New trends for coherent and integrated 3D scene understanding

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The problem: joint 3D scene reconstruction and recognition
The intuition

- High level semantics help solving geometrical ambiguities

- Object **detections** and their **geometrical attributes** provide constraints for estimating the scene layout
  - Geometrical attributes: Pose -- Scale -- 3D shape

Savarese, Fei-Fei, ICCV 07
Savarese, Fei-Fei, ECCV 08
Su et al, ICCV 2009; Sun, et al, CVPR 2009
Sun et al, ECCV 2010
Joint 3D scene reconstruction and recognition from 1 or N image

Bao, Sun, Savarese CVPR 2010
Sun, Bao, Savarese, BMVC 2010

**Semantic Structure From Motion,**
Bao, Sun, Savarese CVPR 2011
Applying SSFM
Detection results improved
Object correspondences are established across views

Each colored bounding box represents a unique Car
Joint 3D scene reconstruction and recognition from 1 or N image

By injecting semantics, few images are necessary to obtain accurate 3D reconstructions

This has the potential to initiate a new trend in computer vision
Large scale object categorization meets 3D reconstruction

Iso-performance curve

# category (degree of semantics)

SSFM, Bao et al. CVPR 2011

SFM/SLAM/stereo

# images needed for reconstruction (redundancy)
Thank you!