

Example measurement results (3D models):



	object	material	number of measurement directions	number of points	number of triangles
1	shuttle on a loom	wood	13	6,42 mln	105 000
2	china figure	ceramics	39	960 000	160 000
3	olive lamp	brass	15	4,89 mln	165 000
4	Nativity scene	wood	32	40 mln	670 000
5	volume reference	wood	28	800 000	90 000
6	weight reference	iron	21	4,78 mln	60 000

OGX|OPTOGRAPHX  
 Warsaw University of Technology, Institute of Micromechanics and Photonics  
 Boboli 8 Str. 02-525 Warsaw, Poland  
 +48 22 234 82 83  
 r.sitnik@mchtr.pw.edu.pl  
 http://ogx.mchtr.pw.edu.pl



## INTEGRATED SYSTEM FOR SURFACE MEASUREMENT OF CULTURAL HERITAGE OBJECTS

built at Warsaw University of Technology, Faculty of Mechatronics by OGX research group

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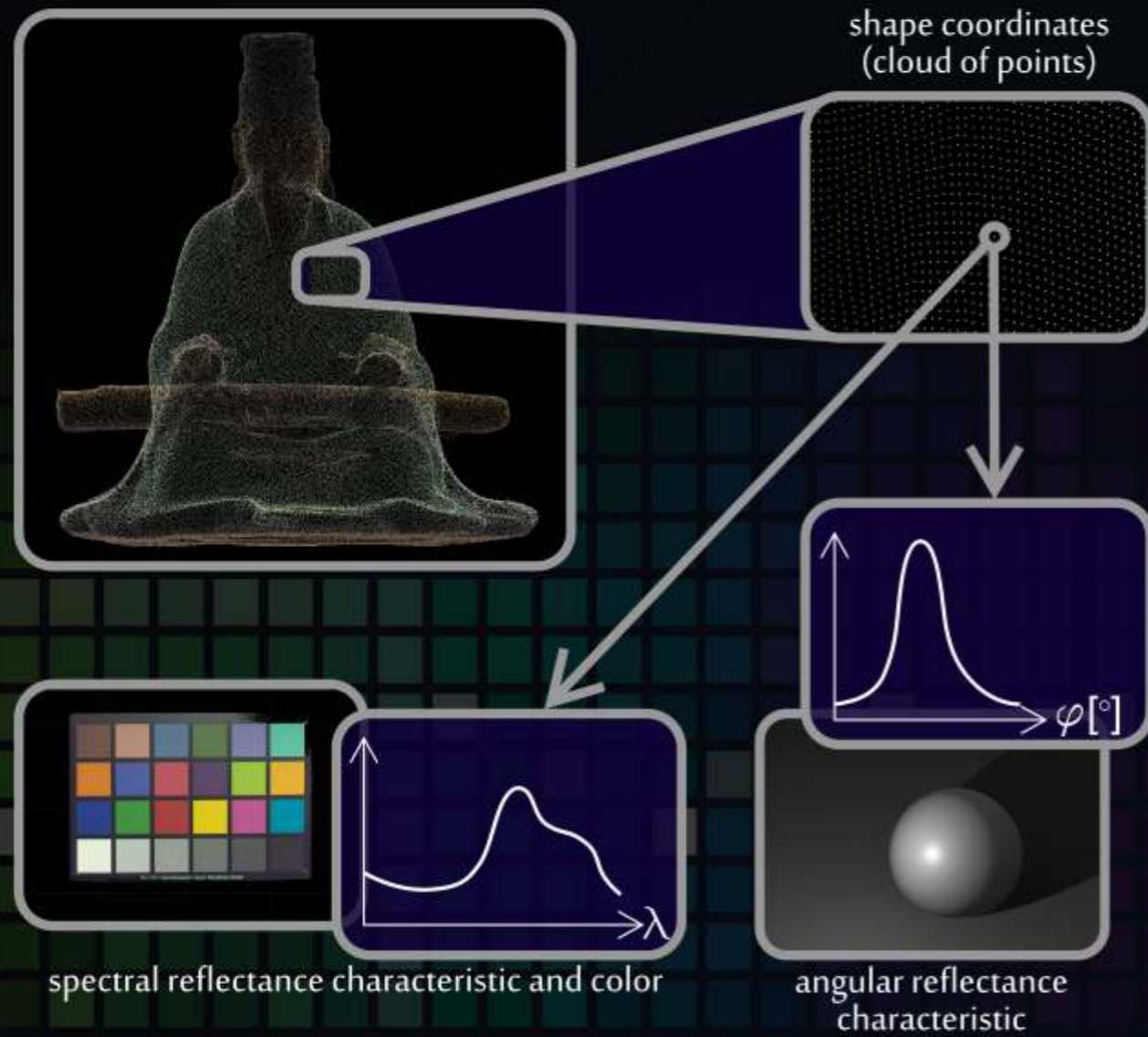


measured object



virtual model

## Integrated measurement:

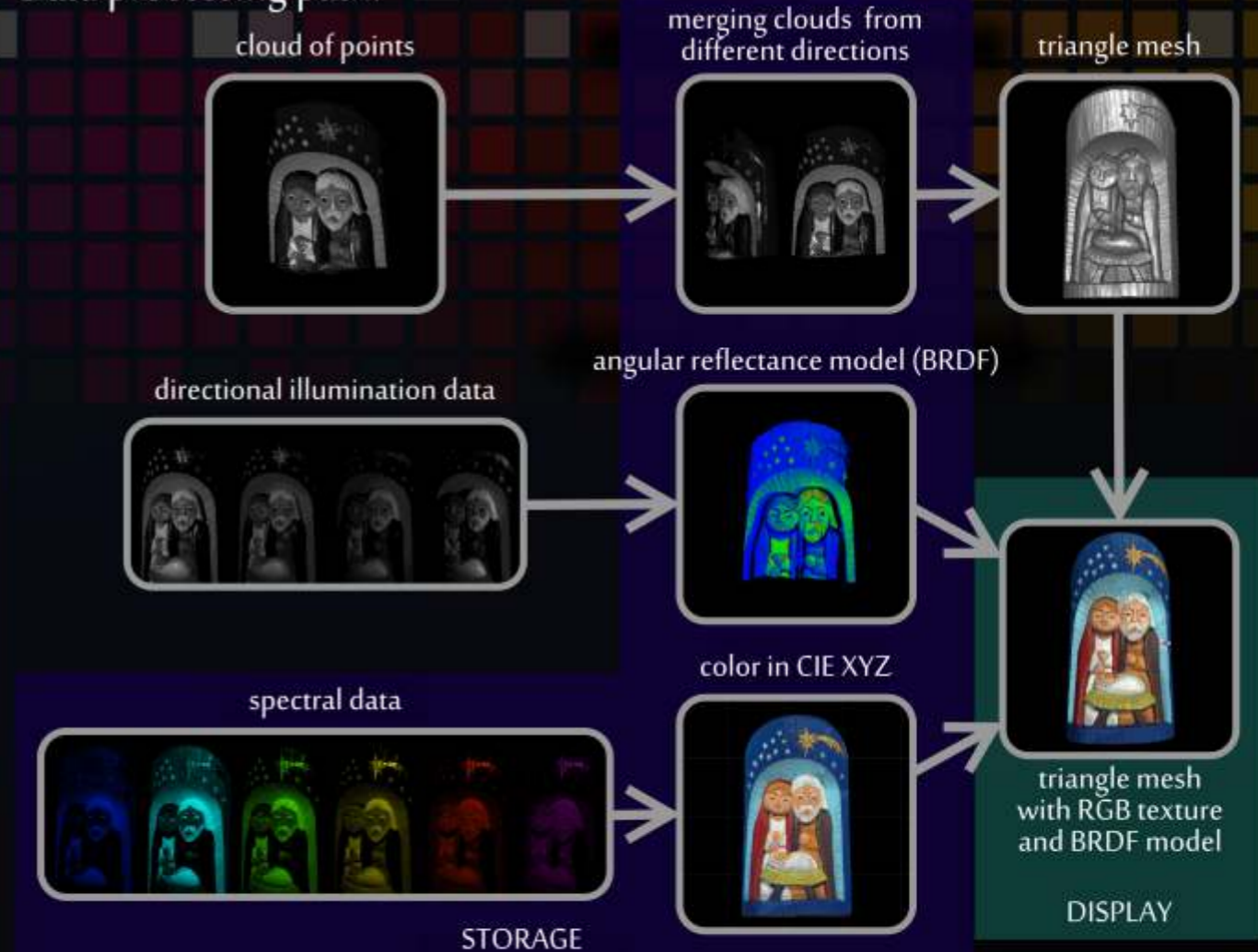


## Measurement system parameters:

- operating volume: 300 x 200 x 100 mm
- shape measurement uncertainty: 10  $\mu\text{m}$
- spectral reflectance uncertainty (RMS): 1.5%
- color measurement uncertainty ( $\Delta E$ ): 5
- angular reflectance uncertainty: 10%
- number of spectral channels: 10
- method of spectral channels separation: interference filters
- number of directional illuminators: 16
- detector resolution: 4872 x 3248
- projector resolution: 1920 x 1080



## Data processing path:



The aim of the project titled "Digitalization and 3D reconstruction of European cultural heritage objects" was to build an integrated measurement system, capable of automatic measurement of shape coordinates and spectral and angular reflectance characteristics of the surface of artifacts with the use of a single detector. The system uses optical shape measurement method with structured light projection, which results in a cloud of points with shape coordinates. Additionally for every point of the cloud the spectral reflectance is estimated using multispectral acquisition method and angular reflectance is modeled based on reflectometric measurement method. This allows for derivation of color in an independent color space and a faithful simulation of the object's appearance in different illumination conditions.

Developed data processing methods serve for automatic and objective merging of measurement data from different directions in order to establish coherent model of the measured object. The result of the measurement may be applied in digital storage, conservation and display of cultural heritage objects.