

Video and Still Imaging at nees@berkeley: Case Studies

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Outline

- ◆ **Overview of all video and still-imaging equipment at nees@berkeley:**
 - Video equipment
 - High-resolution still imaging equipment
 - High-definition laser Leica scanners
 - Timestamp issues
- ◆ **Case studies:**
 - High-definition Sony 1080i miniDV cameras
 - High-resolution still imaging Canon cameras in hybrid simulation
 - High-definition laser Leica scanners in earthquake engineering

Overview of Video and Still-Imaging Equipment

| Camera | Key parameters | Quantity |
|--|----------------------------|----------|
| Axis 2130 PTZ Network Camera | 704x480@10 fp | 1 |
| Axis 2120 Network Camera | 704x480@12 fps | 4 |
| IQeye3 Ultra-High Resolution Digital Camera | 1280x1024@1.5 fps | 1 |
| Fire-I Digital Camera | 640x480@30 fps | 12 |
| CV1280M Cameras from Prosilica | 1280x1024@29 fps, mono | 6 |
| CV1280C Cameras from Prosilica | 1280x1024@29 fps, color | 6 |
| CV640M Cameras from Prosilica | 640x480@120 fps, mono | 5 |
| CV640C Cameras from Prosilica | 640x480@120 fps, color | 5 |
| Canon GL2 miniDV Camcorder | 1.7 Mp (still image) | 1 |
| Sony HDR-HC3 High Definition Camcorder | 1440x1080@30 fps, high-def | 2 |
| Sony HDR-FX1 3-CCD High Definition Camcorder | 1440x1080@30 fps, high-def | 1 |
| Cannon EOS-1 Digital Camera (still images) | 4064x2704@3 fps | 4 |
| Tele-photo Zoom Lens (Canon) | for Cannon EOS-1 camera | 1 |
| Standard Zoom Lens (Canon) | for Cannon EOS-1 camera | 4 |
| Macro Lens (Canon) | for Cannon EOS-1 camera | 1 |
| Macro-photo Lens MP-e65mm f/2.8 1-5x (Canon) | for Cannon EOS-1 camera | 1 |
| 360 One VR Optic Lens and Software | 360 degree image | 1 |

Overview of Video and Still-Imaging Equipment

Supporting Equipment (professional grade)

- ◆ Lights (ARRI-300): 20 units
- ◆ Flashes – 4 units
- ◆ Tripods
- ◆ Fixtures for mounting



High-Definition Sony Cameras

- ◆ Sony HDR-HC3
 - ◆ 1 CDD camera
 - ◆ 1440x1080
 - ◆ miniDV tape
 - ◆ Consumer grade



- ◆ Sony HDR-FX1
 - ◆ 3 CDD camera
 - ◆ 1440x1080
 - ◆ miniDV tape
 - ◆ Professional grade



High-Definition Sony Cameras

- ◆ Hybrid Simulation of Wood-Frame Building test
 - ◆ Sony HDR-HC3 was used
 - ◆ HD version is in MPEG2 format
 - ◆ SD version is in .avi format
 - ◆ Speeded up 4 times



Still Imaging by Canon EOS 1Ds

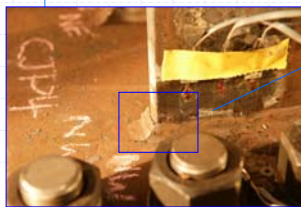
- ◆ Canon EOS 1Ds Body (4)
- ◆ Tele-photo Zoom Lens (1)
- ◆ Standard Zoom Lens (4)
- ◆ Macro Lens (1)
- ◆ Macro-photo 1-5x Lens (1)



Still Imaging by Canon EOS 1Ds

- ◆ Crack Initiation and Propagation Study in Steel Members (image manipulation is done in Matlab)

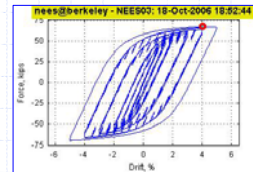
Original image: 11 Mpixels



Zoomed image



Plot at the timestamp



Frame of the final movie



100 frames of title to last about 3 seconds

NEES03 Phase 2
Specimen CJP4 (NW)
under Far-Field time history
10/18/06 Run026
(nees@berkeley)

Still Imaging by Canon EOS 1Ds

- ◆ Crack Initiation and Propagation Study in Steel Members

NEES03 Phase 2

**Specimen CJP4 (NW)
under Far-Field time history**

**10/18/06 Run026
(nees@berkeley)**

High-Definition Leica Laser Scanners

HDS-2500 (2 units)

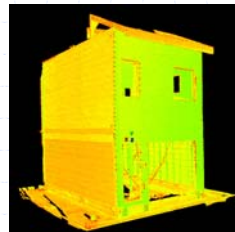
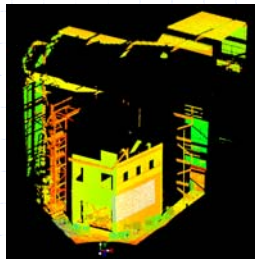
- ◆ 40° x 40° field-of-view
- ◆ Single-point range accuracy of ± 4 mm
- ◆ Angular accuracies of ± 60 micro-radians
- ◆ Laser beam spot size of only 6mm from 0-50m range
- ◆ 360° x 195° pan & tilt mount and dual internal rotating mirrors.
- ◆ Built-in camera for taking snap shots of the object and specifying scan zones
- ◆ Cyclone software application



High-Definition Leica Laser Scanners

Wood-Frame Building Test: Before and After Scans

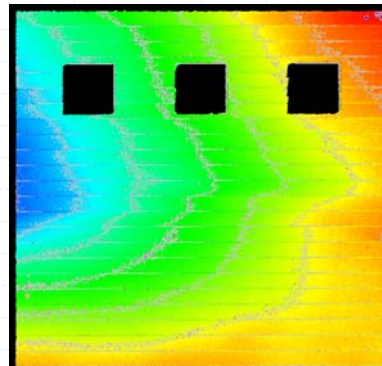
- ◆ 4-5 scans in each conditions
- ◆ At least 4 reference targets for each scan
- ◆ best resolution: 1000x1000 points
- ◆ Scans stitched together based on the reference targets



High-Definition Leica Laser Scanners

Wood-Frame Building Test: Before and After Scans

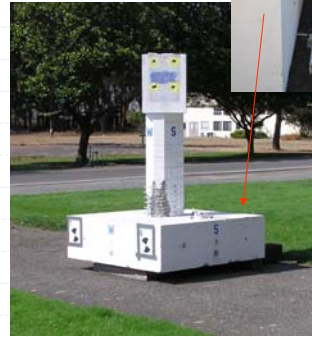
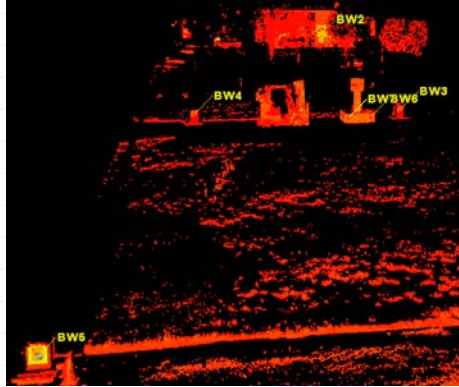
- ◆ Contour of deformed shape of the north wall



High-Definition Leica Laser Scanners

Accuracy of the position measurement over large distances (laser scanner)

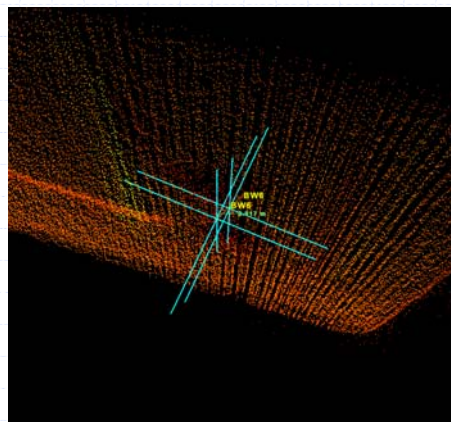
- ◆ Displacement of concrete block was monitored by position transducers
- ◆ Laser scans before and after the displacing the object were conducted
- ◆ Laser was located at about 100 ft away from the specimen



High-Definition Leica Laser Scanners

Accuracy of position measurements over large distances (laser scanner)

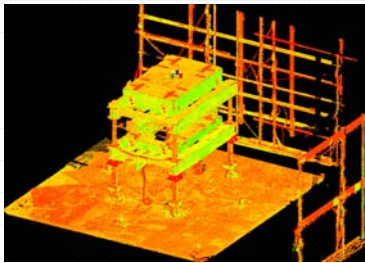
- ◆ Displacement correlation based on the surface displacement (3 mm error)
- ◆ Displacement correlation based on point (target) displacement (less than 1 mm error)



High-Definition Leica Laser Scanners

Example of usage for estimating position transducer locations in sophisticated test setup

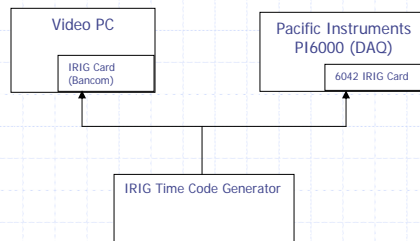
- ◆ Two phase testing: shaking table tests and hybrid simulation tests
- ◆ The displacement of both levels in space was measured by multiple position transducers (wire pots)
- ◆ Each target on the specimen was tracked by 3 position transducers mounted on the instrumentation frame
- ◆ To determine the displacement of each target we needed to measure length of each string and distances between position transducers



Time-Stamp Issues

Proposed equipment to use

- ◆ PI6000 DAQ from Pacific Instruments
- ◆ 6042 IRIG board for PI6000
- ◆ IRIG cards on each digital imaging PC controlling still image camera or continuously capturing video
- ◆ IRIG time code generator



LIGHTS, CAMERA, TEST...

Thank you!

Development and operation of the nees@berkeley equipment site is sponsored by NSF.

<http://nees.berkeley.edu>

