Remote Laboratory for Digital Holographic Metrology

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Motivation

• Scientists wish to collaborate on research
• Raw data is already often recorded and analyzed using computers
• Conditions of the measurement process need to be recorded to interpret the raw data (traditionally in a lab book)
• Publication of raw data desirable
Motivation

Science and Research

Data Acquisition
- Meta Data
- Archiving
- Data Provenance
- Collaboration

Remote Control
- Virtual Environments

Publications
Motivation
Aim of BW-eLabs

• Design an Infrastructure for automatic recording, storage and access to research data
• Secure, single sign-on access to labs without loss of local control
• Support of publication process, including publication of raw data
• Support for integration of specific labs
Dataflow in BW-eLabs

User

Login

3D Virtual Environment

VNC-Connection (through SSH)

User-Data Timestamp

Raw Data + MD

ITO-Data Converter

Publication

DOI + References

Article + BD + DOI + References

Reference to Raw Data

DOI *

XML

eSciDoc Deposit Service

XML

PID

OPUS

Access

Authentication

Item

BWeLabs Portal

Wonderland

ITO – Labor

Remote Experiment

LabVIEW
DH Lab - Setup

- Camera
- 3D Positioner
- 20x/0.85 microscopic objective
- Reference beam
- Illumination
- RJ45 connected to the proxy
- CCD
- Object beam reflection mode
- Object beam transmission mode
- X, Y, Z positioner
- Position Controller
- Fiber Coupler
- LASER
DH Lab - GUI

Topological Reconstruction
DH Lab

- Hologram stores all optical information of an object. Well suited for remote collaboration.

- Complete state of the system can be saved and restored automatically (including geometry and position, reconstruction, description of experiment, description of Holograms).

- Searchable Meta Data generated and stored automatically in eSciDoc database.
Results and Future Work

• BW-eLabs implements an infrastructure for handling research data
• DH Lab implemented as a demonstrator
• Low level integration of additional labs already feasible through generic interfaces (VNC, eSync Daemon, eSciDoc Deposit Service)
• Future Work: 3D Interface in Wonderland, publication of raw data
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Thank You for Your Attention