POLITECHNIKA ŚLĄSKA

WYDZIAŁ INŻYNIERII BIOMEDYCZNEJ

Wykorzystanie metod analizy i przetwarzania obrazów mikrotomograficznych w pomiarach szerokości kanałów muszli ślimaków z praktyczną weryfikacją ze wzorcem

-ROZPRAWA DOKTORSKA-

AUTOR
mgr inż. Michał Tomasz Walczak

PROMOTOR
prof. dr hab. inż. Robert Koprowski

DRUGI PROMOTOR
prof. dr hab. n. farm. Paweł Olczyk

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Summary of PhD thesis

This work presents the operation and specific features of the measurement algorithm proposed for research on the patency of snail shells. The algorithm was created to provide measurement methods for research related to the assessment of the impact of the snail's reproductive strategy on the development of the shell closing apparatus. To find out this influence, it was necessary to trace the diameter of the maximum sphere that could be described in the cochlear canal, simulating the path of the embryo during its birth.

The doctoral dissertation begins with a description of the biological foundations related to the shell structure of land snails, which result in the specific profiling of the algorithm. The first pages also summarize other currently available measurement methods, as well as methods used so far in research on the geometric properties of snail shells. The theoretical introduction also describes the basics of microtomography - the image acquisition method used to obtain data used during the research.

In order to prove the thesis regarding the usefulness of the proposed algorithm, the author proposes several methods to examine the measurement accuracy of the algorithm as well as the influence of the selection of control parameters on the course of measurements. The tests were carried out on two types of test data, digitally generated and data created in the acquisition process using a microcomputer tomography. Accuracy tests also include the influence of initial parameters on the algorithm's operation. A method of managing the algorithm's workflow was discussed so that it was possible to indirectly change the algorithm's tendency to favor the straightest line or the widest possible cross-section.

The dominant part of the work is the description of the algorithm on the example of its implementation using the .m script in the Matlab environment. The script used in the research on the patency of snail shells has been commented and described, marking each of the steps needed to prepare the data and their further use.

After reviewing the features and capabilities of the algorithm, the work focuses on the results of research carried out on samples of snails representing various reproductive strategies, proving the existence of the influence of reproductive strategy on the development of the snail's defense mechanisms.