

NEW METHODS FOR DESIGNING THE MOVING ROBOTS USING BIOLOGICAL PROTOTYPES

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A new approach of special problem-solving methods at the initial design stages is presented. The methods are based on analysis and the combination of technical or biological objects and a legged robot. New robots can be created by applying the introduced method. Merging the kinematics of a salamander with the kinematics of an octopod allows us to develop a new eight legged robot with only three actuators. Combining a flying insect and a piezotransducer with extremities supplies a new object - the piezomicrorobot [1]. We use the trawling wave of the Holothuria for movement of multi-legged robot through a pipe. Biological objects as prototypes are used preferably due to the fact that during millions of years of evolution their principles of motion have been developed contemplating minimal energy wasting. The developed method is based on the well-known principle known as the combination of alternative systems. It enables the transfer of characteristics and structure from one object (i.e. its kinematics) to another object leading to new desirable characteristics or optimisations of existing technical objects. In our opinion, there exist only 4-5 main principles of functioning of biologic objects for providing the necessary trajectory of the legs movement. Several actuators for moving each leg are used in known walking robots. Our principle allow using each actuator for moving several legs. Thus, we managed to minimize number of actuators at the robot. It opens new possibilities of mobile robots considerable miniaturization in the future. We have developed essentially new tiny moving system. As the case and as the actuators the piezo-bimorph-plate are used.

The analyses of biological objects and alternative technical systems offer new opportunities for the engineers. That analysis is an indistinct provisional approach of solving a technical problem. The described technique does not supply convertible constructive drawings immediately, however, it provides new solutions with new ideas. Furthermore, it is possible to develop essential new-legged robots with minimal number of actuators.

References:

Becker, F., Minchenya, V., Zimmermann, K., Zeidis, I. Single Piezo Actuator Driven Micro Robots for 2-dimensional Locomotion. Aachen: Electro. Proc. Of Workshop on Microactuators and Micromechanisms, 2010.