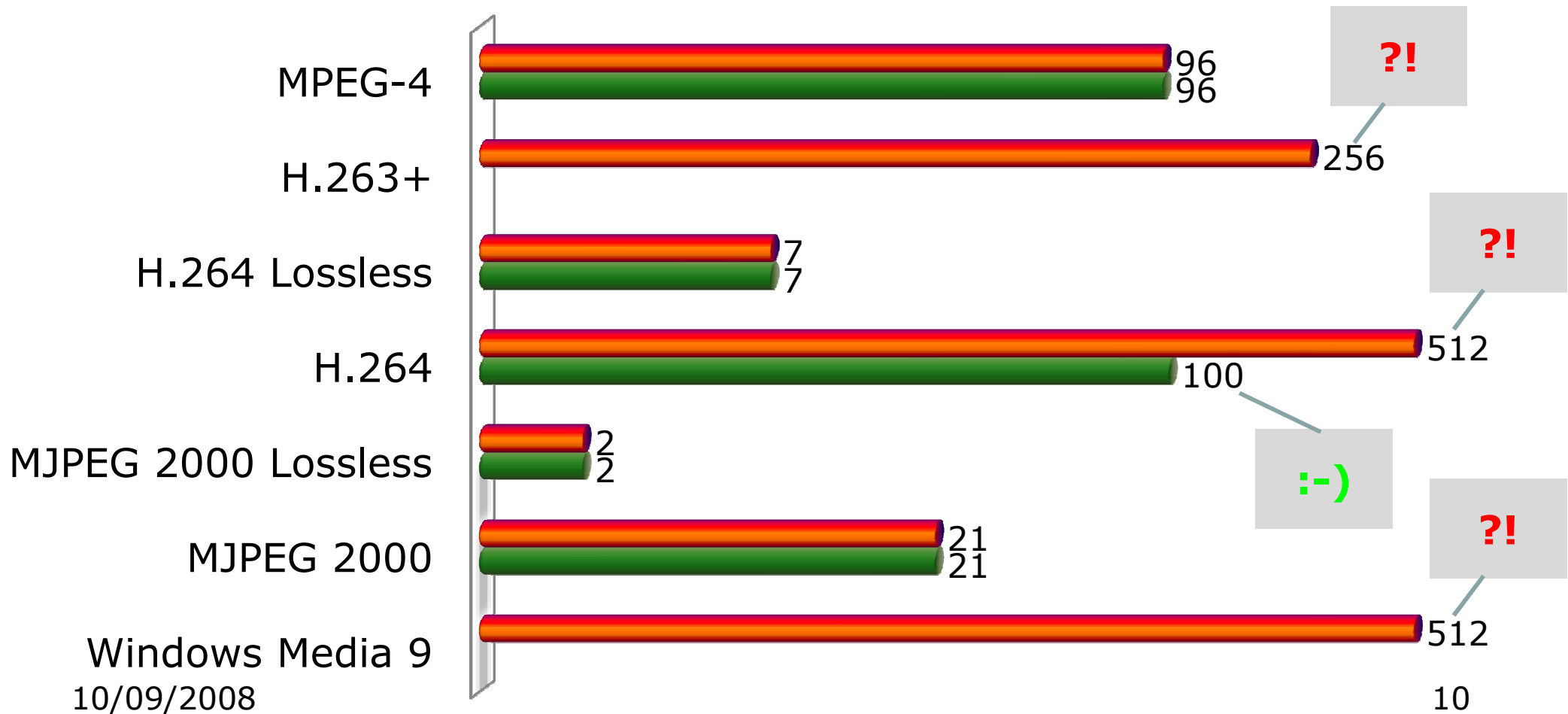
Objective Evaluation of Other Codecs

- **Modern video codecs chosen**
 - **H.263+**
 - **H.264 Main Profile**
 - **Lossless**
 - **Lossy**
 - **MJPEG 2000**
 - **Lossless**
 - **Lossy**
 - **WMV 9**
- **Repeated objective tests for these codecs**
- **CR increasing until HVM and Hosaka metrics reach ones obtained for MPEG-4 Part 2**

Results of Codec Evaluation

Maximum Compression Ratio

■ Hosaka ■ HVM



Summary and General Conclusions

- **Possible to effectively compress video-bronchoscopy sequences**
- **Preserving their diagnostic features**
- **Methodology applicable for and extendable into recording of other type of endoscopic procedures**
 - **Low level of motion**
 - **Long-lasting videos**

Thank you for your attention
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