Natural Feature Tracking
G. Klein and D. Murray, ISMAR 2007

- PTAM: Parallel tracking and mapping
- Previously unknown environment
- Fast, robust alternative to sequential, frame-by-frame SLAM (Simultaneous Localization and Mapping)
  - SLAM: A technique used by robots and autonomous vehicles to build up a map within an unknown environment while at the same time keeping track of the current location
  - Classic chicken or egg problem
- PTAM
  - Tries to determine a single plane
  - Uses dense map of low-quality features, instead of a sparse map of high-quality features.
  - Has separate mapping and tracking threads that run asynchronously
    - Tracking can focus on robustness and real-time performance
- See also later work on single-camera SLAM
  - http://13thlab.com
  - http://www.minecraftreality.com/
  - http://www.youtube.com/watch?feature=player_embedded&v=Df9Whg9fCDQ
  - http://www.doc.ic.ac.uk/~rfs09/slampp.html
Tracking Nonrigid Objects
J. Pilet, V. Lepetit and P. Fua (EPFL)

- Real-time technique to detect deformable surfaces
  - 10 fps
- Problem Statement
  - Looking for the transformation that maps the known, undeformed model surface (i.e., mesh) into the deformed target one such that (squared) error is minimized
- Also models lighting and detects occlusions

Matching Visual Appearance
G. Klein and D. Murray, ISMAR 2008

- Emulate distortions of low-end cameras
  - Lens effects
  - Bayer mask
  - Image sensor
  - In-camera processing
  - Color space conversion
**Handy AR: Markerless AR Interaction Using Hand Tracking**

T. Lee and T. Höllerer, VR 2008

- Curvature-based fingertip detection
- Camera pose estimation relative to the hand
- User may rotate or move the hand arbitrarily to inspect virtual object on top of the hand

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**KinectFusion**

R. Newcombe et al., ISMAR/UIST 2011


- Interactively tracks depth camera position over time and fuses depth information captured from different viewpoints to create a continuously updated 3D volumetric surface representation
- Raycasting used to derive views of the scene
- Available starting in Kinect for Windows SDK 1.7