INTERNATIONAL CONFERENCE «PRESERVATION OF TANGIBLE AND INTANGIBLE CULTURAL HERITAGE: CHALLENGES AND STRATEGIES», August 26, 2019, Samarkand, Uzbekistan

ICT in Cultural Heritage Preservation and Popularisation – Lessons from Polish-Uzbek Cooperation

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Agenda

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

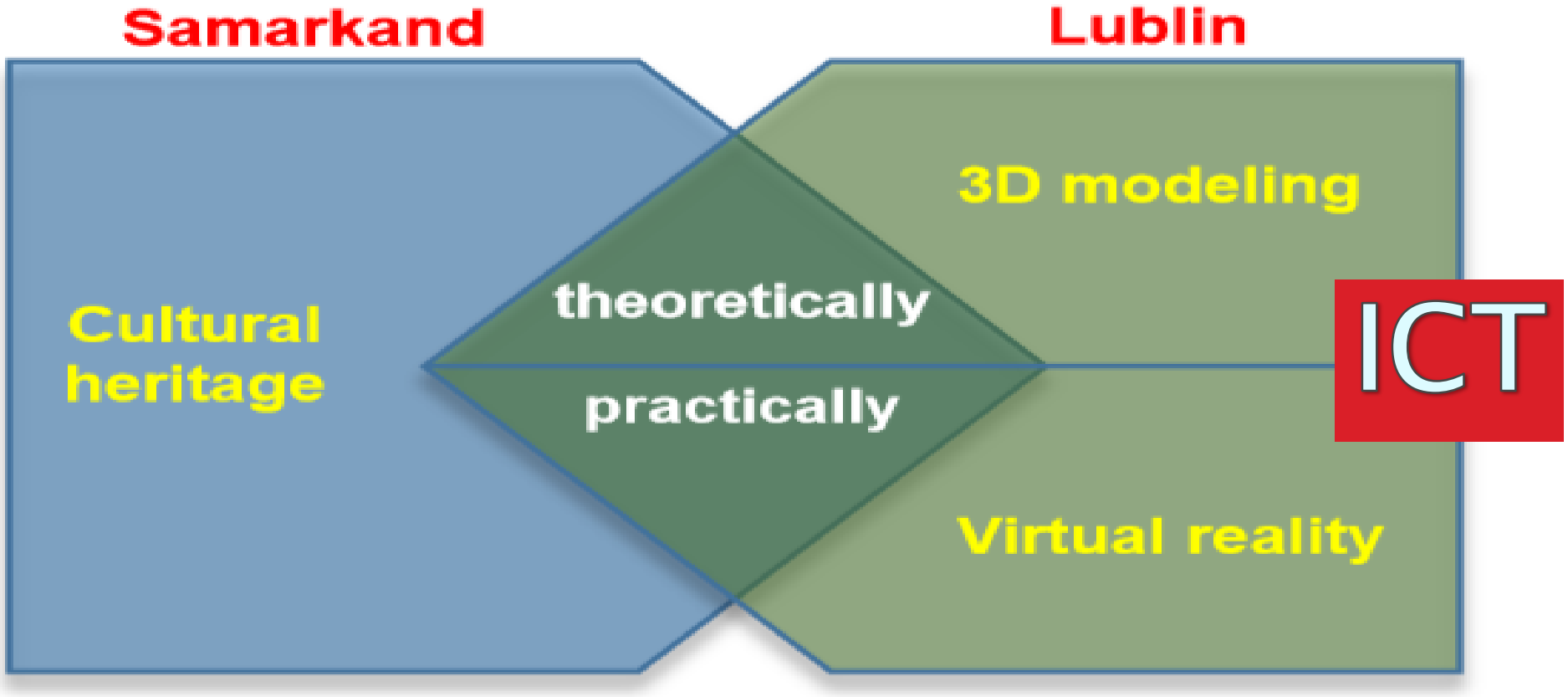
History of the cooperation (1)

- Meeting with Rahim Kayumov, director of the Scientific-Practical Museum-Laboratory SamSU (2014)
- Agreement about cooperation between Lublin University of Technology (LUT) and Samarkand State University (2015),
- Distance direct cooperation (2015-2016) → five joint scientific publications

History of the cooperation (2)

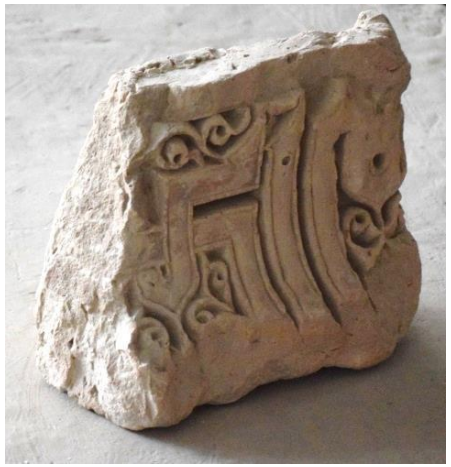
- Additional agreements (2018 – Registan Ensemble, International Institute for Central Asia Research, others museums from Samarkand)
- Scientific Expeditions of the LUT to Central Asia (1st – 2017, 2nd – 2018, 3rd – 2019):
  - 3D scanning
  - International Practical-Scientific Seminars organizing
  - International Conferences „IT in Cultural Heritage Management (IT-CHM)" organizing (in 2018 and 2019)

The platform of the cooperation



1st Scientific Expedition

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



Dr. M. Miłosz
Dr. J. Kęsik
Prof. J. Montusiewicz

1st Scientific Expedition

Visualization of scanned objects in a Web Browser

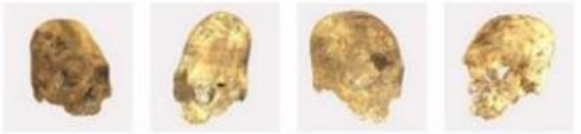
Below are presented 3d models (simplified for the Web) of the scanned objects. Objects are divided into 3 main groups. A middle class computer or tablet equipped with a modern web browser is needed to view the models in 3D. Just click the desired group to start.

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

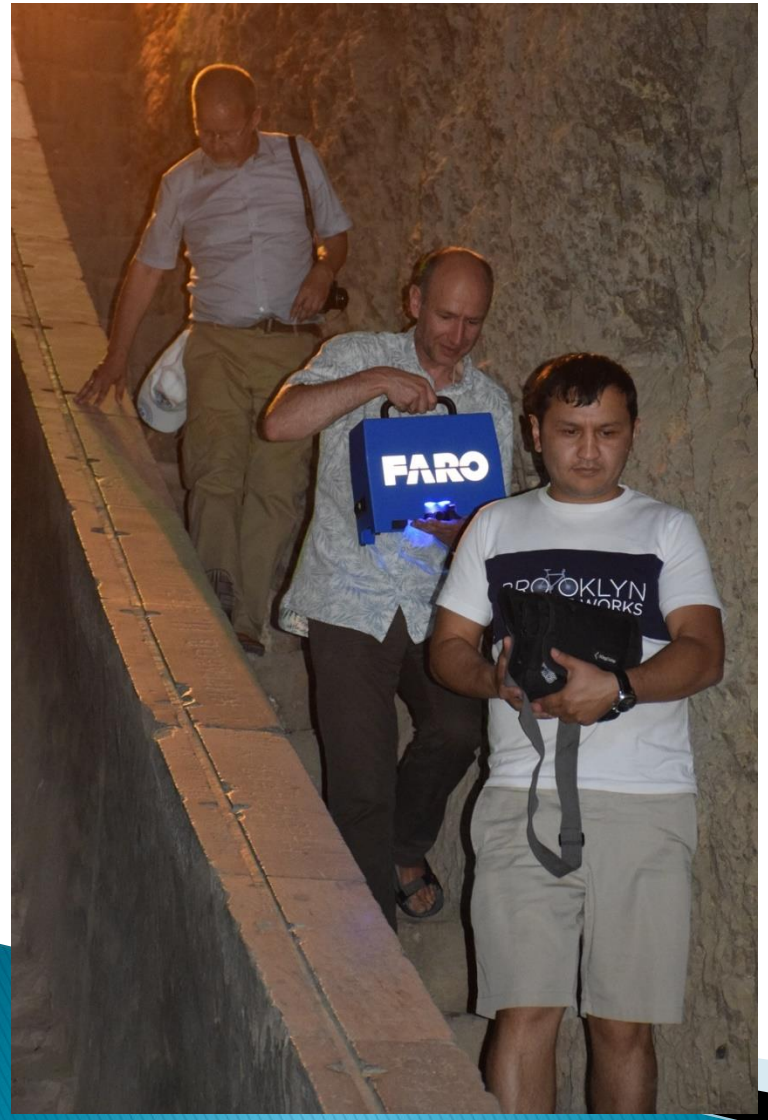
Anthropological objects scanned during the 2-nd day, in the Afrasiab Museum of Samarkand.

2nd Scientific Expedition

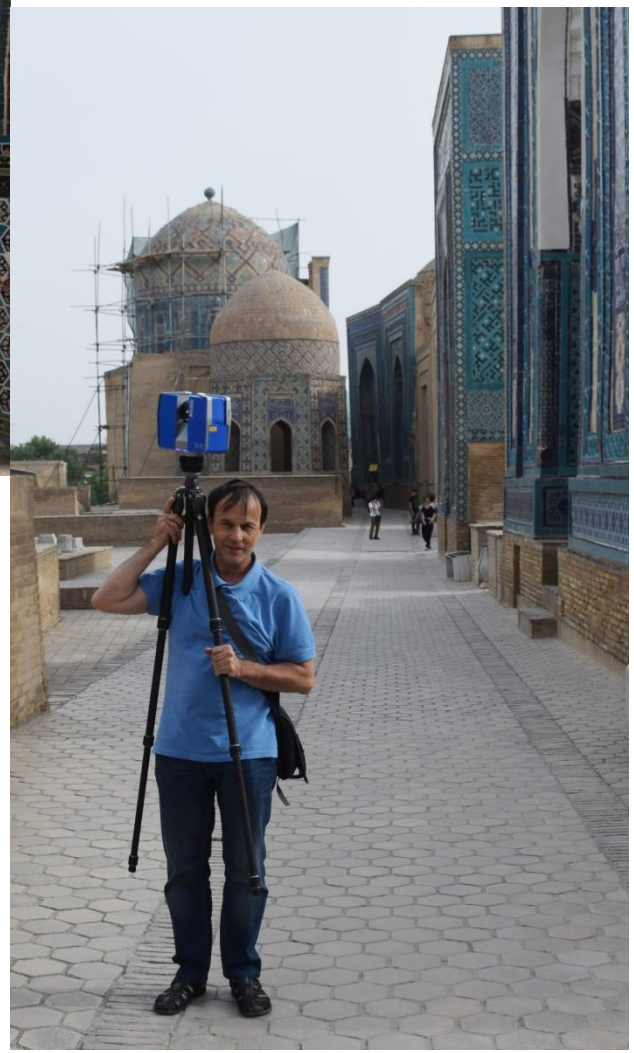
- Samarkand – Tashkent – Turkiestan , May–June, 2018
- 3D scanning of buildings:
  - selected external and internal complexes: Registan, Shah-i-Zinda, Gur-e Amir mausoleum and Ulugh Beg observatory, as well as unique frescoes in the Afrasib Museum
  - at the Khoja Ahmed Yasawi Mausoleum in Turkiestan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

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

2nd Scientific Expedition – Mirzo Ulugbek Museum



2nd Scientific Expedition – Shahi Zinda



Samarkand, 26/08/2019

2nd Scientific Expedition – Registan Ensamble

2nd Scientific Expedition – Mausoleum of Khodja Ahmet Yasawi

3rd Scientific 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 Expedition (1)

3rd Scientific Expedition (2)

3rd Scientific Expedition (3)

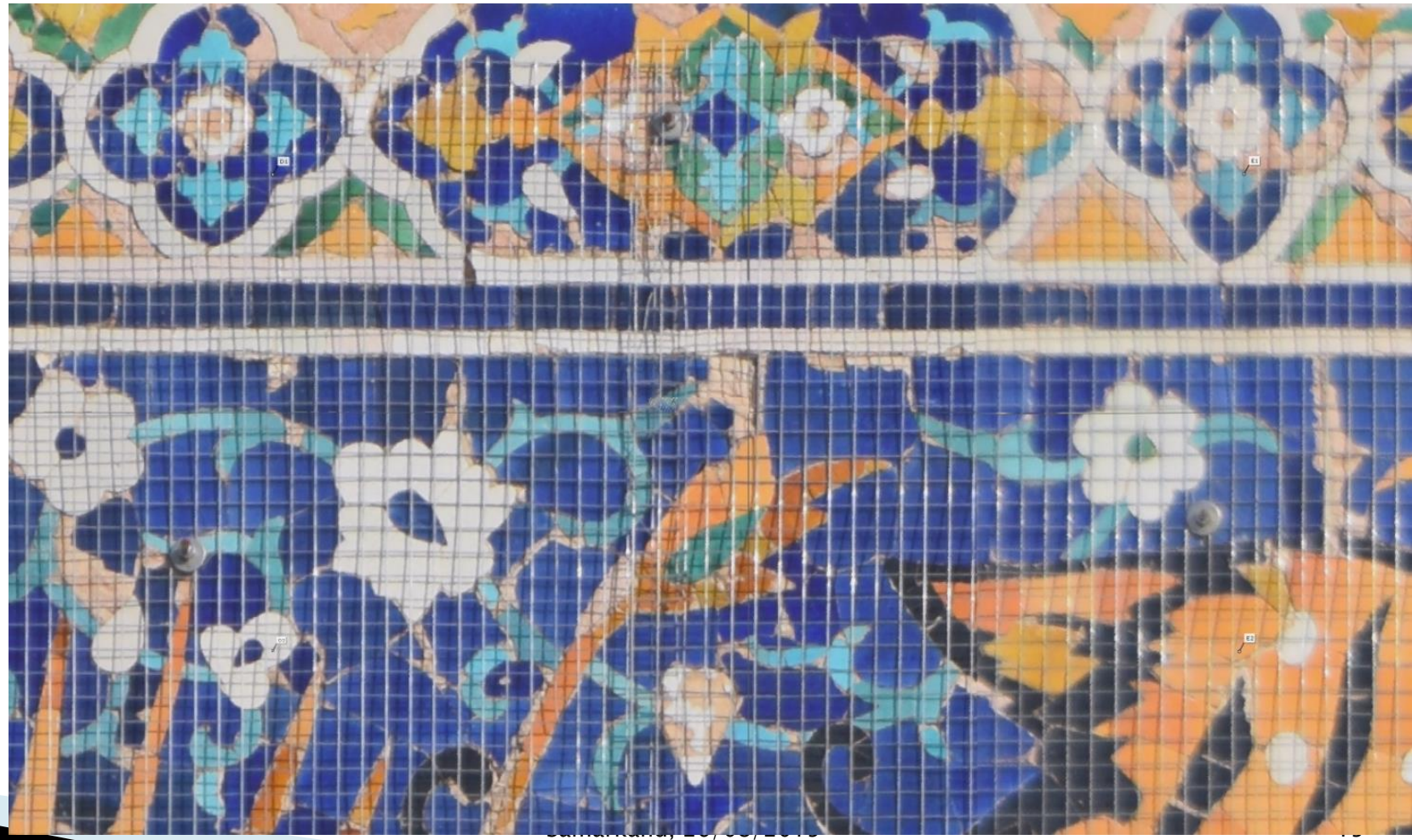
3rd Scientific Expedition (4)

Results of the cooperation

- 3D computer scanning of several artifacts and buildings in Samarkand
- 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
- Measurement of the geometry of the Golden Mosque cupola in Registan
- 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 (IT-CHM)”

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

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



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

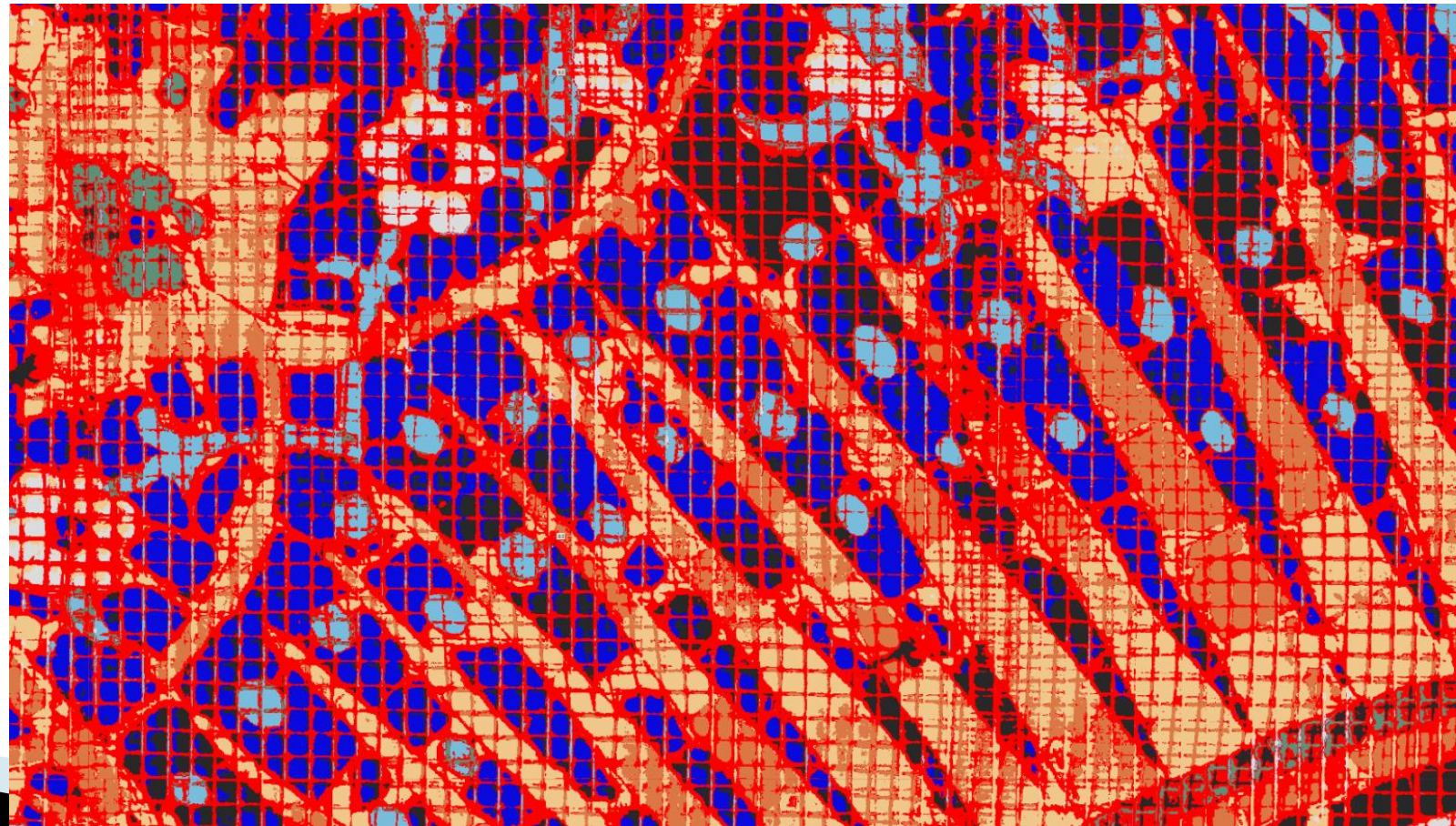
- Hybrid method: 3D scanning + high resolution photography
- Accuracy: 2-3 mm

Dr. M. Miłosz
R. Kayumov
Prof. J. Montusiewicz
B. Marufi
Dr. J. Kęsik

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

red 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

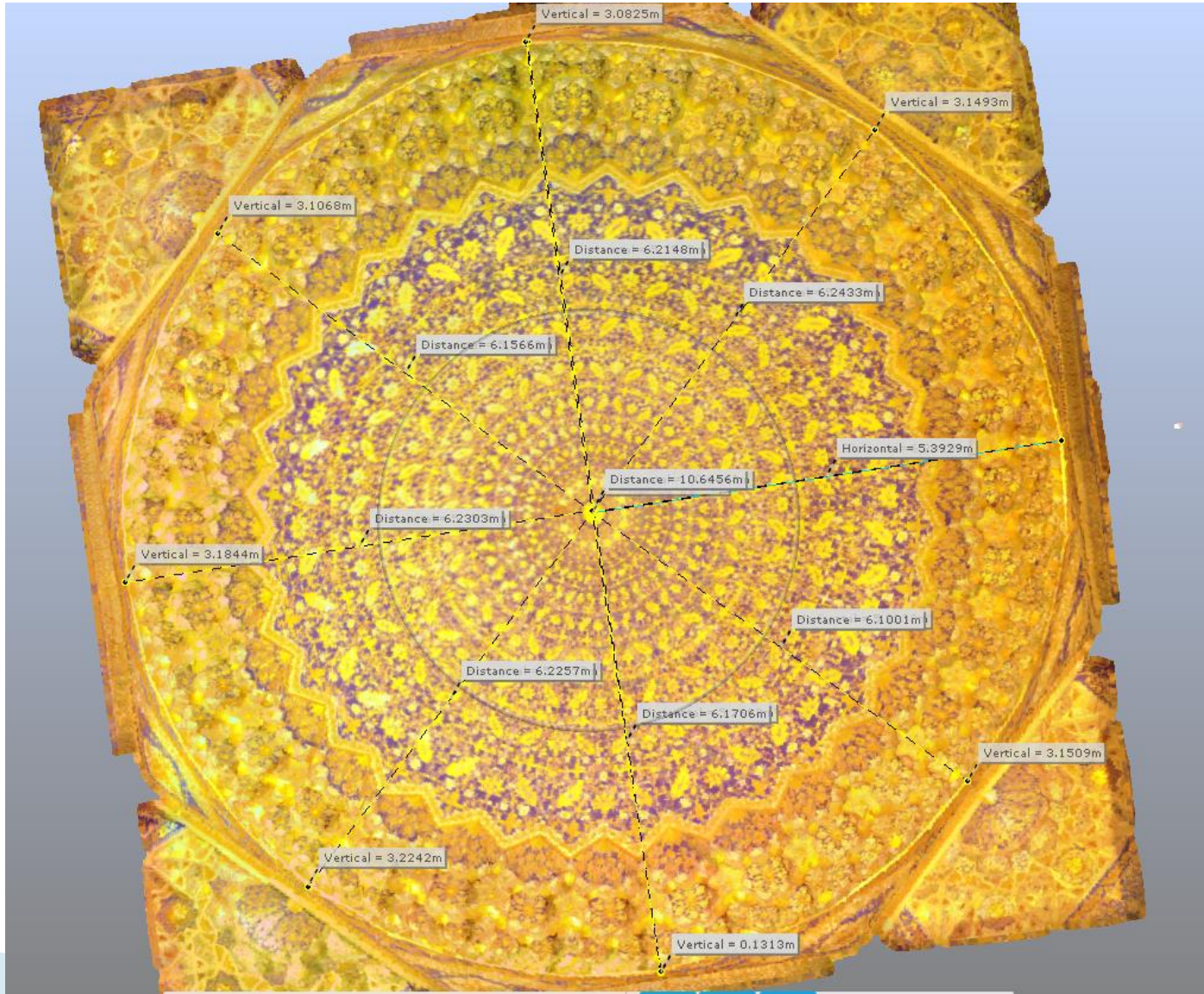
Estimation based on over 70% of the area.
Rest of area: mesh, joints, repairs, defects, ...

Measurement of the geometry of the Golden Mosque cupola in Registan (1)

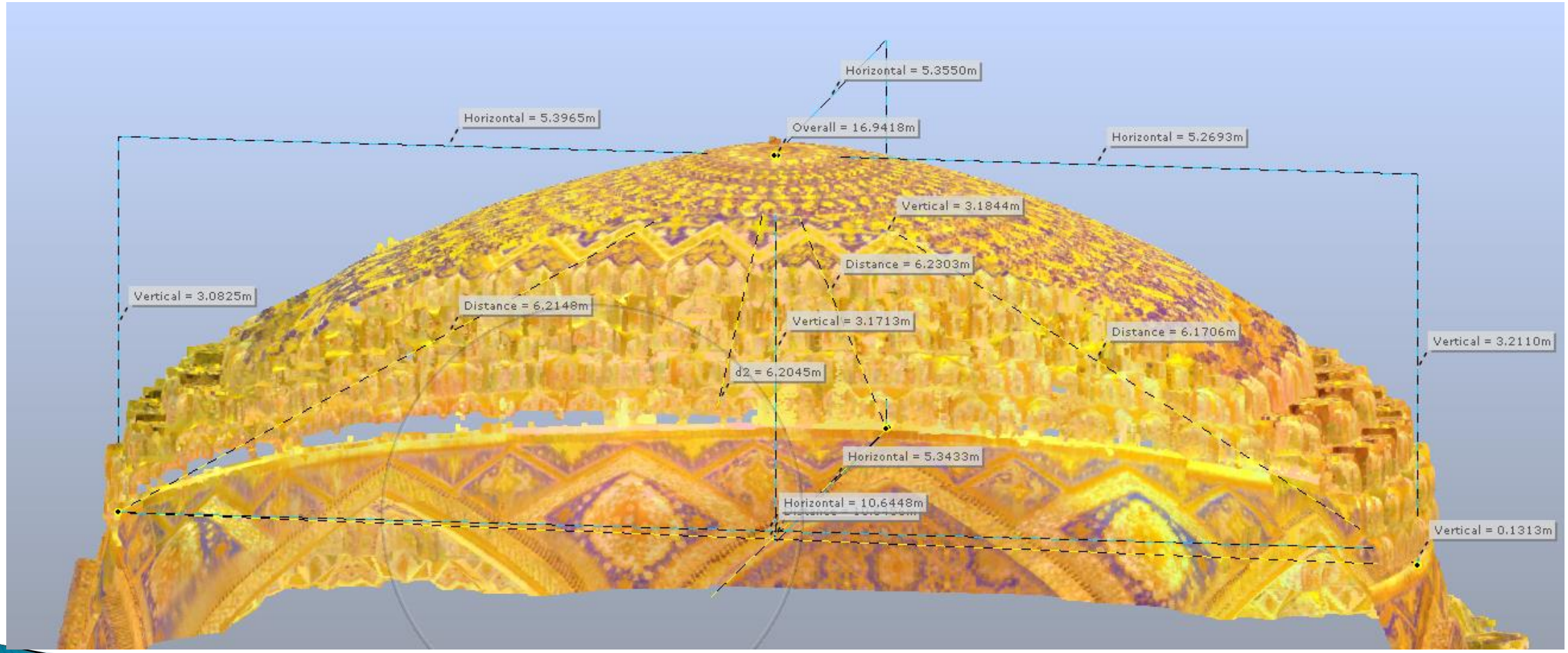
Having 3D scan we can build 3D model and measure all distance

Accuracy:

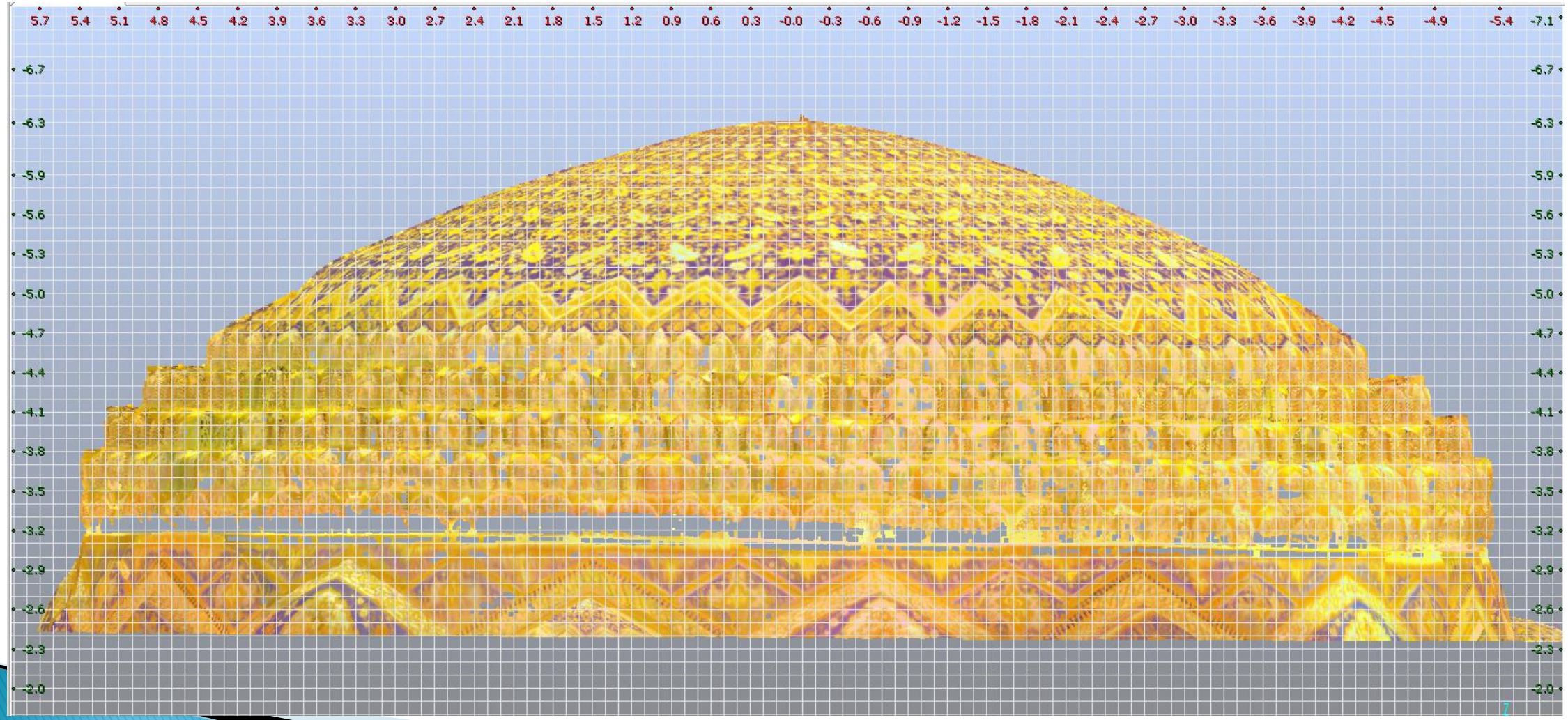
- Distance: 1–2 mm
- Leveling: 0.015 °



Measurement of the geometry of the Golden Mosque cupola in Registan (2)



Measurement of the geometry of the Golden Mosque cupola in Registan (3)



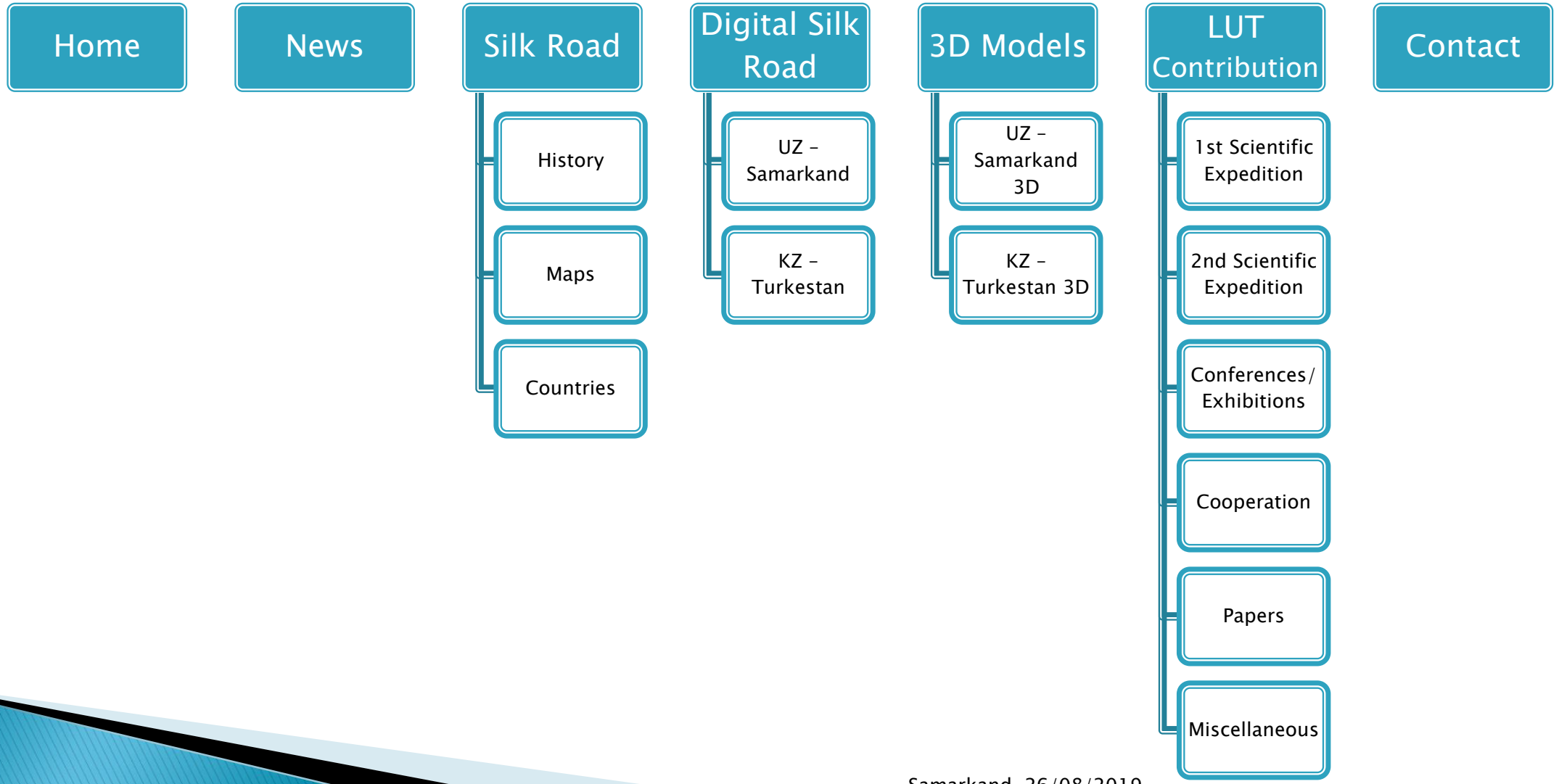
Portal ”3D Digital Silk Road”

SilkRoad3D.com

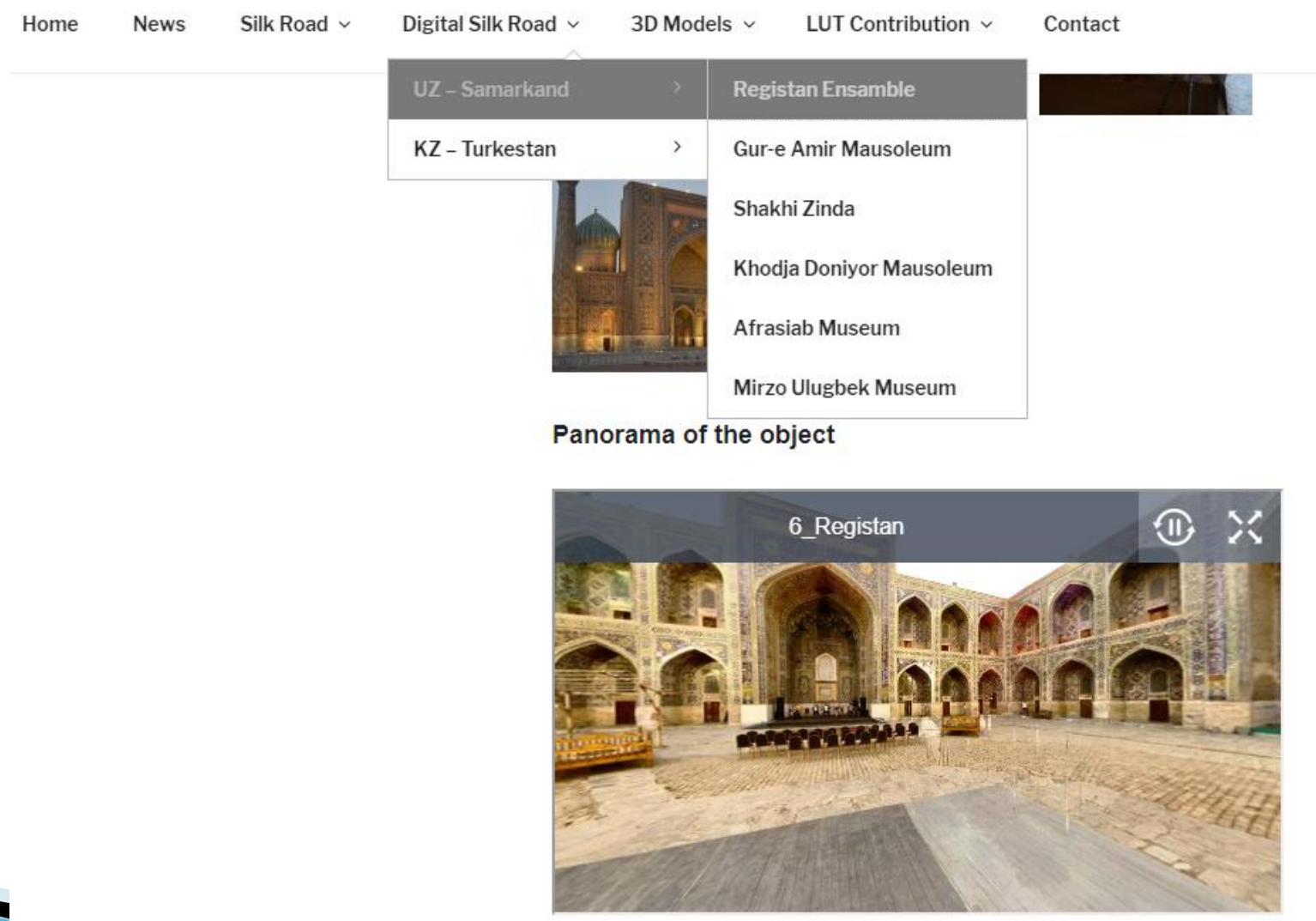
Portal ”3D Digital Silk Road” – aims

- Promotion of the cultural heritage of the Silk Road in new digital media (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

Portal ”3D Digital Silk Road” – structure



Portal ”3D Digital Silk Road” – panoramas



Portal ”3D Digital Silk Road” – VR

360 images for 3D glasses

Instruction

Portal ”3D Digital Silk Road” – 3D models

- **Scientific-Experimental Museum-Laboratory of the Samarkand State University in Uzbekistan** (bowls, candlesticks, pitchers, dishes, decorative elements – about 16 objects)

- **Afrasib Museum of Samarkand** (exhibits dating from the second century BC to the 14th century AD: pitchers, dishes and their fragments, cups, bowls, fragments of cornices, an ossarium and skulls – 20 objects)

Portal ”3D Digital Silk Road” – reports

- Scentific expeditions:
  - 1st
  - 2nd
  - 3rd
- Conferences/ Exhibitions
- Cooperation
- Papers
- Miscellaneous

Thank you

We invite you to cooperation

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