The 89th Textile Institute World Conference
Wuhan - China

Digital 3D Reconstruction of Historical Textile Fragment

Sophie Calvert, Dr. Jess Power, Dr. Paul Bills, Dr. Helen Ryall

Presented by Dr. Jess Power
Project Overview

Aims

• To use photography and 3D scanning techniques to analyze a historic textile fragment
• To accurately record data and explore a methodology suitable for handling and testing historic textiles
• To discuss possibilities for future research
Project Overview

The Fragment

- Analyzing textile fragments from the English National Trust Archive
- Fragments examined in this study loaned from Claydon House archive, Buckinghamshire
- Textiles date back to 1625c
- Fragments examined are part of a decorative mens reticella lace collar
- Iron Mordant is causing the rapid deterioration of the textile
Project Overview

The Fragment

• A- Detail of the lace decorative collar

• B- Detail of the silk trim (seen at the base of the collar)
Computerized Tomography Scan (CT)

- Used to determine 3D yarn architecture
- Instrument used in this study- Nikon Metrology 225 Micro CT Scanner
- Each Scan contained 1583 frames which were constructed using Nikon Metrology Software

Digital 3D Reconstruction of Historical Textile Fragment
Computerized Tomography Scan (CT)
Video File

Computerized Tomography Scan (CT)
Computerized Tomography Scan (CT)
Infinite Focus Microscopy (IFM)

- Used to determine surface and yarn measurement and structure
- Objective Lense provides small depth of focus to combine with vertical scanning to capture point height and true colour surface data

Digital 3D Reconstruction of Historical Textile Fragment
Infinite Focus Microscopy (IFM)
Linen Lace structure
10.00x Magnification
Exposure Time 167.5
Ms. Contrast 0.76
IFM G4g measurement
Device

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Linen Lace structure
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Contrast 0.76
IFM G4g measurement Device

Infinite Focus Microscopy (IFM)
Silk structure
10.00x Magnification
Exposure Time 1.165ms
Contrast 0.94
IFM G4g measurement
Device

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Infinite Focus Microscopy (IFM)
X-Ray Florescence (XRF)

- Used to determine constituent elements including possible links to dye process
- Qualitative and semi quantitative Xray Florescence measurements were performed on different areas of the textile fragments
- Instrument used in this study-
  A commercially available Bruker Artax 400 XRF
Silk 40kV for 90s
Bruker ARTAX 400 XRF
Rh Tube and a 650μm collimator

Credits: Working the XRF for this project Professor Sue Kilcoyne

University of Huddersfield
Conclusions

- Research has demonstrated the potential of (CT), (IFM) and (XRF) 3D scanning technique to examine both structure and fibre of historic textile fragment.
- These methods non destructively unlock the data and detail which in time would fully disintegrate with the textile.
- Data collected will be used within 3D software packages for advanced textile simulation modelling purposes.

Digital 3D Reconstruction of Historical Textile Fragment
Further Research

• A range of software currently exists which takes 3D scan imagery such as the CT data within this study into reconstruction including; MATA LAB, Rhinoceros, ANSYS.

• Reverse engineering software has the capability to convert 3D image dataset into high quality meshes for image modeling which is an exciting opportunity for the textile designer

• Current 3D textile software work with a range of assumed fabric properties unsuitable for historic textile modeling, often without areas of degradation, rot or dye variability