САМАРСКИЙ УНИВЕРСИТЕТ
SAMARA UNIVERSITY

NEURAL NETWORK MODEL OF MACHINE PARTS CLASSIFICATION BY OPTICAL SCANNING RESULTS

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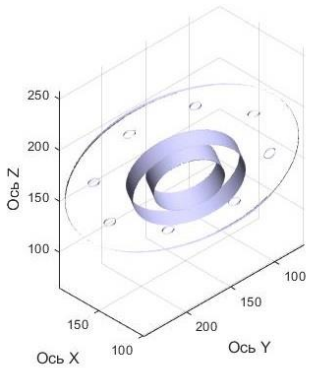
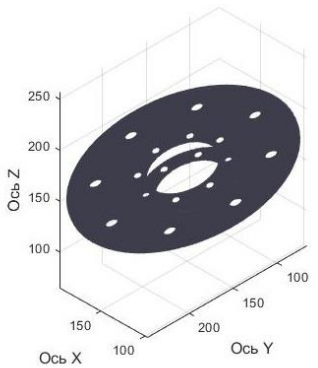
Relevance of work

Robot assembly of complex high-precision products is constrained by the following factors:

- the requirements of the autonomy of robotic systems in making a certain set of production decisions, depending on the geometric parameters of the parts coming to the assembly.
- high requirements for the accuracy of manipulation of assembled parts, including adapted positioning taking into account feedback on the power factor.

define type of the part delivered for assembly and surface components for their spatial orientation





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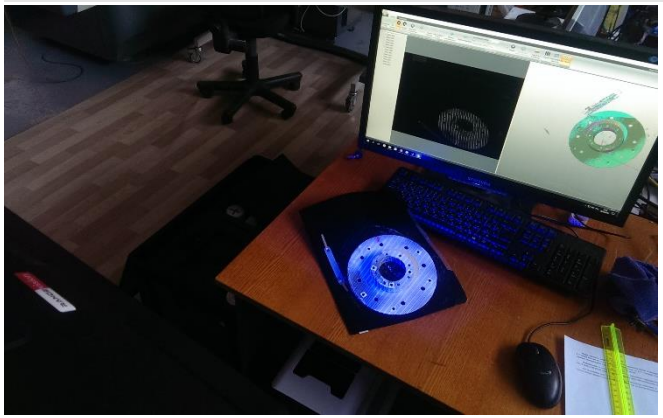
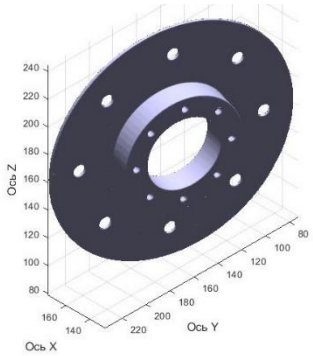
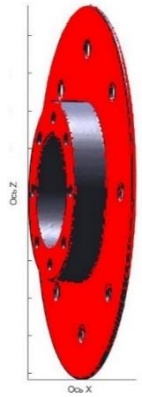
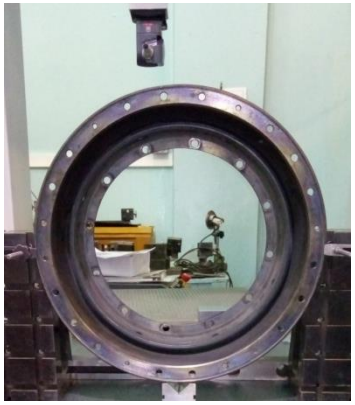
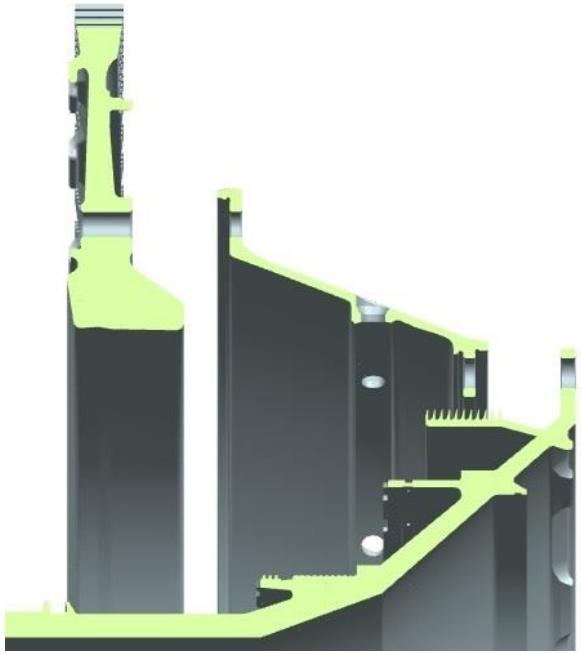


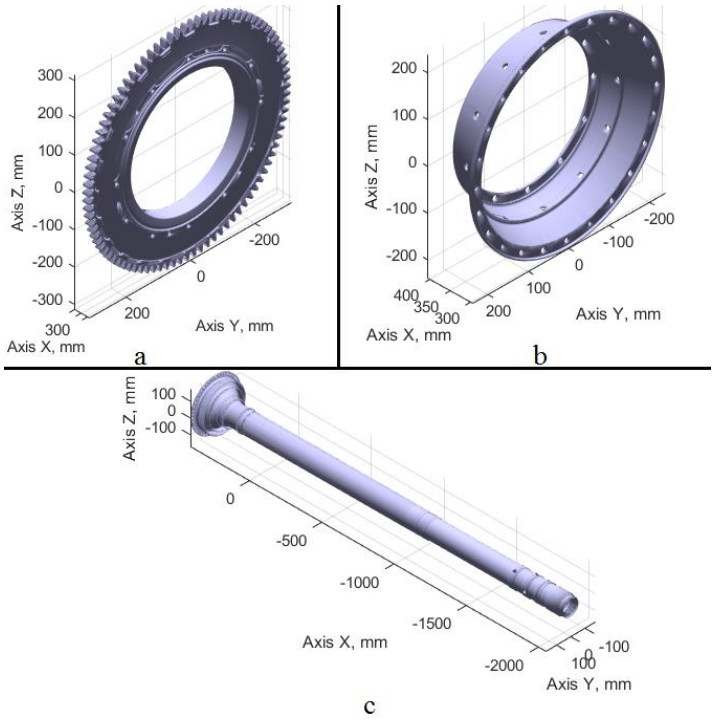




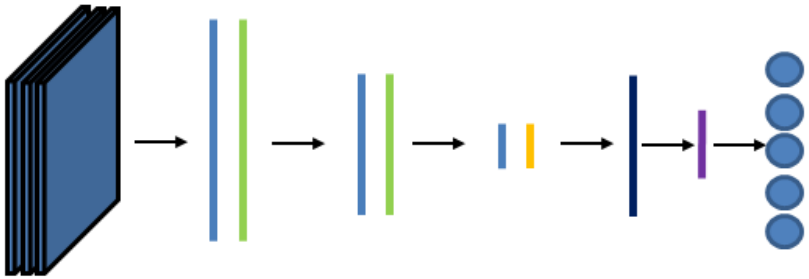
- **Purpose of work.** solve the task for classifying the parts to a known type after their measurement using optical scanners.
- **Object of study.** Low pressure turbine rotor parts.

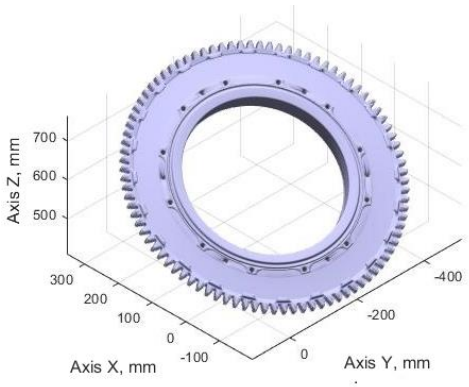






Experiment Results





A training sample of 4000 objects was created, as well as a test sample containing 400 objects. The sample included shaft, spacer and disk parts.

For each of the objects, 3 projections-images in shades of gray, 112 × 112 pixels in size, were compiled.

The neural network for classification was implemented in Python. Organization - convolutional neural network.

$$\delta_{class} = N_{corr\_c} / N_{total}$$

N_{corr_c} correctly classified objects

N_{total} total number of objects

Result: One hundred percent efficiency (δ_{class} = 1) showed a network with three layers of convolution, with 50 eras of training.

Conclusions

The results obtained allow us to conclude that using the developed neural network model allows the classification of parts obtained after measurement and saved in * .stl format.

Further development of research is:

1. Conducting experiments on the classification of parts measured on an optical scanner;
2. Development and implementation of segmentation algorithms for individual surfaces of parts of different classes.

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