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With:
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motivation

Surgical settings
Activity recognition
Interaction monitoring
General workflow

Intensive Care Unit
Procedure detection
Differentiate similar actions
motivation

Procedure:
1) Pose initialization
   T-pose
   Data-driven
2) Tracking
   Surface-based
   Control-based

T-pose [Seidel ‘04]

Surface tracking [Ilic ‘10]
ideal setting

Geodesic Extrema [Theobalt ‘11] →

Decision Forests [Blake ‘11]

Templates [Fujimura ‘08] →
prior work

**Depth Images:**
- Geodesic Extrema
- Decision Forests
  (Stanford, MPI, TUM)
  (Microsoft, TUM)

**Pointclouds:**
- Manifold segmentation
- Templates/Registration
  (UMD)
  (?+EPFL)

**RGB Images:**
- Pictorial Structures
  (Cornell, UCI, Oxford)
geodesic extrema
decision forests

[OpenNI w/ NiTE]
manifolds
template matching

Adaptive, Articulated ICP
pictorial structures

[Code from Taskar’11]
superpixels

Reduce dimensionality
11k -> 30 pixels
• Quickshift
• SLIC (EPFL)
pictorial structure
**pyKinectTools**

**Pose Estimation Pipeline**
- Geodesic extrema
- Graph Algorithms
- Belief Propagation (tree-based)
- Iterative Closest Point
- Laplacian Eigenmaps
- Superpixel wrapper

**Activity Recognition Pipeline**
- Background subtraction
- Simple person tracker
- 3D Features
- Space-time interest point detector
- PCA-based gesture recognition

**Utilities**
- Depth image utilities
- Depth image streams
- HOG visualization
- Profiler template
- Cython template
- Chalearn dataset reader