

SUMMARY

The main subject of the thesis is adaptive architecture, what value it adds, and in what way it may fulfil new functions. The thesis presents the origin, development and the current state of knowledge of adaptive architecture. It discusses the influence of development of CAD methods, parametric design and digital fabrication, and describes how it has changed the approach to architecture. Then, the subject and the range of the research underwent analysis, followed by an array of examples of past and current investigations undertaken both in academic institutions and by independent architects, designers, creators and artists. The thesis presents and discusses a range of innovative buildings that are compatible with the trend in adaptive architecture. The main subject of the thesis is a design and realization of an adaptive architectural panel of variable geometry that is capable of controlling selected properties of an architectural space if selected stimuli are initiated.

Investigations presented in the thesis were carried out in compliance with bionic rules. Selected elements and processes of the nervous system of beetles of the family Scarabaeoidae were analysed and interpreted. Next, comparative analysis of selected elements used in construction of adaptive architectural systems was carried out. Observations that followed served as a basis for a diagram which inspired creation of a new adaptive mechanism. The range and method of the impact of the designed panel were determined. The thesis discusses all stages of the investigations into the development of the experimental model. Results and conclusions were fundamental to the design of the adaptive panel. By means of 3D printing and a CNC laser, it was possible to create a fully functional prototype. The adaptive panel was equipped with a stepper motor with epicyclic gearing. Steering the engine is facilitated by an ARDUINO module on the basis of information from a sound sensor. Operation of the whole system is based on a programme written in C++ language.

mgr inż. arch. Bartłomiej Bieńkowski