Papers of Interest from ICCV2001

Below is a list of some of the papers that caught my eye at ICCV, together with brief comments.

Sensors

Generalized Mosaicing
Y.Schechner and S. Nayar(Vol.I,pp.17-25)
High Dynamic Range Panoramic Imaging
M.Arrarwal and N.Ahuja (Vol.I,pp.2-9)

- Each part of scene appears in several images at different places
- Use spacially varying filters when taking multiple images of scene
- Varying transmittance : Increased dynamic range
- Varying spectal filter : Measure spectral distribution
- Polarized filters etc

Robust Principal Component Analysis for Computer Vision

F.De la Torre and M.Black(Vol.I,pp.362-369)

- Set up problem as big optimisation
- Either discard whole vector as outlier or elements of vector
- Latter useful for noisy measurements
- eg Backround models of scenes with things moving across occasionally.
- Matlab code on the web

Visual Learning by Integrating Descriptive and Generative Models
C.Guo, S. Zhu and Y.Wu (Vol.I,pp.370-377)

- Represent textures using texton like patches
- Learn statistics of textons and the underlying stochastic processes
- "the integrated framework ... creates a richer class of probability models for visual patterns, which are suited for middle level vision representations."

3D Hand Pose Reconstruction Using Specialized Mappings
R.Rosales, V.Athitsos, L.Sigal and S.Sclaroff
Vol.I,pp.378-385

- Use computer graphics to render 2D outline of hand given joint angles
- Learn relationship between outline shape and joint angles
- Given 2D shape can hypothesise several 3D poses
- Use CG to refine poses

Real-Time 3D Hand Posture Estimation Based on 2D Appearance Retrieval Using Monocular Camera
N.Shimada, K.Kimura and Y.Shirai RATFGRTS Workshop pp23-30

- Similar idea. Uses temporal consistancy to help select most plausible candidate.

Capturing Natural Hand Articulation
Y.Wu, J.Y.Lin and T.S.Huang Vol.II,pp.426-432

- 20 joint angles. PCA shows only 7 dimensions.
- Actual distribution very lumpy - model with mixtures of gaussians

A Probabalistic Framework for Space Carving
A.Broadhurst, T.Drummond and R.Cipolla
(Vol.I,pp.388-393)

- Estimate p(voxel occupied) - get good results

Articulated Soft Objects for Video-based Body Modelling
R.Plankers and P.Fua (Vol.I,pp.394-401)

- Model 3D objects with 'meta-balls' - implicit surfaces
- Good results tracking human torso,head and arms.

Matching Shapes
S.Belongie, J.Malik and P.Puzicha (Vol.I,pp.454-461)

- For each point compute ‘shape context’ : radial histogram of nearby points
- To match two shapes:
  - Find correspondences give shape context and relative positions
  - Use TPS to warp one to the other
  - Iterate a few times
- Impressive results on standard databases, eg handwritten characters

Statistical Context Priming for Object Detection
A. Torralba and P. Sinha (Vol.I,pp.763-770)

- Use simple global models to estimate what type of scene (street, indoor, human etc)
- Divide image into grid (eg 16x16), use first few PC in each square as feature
- Given type of scene, predict where components might be (heads, cars etc)

Stochastic Rigidity: Image Registration for Nowhere-Static Scenes
A.Fitzgibbon (Vol.I,pp.662-669)
Dynamic Textures
S.Soatto, G.Doretto and Y.Wu(Vol.II,pp.439-446)

- Model time varying textures (eg flowers in wind, smoke drifting etc)
- Apply PCA to image sequence
- Train auto-regressive model on components
- $\mathbf{x}_{t+1} = \sum_{i=0}^{p} \mathbf{A}_i \mathbf{x}_{t-i} + \mathbf{w}_{t+1}$
- Generates convincing sequences
- AWF registered images to minimise complexity
- (eg allowing estimation of distance to water beneath a bridge)

The Space of All Stereo Images
S.Steitz (Vol.I,pp.26-33)

- Marr Prize winner or runner up

Multi-View Scene Capture by Surfel Sampling: From Video Streams to Non-Rigid 3D Motion, Shape and Reflectance
R.L.Carceroni and K.N.Kutulakos (Vol.II,pp.60-67)

- Given several sequences of same scene, compute everything
- Set up huge optimisation problem
- Represent scene with lots of curved patches ('surfels')
- Very impressive results: Shaking cloth

Probabalistic Tracking in a Metric Space
K.Toyama and A.Blake (Vol.II,pp.50)

- Joint Marr Prize winner
- Exemplar based approach
- Select typical examples (eg edge pixel image) from training set automatically
- Investigated a variety of distance measures between examples ('shuffle distance' gives best results in one case)
- Use cunning approximations to turn distances into proper probabilities
- Estimate dynamics from training sequence
- Bung into particle tracker
- Impressive results

Example Based Facial Sketch Generation with Non-parametric Sampling

H.Chen, Y.Xu, H.Shum, S.Zhu and N.Zheng

(Vol.II,pp.433-438)

- Generate cartoon sketches from face images
- Trained on many cartoons drawn by artist (over image)
- Learn relationship between local image patch and cartoon pixels
- Use ASM to match to new face
- Use local search to refine match - predict cartoon pixels
- Do some integration to generate final result
- Only works well on young male orientals at present
- No exaggeration yet

Computationally Efficient Face Detection
S.Romdhani, P.Torr, B.Scholkopf and A.Blake
(Vol.II,pp.695-700)

- Use sequence of support vectors to elliminate non-faces quickly
- Optimise positions of a few such vectors

Finding Anomalies in an Arbitrary Image
T.Honda and S.K.Nayar (Vol.II,pp.516-523)

- Model p(region—surrounding region) using ICA and kernel based estimates
- Detect unlikely regions (eg faults in cloth, squirrel in a wall etc)

Sample-Based Synthesis of Talking Heads
H.P.Graf and E.Cosatto (RATFGRTS,pp.3-7)

- Eigen-models of eyes and lips wrapped onto a head model
- Sample-based approach used to estimate parameters of eigen models
- Require models linking text, speech and lip movement
- Convincing results

Automatic Learning of Appearance Face Models
F.De la Torre (RATFGRTS,pp.32-39)

- Given sequence of someone moving head/talking
- Model using set of linked eigen-patches (eyes, mouth, head etc)
- Treat as big optimisation problem
- Minimize robust sum of squares measure
- Impressive results