

画像処理とMPEG符号化 今後への期待

Image Processing and MPEG Coding
Expectation for the Future

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Brief History of Image/Video Coding

	1950	1970	1980	1990	2000
Standard				H.261(90), JPEG(92) MPEG1(92),MPEG2(96) MPEG4(99), JPEG2000 H.264(03)	
	Waveform based approach				
Techniques	Intra Frame Coding				
	DPCM(52)	Transform Coding(65)	DCT(74)	VQ(80)	Subband Coding(86) Fractal coding(90)
	Mutidimensaional Sampling Theory(59)			Pyramid Coding(80)	Wavelet (88) Zero tree (93) EBCOT (98)
	Inter Frame Coding				
	Interframe Prediction(59)	Motion Compensation(74)	MC-DCT(81)		
Structure / Content based approach					
			Semantic Coding(83)	Second Generation(86)	Object-based Coding(89)
				Model-Based(86)	



On a hypothesis based on the history

- The future may be already present.
- Structure / content based approach:
Expectation for content aware processing



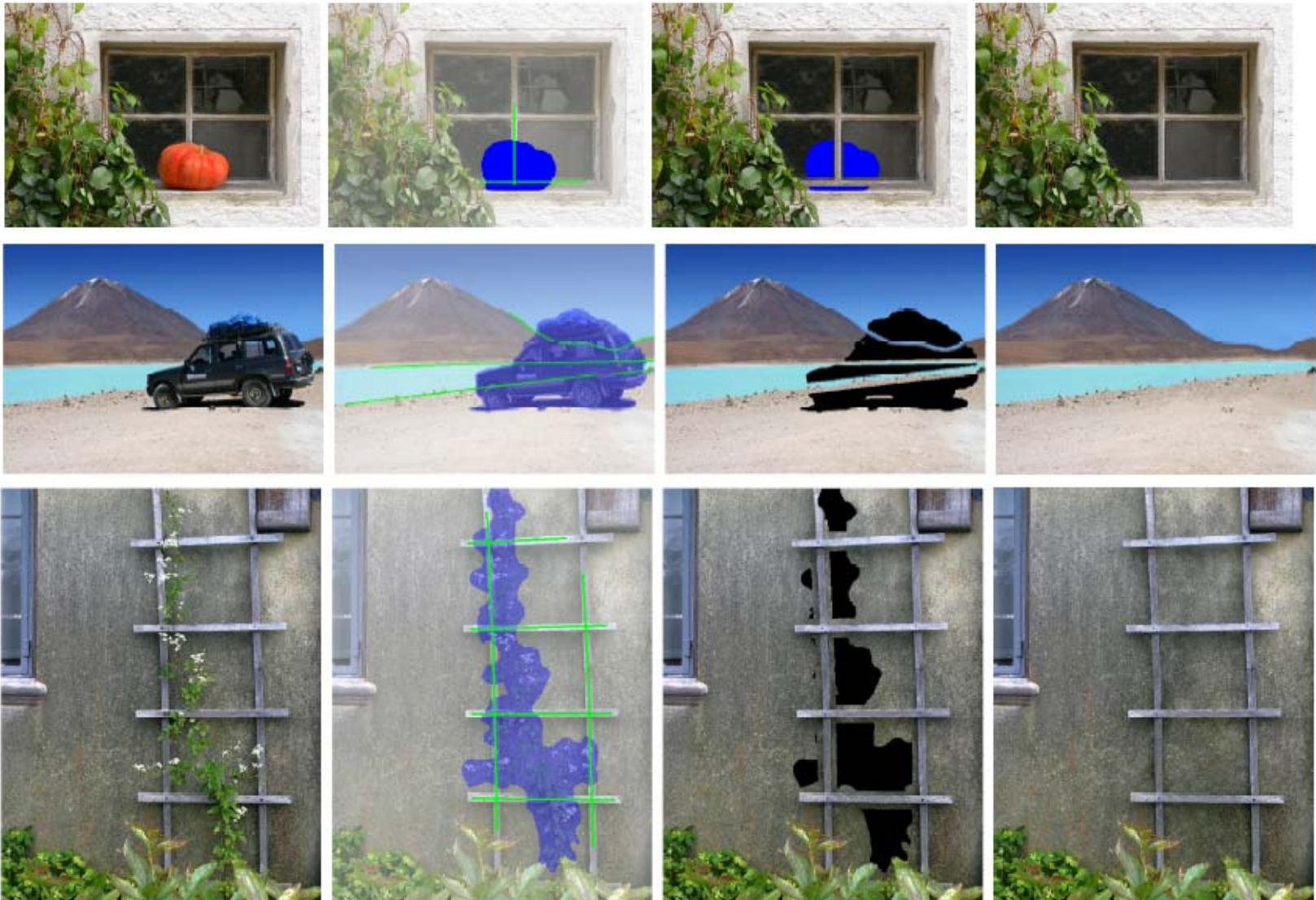
Recent Progress in Content Aware Processing

For example, in this ten years

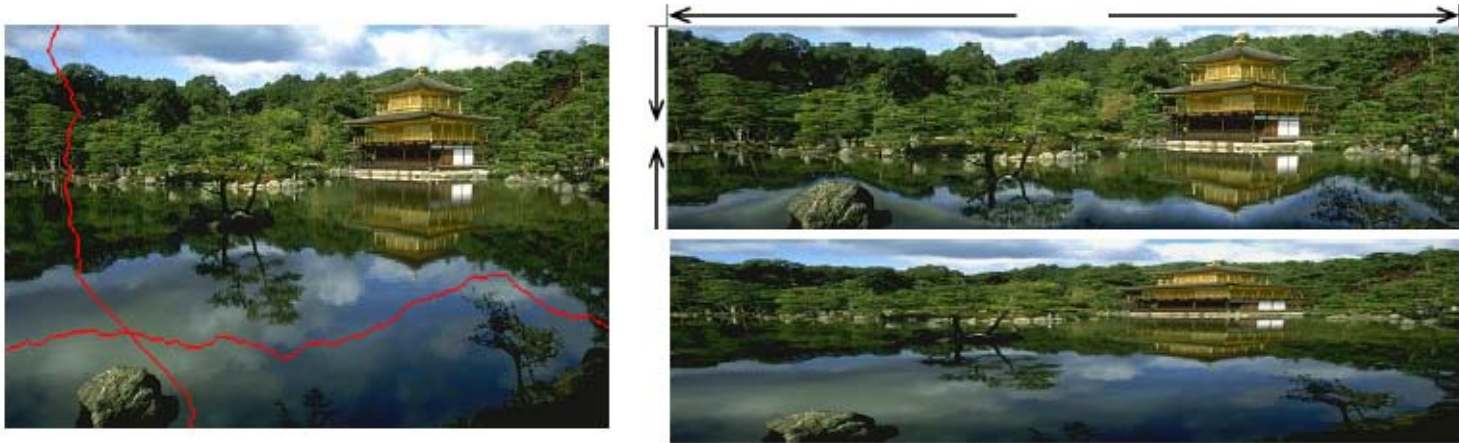
- Segmentation
 - GraphCut
 - Image Editing
 - image completion
 - content aware image resizing
 - Concept Detection, Image Retrieval
 - Local features (ex. SIFT) and bag of words approach
 - Face Detection, Face Recognition, Smile Detection etc.
 - Web scale database
- etc.



Image Completion (J. Sun et al, 05)



Content aware resizing: Seam Carving (S.Avidan, 07)



- Content aware processing + compression
 - Include content aware processing into compression
 - Optimize compression for content aware processing
- Evaluation of quality and performance
 - MSE is not good any more.
 - What should be evaluated?



Expectations for 3D Imaging Tech.

Coherently growing interest.

Recent Project, Forum, Consortium

- EU: 3D Media Cluster (2008 ~)
- Japan: URCF (2007 ~)
(Ultra Realistic Comm. Forum)
- US: 3D@HOME (2008.3 ~)



3D MEDIA CLUSTER
Three-Dimensional Community...

Home News Projects Documents Internal Pages Contact

3D Video

- Requirements for 3D Video
 - “Real”
 - “Dynamic”
 - “Free-View Point”



3D Video

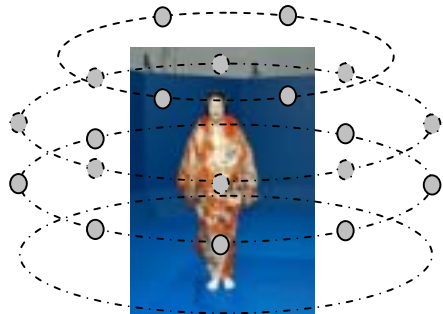
- Two approaches to representation of 3D video
 - Geometry based approach : Model based
 - Capture geometry and texture of real 3D moving objects
 - T.Kanade et al, Virtualized Reality (97)
 - Image based approach: FTV
 - Capture multiview images. No geometry
 - T.Fujii et al, Ray space (94)
 - M.Levoy et al, Light Field Rendering (96)



T. Kanade (97)



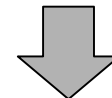
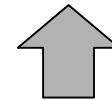
Outline of Our Project



3D video generation

3D video Compression

Applications: Retrieval, Interactive System etc



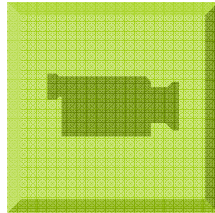
Research on various processing required for 3D Video:

Univ. of Tokyo, NHK, ATR

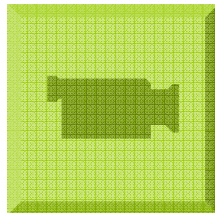
(MEXT Leading Project, 2004.10 ~ 2009.3)

3D video (geometry based)

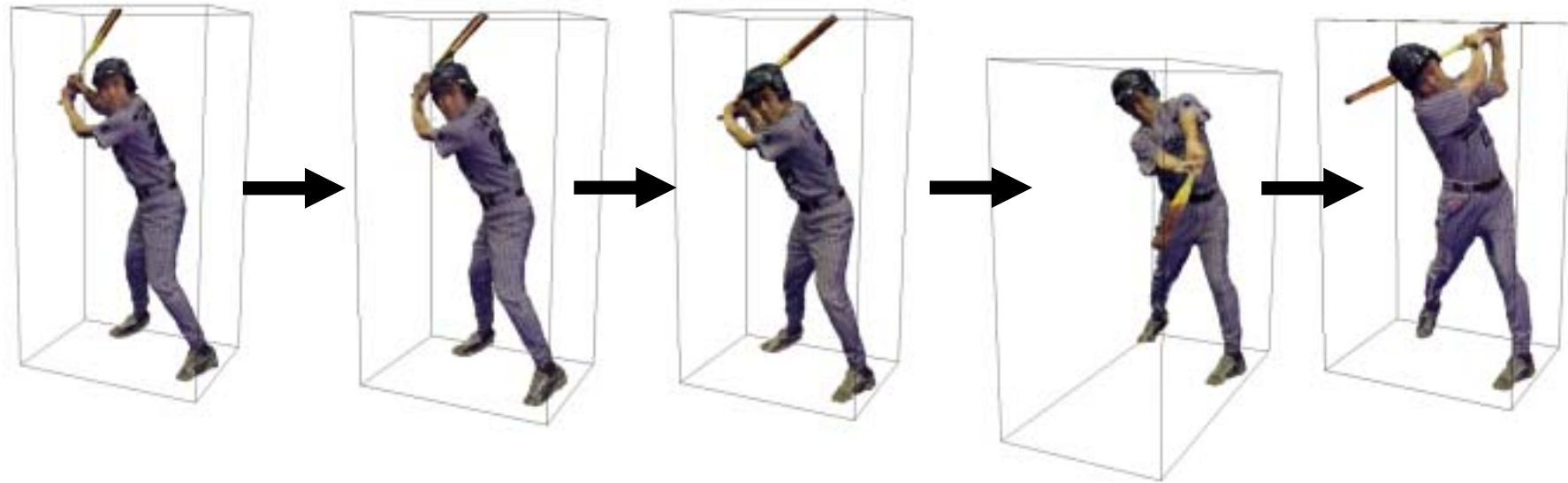
- Demo 1



- Demo2



3D Video : Time Varying Mesh (TVM)



- 3D mesh models of a sequence are generated independently.
- Time varying mesh: number of vertices, connectivity change
 - Topologically inconsistent model
- Non-rigid nature



Close Up of 3D Video



- Vertex : 50,000 ~ 100,000 / frame
- Connectivity: 100,000 ~ 200,000 / frame
- Color : 50,000 ~ 100,000 / frame
- File Size (VRML) : 5MB~10MB/ frame
3 ~ 5 GB/1minute



Compression
Is needed.



Conclusion

- History
 - The future is already present.
- Expectations
 - Content aware processing + compression
 - Quality evaluation
 - 3D Video



- **歴史**
 - “次”はすでにあらわれている
 - オブジェクトベース, モデルベース,
Hybrid
- **3次元への展開**
 - 2次元の発展との対比
- **インターネットパラダイム**
 - CGV

