INTERACTIVE PROTOTYPE
FOR FRACTAL ANALYSIS OF MEDICAL IMAGES

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Breast cancer remains one of the leading causes of female mortality worldwide. Timely diagnosis significantly increases the likelihood of successful treatment, but the accuracy of detecting pathologies at early stages often depends on the quality of the image and the experience of the specialist. Fractal analysis, in particular the multifractal approach, allows to quantify the complexity of tissue structure and can be used to support decision-making when analyzing mammograms [1, 2]. Fractal approaches have already been used in the analysis of medical images of various nature, from histological specimens to breast images, some of which exhibit morphological characteristics that are well suited to fractal description [3].

The aim of this work is to create a prototype of a digital service that allows testing various methods of fractal analysis of medical images. A basic web platform has been implemented with the ability to process mammograms directly in a browser, without installing software. This approach is especially important given the limited resources of medical institutions in Ukraine, which is suffering from a full-scale war, as well as the high cost and complexity of implementing off-the-shelf foreign solutions. Online access to the tool allows doctors to upload a mammogram, get the processing result and visualization without the need for additional settings.

The developed programming prototype implements two approaches: classical fractal analysis (box-counting) and the DBC method (differential box-counting, which takes into account the brightness of pixels). Image preprocessing (breast extraction, normalization) and visualization of the results in the form of graphs have been added, allowing to assess the characteristic of the image and the value of the D parameter. The current results demonstrate the functionality of the implemented methods, but further research is needed to identify a stable correlation with diagnoses.

References

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