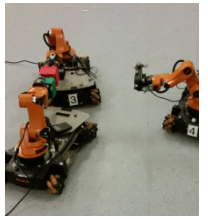
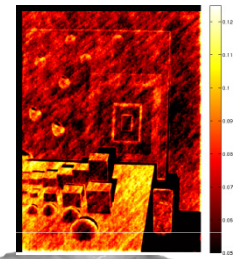
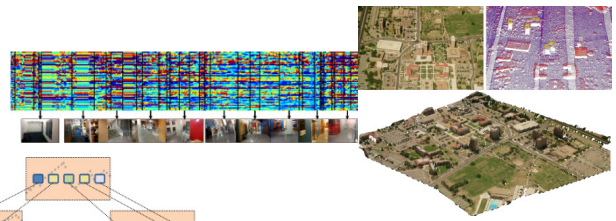
Research and Teaching Overview

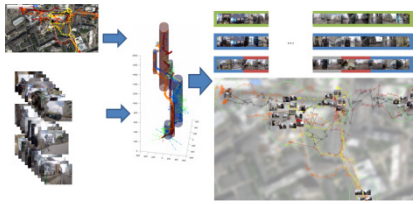
Guy Rosman

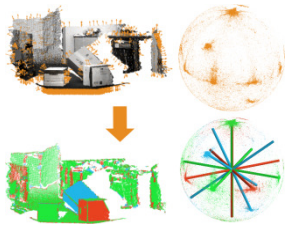
1/15/15

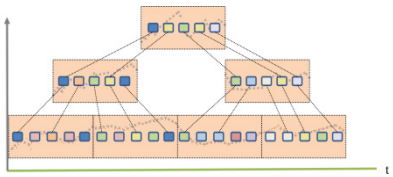








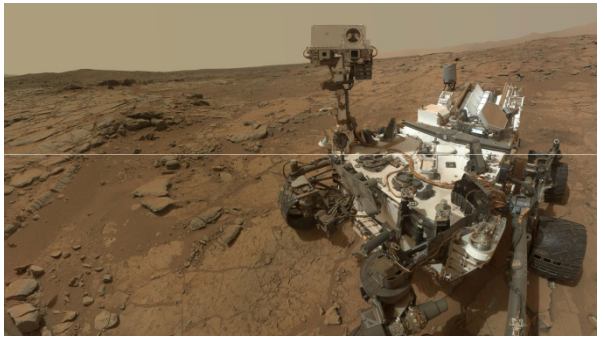




Aspects of future robotic vision

– Adaptive sensors

– Efficient sufficient statistics for lifelong learning



– Semantic-level understanding of the scene; of humans

What does it afford us?

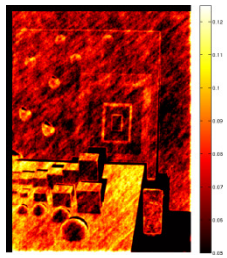
- More efficient and effective sensing subsystems,

- Robotic systems should interact with a much broader spectrum of environments.

Current status

3D sensing

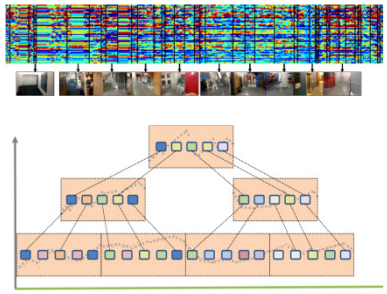
- Adaptive 3D scanning - CVPR'16 submission, journal in preparation
- Improved 3D scanners, 3D reconstruction – CVPR'14, CVPR '15



Coresets for visual summarization

- New k-segment mean coreset - NIPS'14 - journal in preparation
- Using coreset for localization and search - ICRA'15

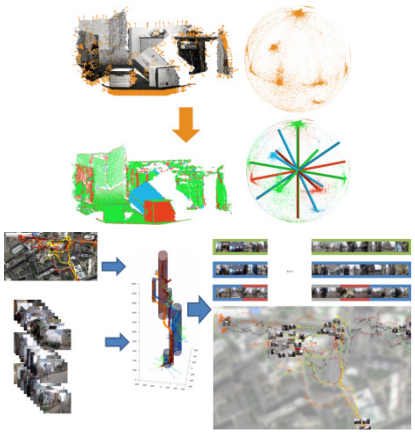
  (new challenges – how to generalize to multimodal? To multitask?)



Inference in 3D and multimodal data

- Manhattan frames representation for scenes (CVPR'14)
- Multiuser summarization of human activities (CVPR'16 submission)
- On the role of 3D representation in multiple tasks

  (CVPR'16 submission)



Plans Ahead

3D sensing – faster, higher (semantically), more accurate

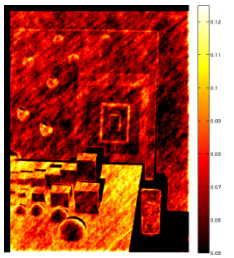
- Realtime adaptive 3D scanning
- Semantically adaptive 3D scanning
- Incorporating visual and geometry priors into sensing

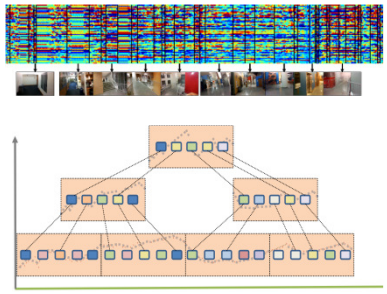
Coresets for visual summarization

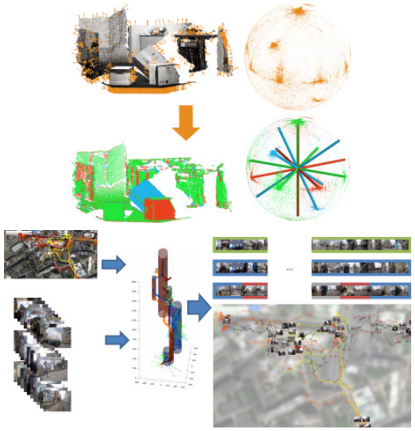
- Learned representation for segmentation coresets
- Viewpoint-robust coresets

Inference in 3D and multimodal data

- Sensor planning in semantic models – integrating users and sensors
- Semantic-level sensing – breaking the sense – reconstruct-analyze







Educational vision

- Structured teaching
  - Slide set – lecture – problem sets – project – exam
- TA in charge (6 years) – Numerical Geometry of Images (http://webcourse.cs.technion.ac.il/236861)
  - Advanced Graduate Course
  - EECS Students had to catch up on differential geometry, optimization
  - End projects are individual, some with industry, some led to conference papers
  - 15-20 students per class, individual-level teaching (universities are not MOOCs)
  - Created most of the slides set – still in use.
- Relevant high-level courses:
  - CS5330 pattern recognition and computer vision
  - CS5320 Digital image processing
  - CS5310 Computer graphics
  - CS5350 Applied Geometric Representation and Computation
- Basic CS courses
  - Programming, graphs and data structures, numerical analysis / linear algebra, probability
- Diverse teaching background (academy, industry, army)