An Invitation to 3-D Vision
From Images to Geometric Models

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Lecture 1
Overview and Introduction
Input: Corresponding “features” in multiple perspective images.
Output: Camera pose, calibration, scene structure representation.
APPLICATIONS – Autonomous Highway Vehicles

Image courtesy of California PATH
APPLICATIONS – Unmanned Aerial Vehicles (UAVs)

Rate: 10Hz; Accuracy: 5cm, 4°
APPLICATIONS – Real-Time Virtual Object Insertion
APPLICATIONS – Real-Time Sports Coverage

First-down line and virtual advertising

[Images of football games with first-down lines and virtual Ford advertising]
APPLICATIONS – Image Based Modeling and Rendering

Image courtesy of Paul Debevec
APPLICATIONS – Image Alignment, Mosaicing, and Morphing
GENERAL STEPS – Feature Selection and Correspondence

1. Small baselines versus large baselines
2. Point features versus line features
GENERAL STEPS – Structure and Motion Recovery

1. Two views versus multiple views
2. Discrete versus continuous motion
3. General versus planar scene
4. Calibrated versus uncalibrated camera
5. One motion versus multiple motions
GENERAL STEPS – Image Stratification and Dense Matching

Left

Right

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Invitation to 3D vision
GENERAL STEPS – 3–D Surface Model and Rendering

1. Point clouds versus surfaces (level sets)
2. Random shapes versus regular structures