Building Digital Bridges between Medieval History and Present Time Using ICT – Results of Polish-Uzbek Cooperation

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Agenda

- ICT in culture heritage
- Six-year cooperation between Lublin University of Technology (LUT) and different cultural organisations in Smarkand, mainly Samarkand State University, and Uzbekistan, Kazkhstan, Kyrgyzstan
- Field of the cooperation: using modern ITC tools to cultural heritage preservation and popularisation
- Common activities
- Cooperation results

ICT in culture heritage

- ICT development:
  - the development of digitization systems, as well as the possibility of storing and sharing information -> **preservation and protection**
  - the possibility of wide reception of digital information by the whole of society -> **wide dissemination**
- Digitization of cultural heritage facilities began with the era of digital photography and techniques using various 2D scanners. With the development of technology, it has extended a third dimension to 3D technology, using various techniques and tools

History of the cooperation (1)

EU TEMPUS project PROMIS (with NUU) -> first contact

Meeting Marek Milosz and Rahim Kayumov (director of the Scientific-Practical Museum-Laboratory SamSU) (2014) -> firs verbal agreement

Agreement about cooperation between Lublin University of Technology (LUT) and Samarkand State University (2015),

Distance direct cooperation (2015-2016) → five joint scientifi publications

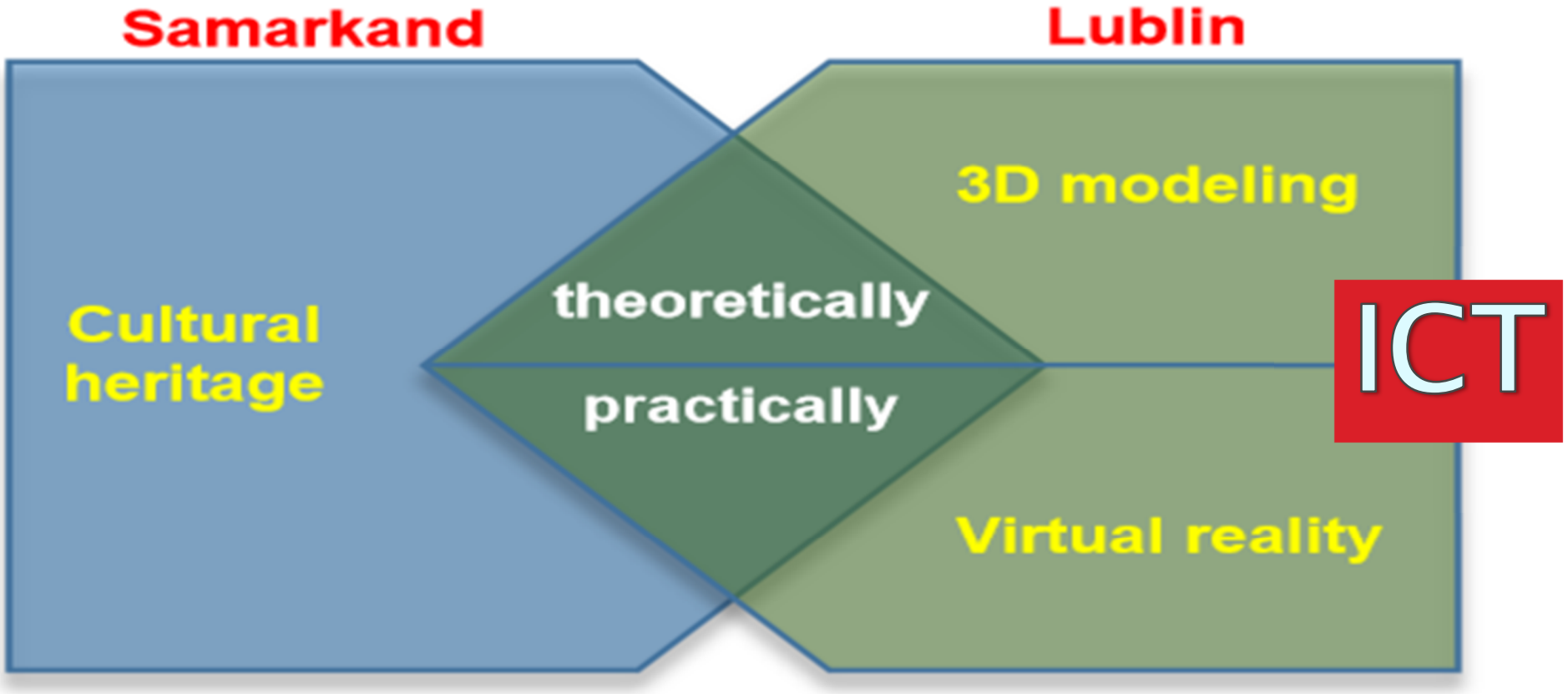
History of the cooperation (2)

Additional agreements (2018 – Registan Ensemble, International Institute for Central Asia Research, other museums from Samarkand)

Scientific Expeditions of the LUT to Central Asia (1st – 2017, 2nd – 2018, 3rd – 2019):

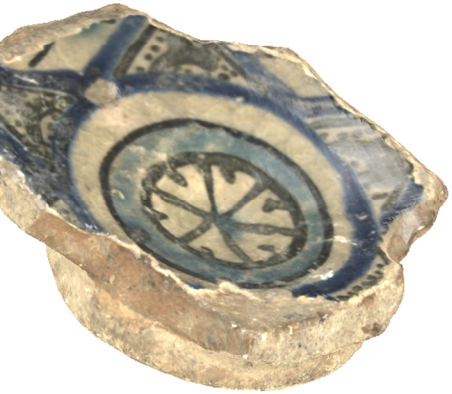
- 3D scanning
- International Practical-Scientific Seminars organizing
- International Conferences „IT in Cultural Heritage Management (IT-CHM)" organizing (in 2018 and 20

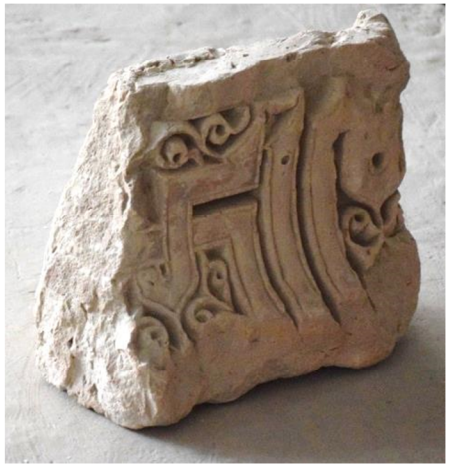
The platform of the cooperation



1st Scientific LUT Expedi

- Samarkand, May–June, 2017
- 3D scanning small artifacts in:
  - Museum Afrasiab
  - Museum SamSU





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Dr. J. Kęsik
Prof. J. Montusi

Small artifacts

1st Scientific LUT Expedition

Visualization of scanned objects in a Web Browser

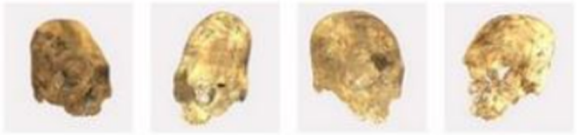
Below are presented 3d models (simplified for the Web) of the scanned objects. Objects are divided into 3 main groups. A middle class computer or tablet equipped with a modern web browser is needed to view the models in 3D. Just click the desired group to start.

Scientific-Experimental Museum-Laboratory

Objects scanned during the 1-st day, in the Scientific-Experimental Museum-Laboratory of the Samarkand State University, Uzbekistan.

Afrasiab

Objects scanned during the 2-nd day, in the Afrasiab Museum of Samarkand, Uzbekistan.



Anthropological

Anthropological objects scanned during the 2-nd day, in the Afrasiab Museum of Samarkand.

2nd Scientific LUT Expedition

- Samarkand – Tashkent – Turkiestan , May–June, 2018
- 3D scanning of buildings:
  - selected external and internal complexes: Registan, Shah-i-Zinda, Gur-e Amir mausoleum and Ulugh Beg observatory as well as unique frescoes in the Afrasib Museum
  - at the Khoja Ahmed Yasawi Mausoleum in Turkiestan (Kazakhstan)
- 3 seminars

Big buildings

16 architectural objects
35 small museum objects
120 GB of data were obtain

2nd Scientific LUT Expedition – Mirzo Ulugbek Museum

2nd Scientific LUT Expedition – Shahi Zinda

Samarkand, 16/07/2020

2nd Scientific LUT Expedition – Registan Ensamble

Sama

2nd Scientific LUT Expedition – Mausoleum of Khodja Ahmet Yasawi

3rd Scientific LUT Expedition

- Bishkek – Samarkand – Tashkent , May, 2019
- 3D scanning of:
  - petroglyphs (Cholpon-Ata, Lake Issyk Kul)
  - tower-minaret of Burana (Kyrgyzstan)
  - stone sculptures, eg. stone Buddha from the Fayaztepa aera (National Museum of the History of Uzbekistan)
  - robes of Bukhara's emir and other elements of his outfit (turban, shoes)
  - stalactites – the ornaments of the apseal of Registan mosques
- Organizing of:
  - Science-practical seminars in Bishkek (KSTU) and Tashkient (Unational Academy of Science)
  - 2nd International Conference „IT in Cultural Heritage Management (IT-CHM 2019)" in Samarkand

3rd Scientific LUT Expedition (1)

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3rd Scientific LUT Expedition (2)

Samarkand, 16/07/2020

3rd Scientific LUT Expedition (3)

Samarkand, 16/07/2020

3rd Scientific LUT Expedition (4)

Samarkand, 16/07/2020

Results of the cooperation

- 3D computer scanning of several artifacts and buildings in Samarkand
- Common scentific and newpapers/Internet/TV publications
- Creation, launch and maintenance of the "3D Digital Silk Road" internet portal
- Organization and conducting a series of seminars and international conferences “Information Technology in Cultural Heritage Management (I CHM)”
- **Development of templates for the renovation of the medieval Sher-Dor Medrese mosaic**
- **Determination of ceramic tile colors surface areas on the Sher-Dor Medrese mosaic**

Templates for the renovation of the medieval Sher-Dor Medrese mosaic – solution

- Hybrid method: 3D scanning + high resolution photography
- Accuracy: 2-3 mm

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. Kayumov
Prof. J. Montusiewicz
B. Marufi
Dr. J. Kęsik

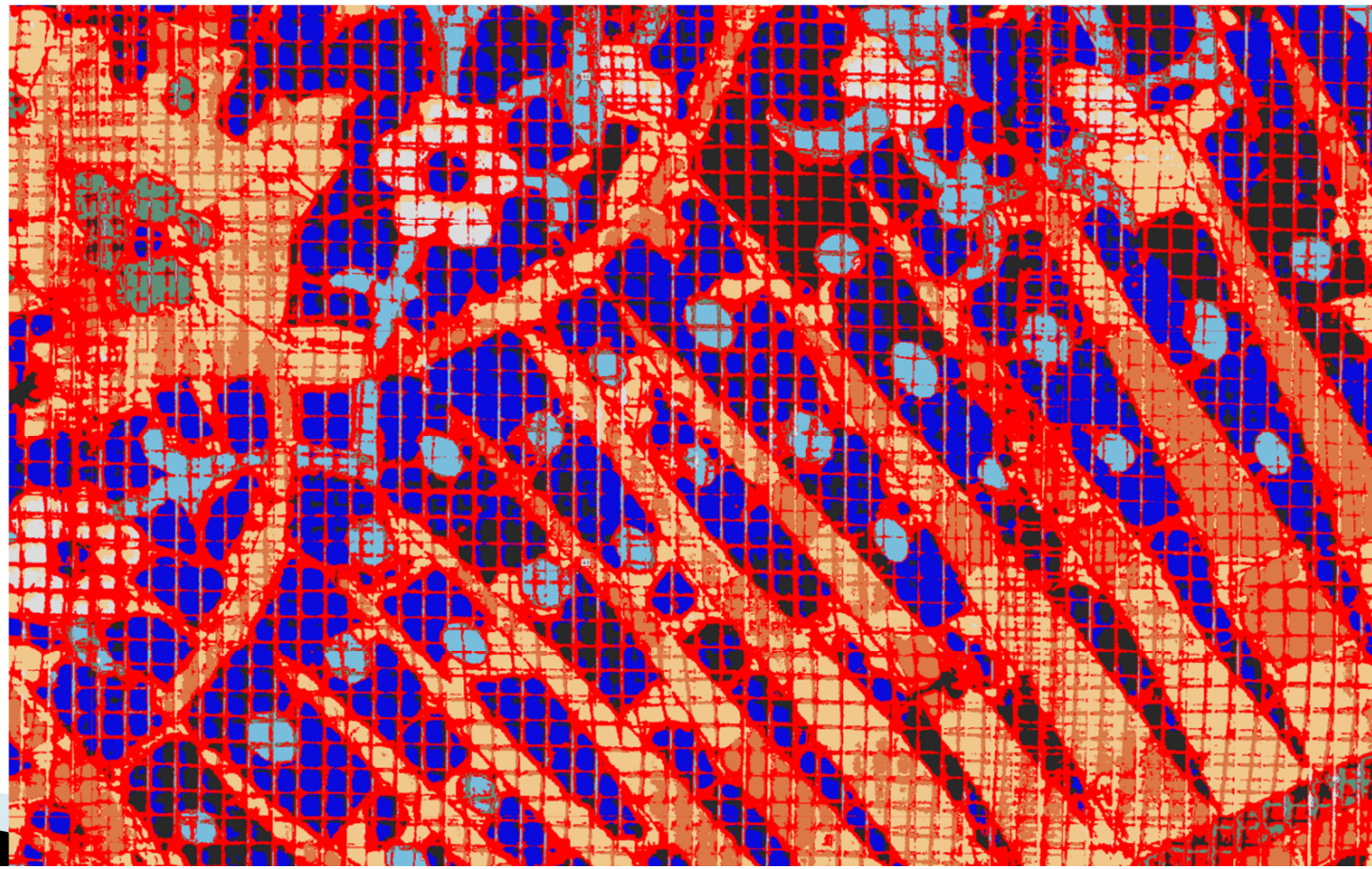
Templates for the renovation of the medieval Sher-Dor Medrese mosaic – problems

- Big area: +100 sq. m
- Mesh
- Big deffects and repairs

Determination of ceramic tile colors surface areas on the Sher-Dor Medrese mosaic (1)

- Problem: colours classification
- Solution – designing and developing special software using AI

colour – not recognised areas



Determination of ceramic tile colors surface areas on the Sher-Dor Medrese mosaic (2)

Colors on REGISTON mosaic Sher-Dor

Colour	R	G	B	% of area	Aera, m^2
blue	120	190	22	11,806%	12,207
navy blue	10	10	220	23,506%	24,305
white	220	220	220	20,019%	20,700
black	40	40	40	7,463%	7,717
light brown	240	200	140	23,107%	23,893
brown	220	120	70	11,039%	11,414
green	94	145	120	3,017%	3,119
light pink	240	180	166	0,044%	0,046
			Total:	100,000%	103,389

Estimation based on over 70% of the area.
Rest of area: mesh, joints, repairs, defects, ...

Portal ”3D Digital Silk Road”

SilkRoad3D.com – the result of cooperation

Samarkand, 16/07/2020

Portal ”3D Digital Silk Road” – aims

- Promotion of the cultural heritage of the Silk Road in new digital media – ICT (Internet, 3Dimension, Virtual Reality)
- Collection of data about historical monuments in one place
- Showing the achievements of Lublin University of Technology (LUT) and its Partners

New project – NAWA

- **Name: "3D Digital Silk Road" – digitization of the Silk Road heritage in Uzbekistan**
- Background: Result of the previous cooperation and partners activities
- Founded by: The Polish National Agency for Academic Exchange (NAWA)
- Budget: +$250 000
- More details about this project in the presentation on this conference:

  3D Digital Silk Road Project – Digitalization of the Cultural Monuments of the Silk Road in Uzbekistan, by Dr. Elzbieta Milosz, Prof. Dilbar Mukhamedova, and Khonkul Samarov (17 July 2020 at 11 am.)

Thank you

We invite you to cooperation

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