

Autonomously Adapting Range Data Patterns for Object Detection

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Problem of human detection

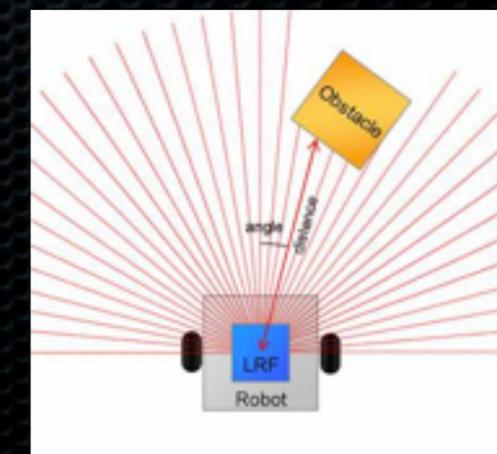
Motivation

- Social robots should improve their interaction skills
- Conversational robots should perceive the presence of humans
- The development of a human detection module becomes essential

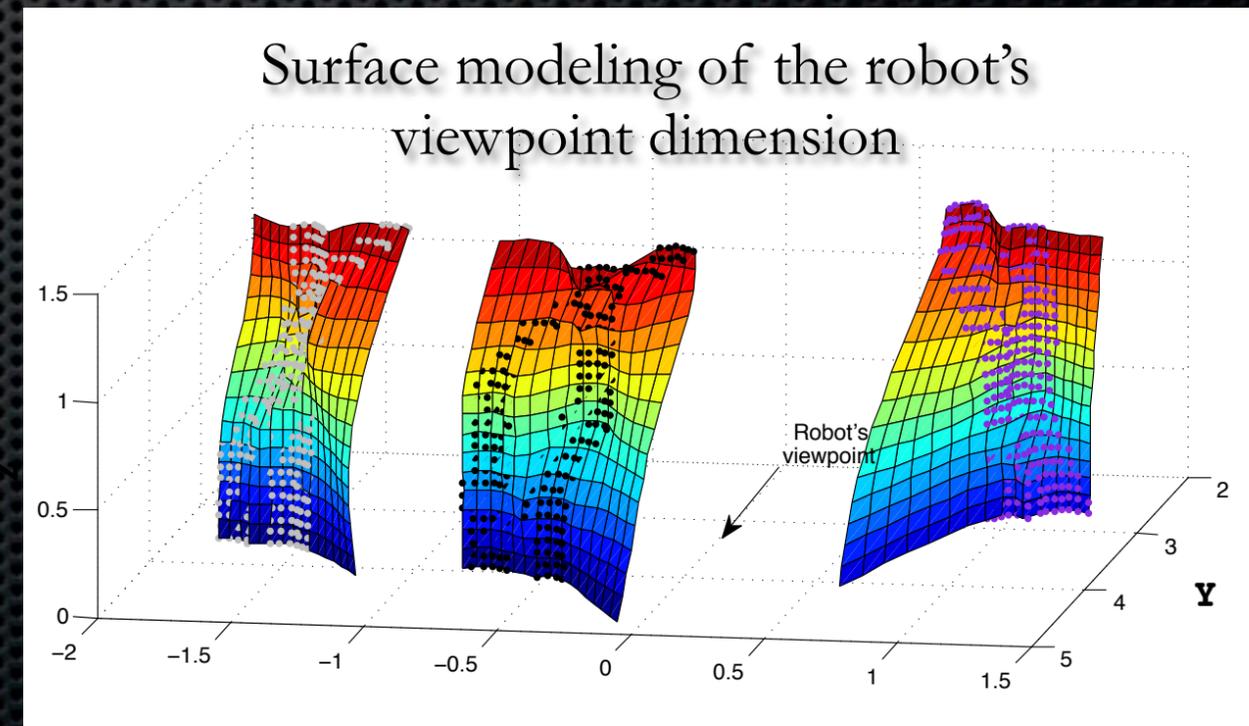
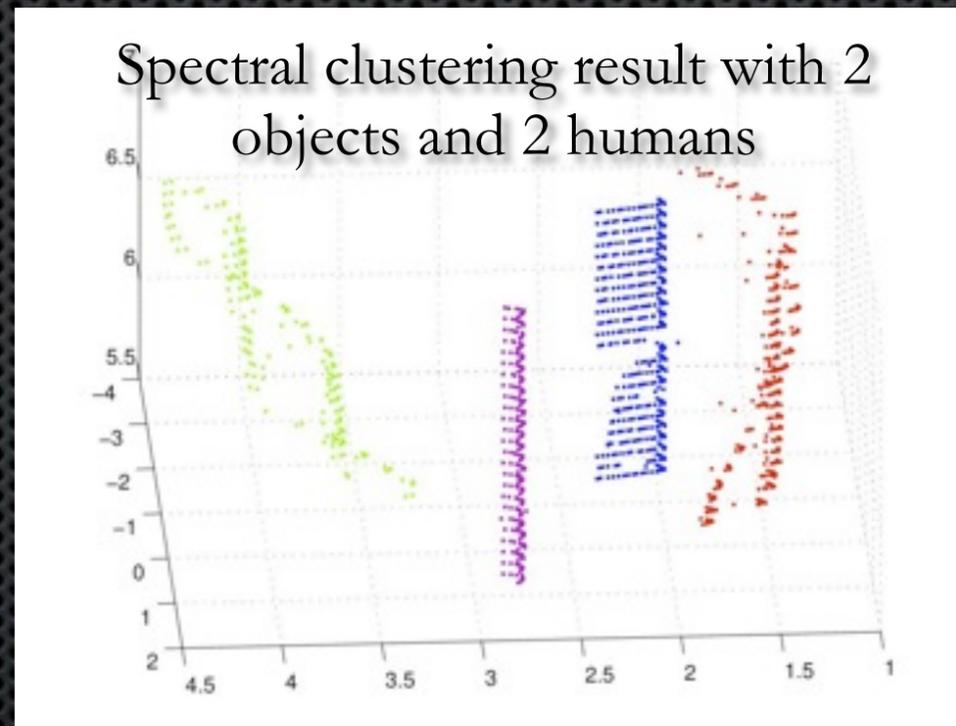
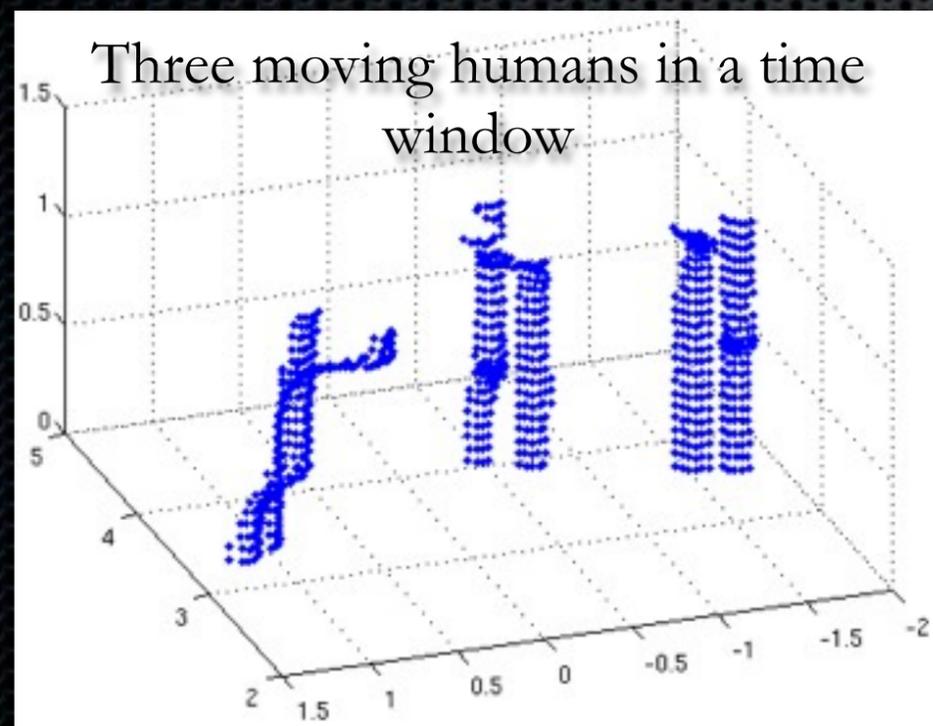
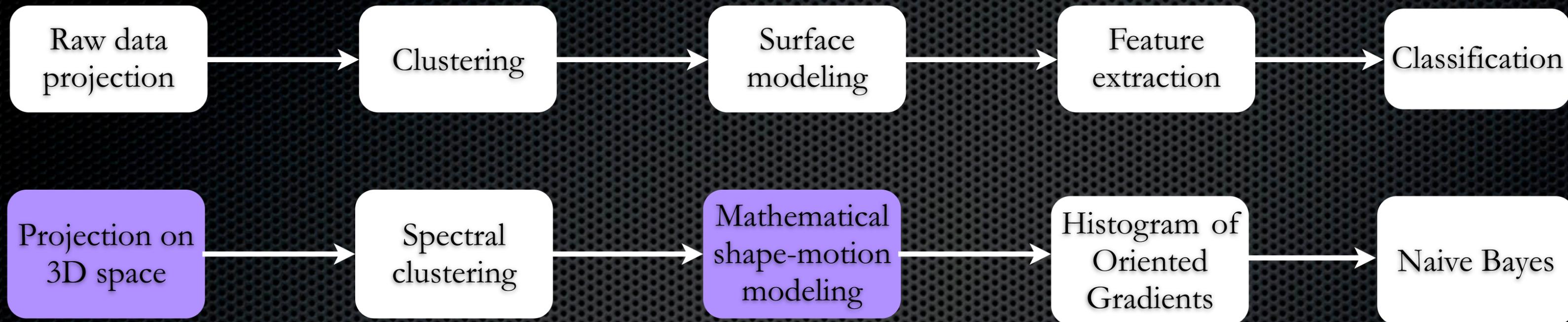


2D Laser range sensor challenges

Phenomenon	Structural changes in data
N/A	continuous topological manifolds
occlusion	gaps within the manifold
speed changes	alternation of sparse and dense data



Approach



Classification results

Average classification error using the GMLVQ and Naive Bayes classifiers.
Naive Bayes results are given with and without PCA preprocessing.

Method	Overall	Object	Human
GMLVQ	0.229	0.182	0.201
Naive Bayes w/o PCA	0.130	0.148	0.110
Naive Bayes with PCA	0.087	0.163	0.055

Comparison with the state-of-the-art. Average classification error using
our features and the features proposed by Spinello *et al.*

Method	Overall	Object	Human
Spinello <i>et al.</i> w/o PCA	0.153	0.367	0.078
Spinello <i>et al.</i> with PCA	0.290	0.740	0.108
Spinello <i>et al.</i> with Adaboost	0.106	0.315	0.027
Varvadoukas <i>et al.</i> with PCA	0.087	0.163	0.055

Conclusion

- Novel approach with results on a par with the state-of-the-art
- Circumventing strong requirements for priors, parametrization, and detailed frame-by-frame annotation: supervision only at the level of real-world objects

Reasoning on the *sensible world*:

- ✓ Multiple sensors refer to objects of the same type and level → Natural fusion
- ✓ Exploitation of objects' contextual information → More holistic approaches
- ✓ Segmentation into individual *human* or *non-human* objects → Robot can interact with such objects and *autonomously* collect the needed supervision to adapt its models

Code and experimental setup at: <http://roboskel.iit.demokritos.gr>

Thank you !