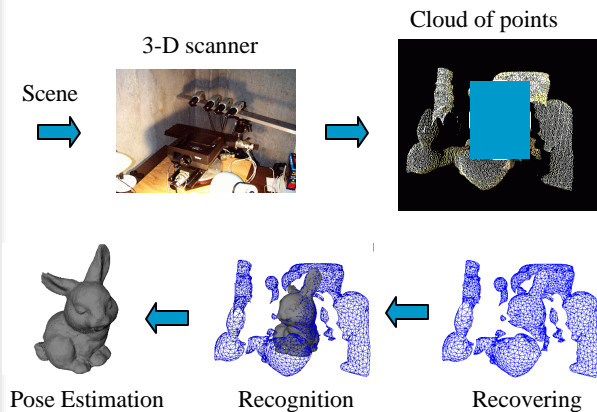




3-D Object Recognition From Shape

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Engineering

Difficult Problem



The Problem

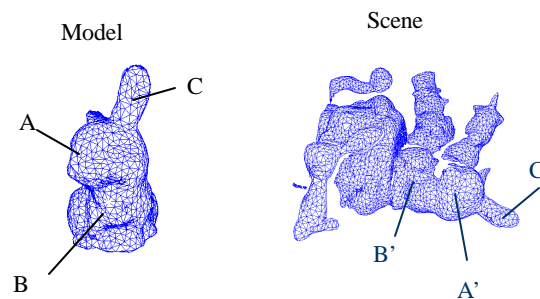


3-D Model
(database)



3-D Scene

Recognition

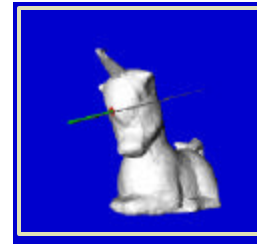


Surface Matching
using local "features"

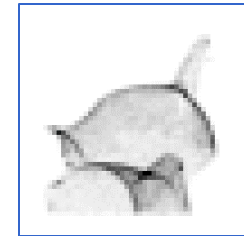
Surface Matching

- Search for candidate ‘point correspondences’ between the the model and scene that are geometrically consistent. (use distance measure in the “space of local features”).
- Generate a set of potential matches (groups of 3 or more correspondences).
- Keep the match that produces the best alignment between Surface meshes (rotation matrix and translation).

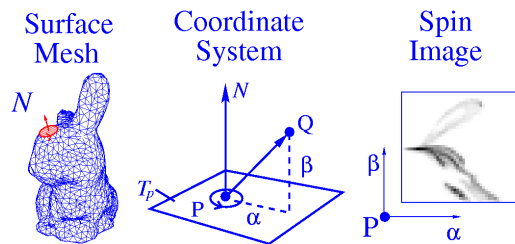
Spin Signature Generation



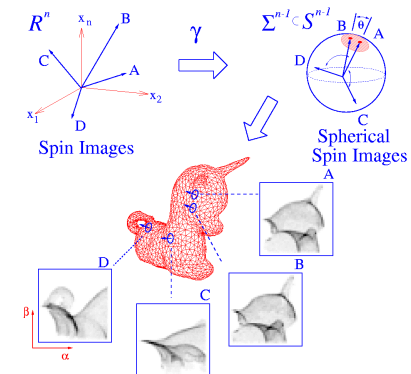
Local descriptors of shape
Pose invariant
Robust to clutter and occlusion



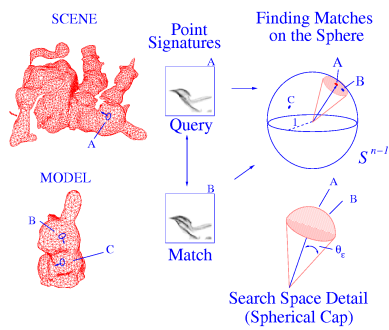
Local Features



Spherical Spin Images (SSI)



Recognition using SSI



Results % Improvement

Tested four methods ~ 4000 experiments

- Standard Spin Images vs Spherical Spin Images. (SI vs SSI)
- SI with PCA vs SSI with Random Projections (SIC + SSIC)

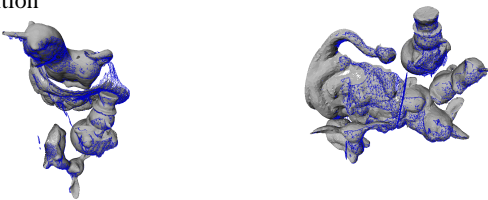
	RO	RC	LO	LC	Time
SSI vs SI	3.36	4.24	4.74	6.68	76.11
SSIC vs SIC	32	25.41	22.2	33.13	16.12

Qualitative Results

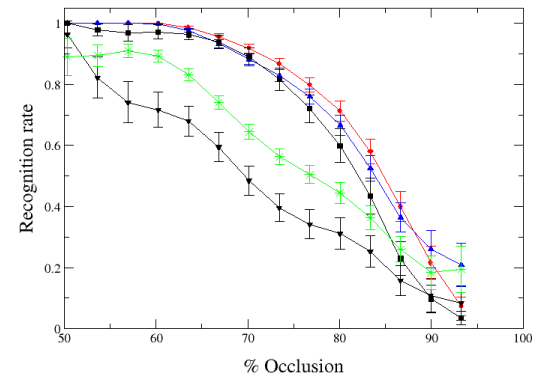
Scenes

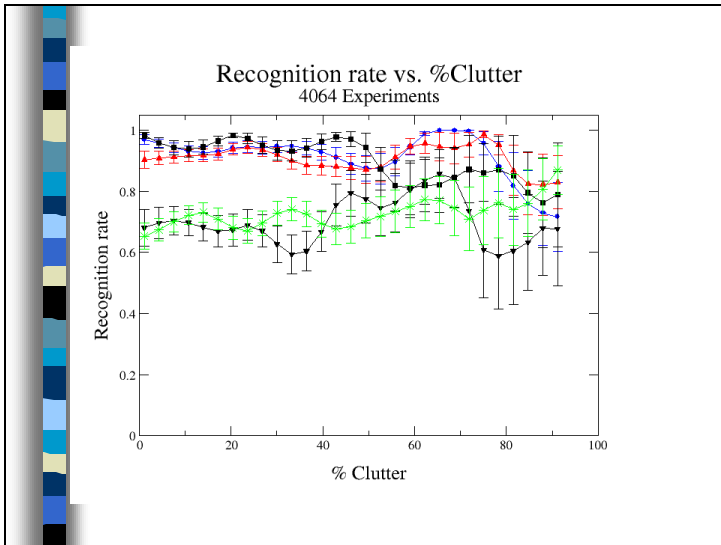


Recognition



Recognition rate vs. %Occlusion
4064 Experiments





Current Research

- Recognition of well defined classes of objects based on 3-D shape.
- Use techniques from statistical learning theory (support vector machines) and knowledge from the physiology of learning in humans to achieve categorization, detection and recognition of shape classes.