New Design –Integration of Art and Technology

Wojciech Bonenberg

Faculty of Architecture, Poznan University of Technology,
Nieszawska 13C, 61-021 Poznan, Poland
wojciech.bonenberg@put.poznan.pl

Abstract. Over the past years, many research methods have been developed to improve designing systems. There is, however, great need for research in this field in order to find new techniques and solutions appropriate for modelling structures of innovative products. This paper puts forward methodological and practical evaluations of some aspects of design creation. Author presents main principles that underline methodological perspectives for a closer integration of art and technology in design of innovative products. The paper presents two key research problems: a) possibility of combining traditional design methods with new computing tools. b) design methodology as a basis for multidisciplinary innovation process. Examples used to illustrate the methodology include design of an architectural structures.

Keywords: Design creation, design methods, creativity, parametric software.

1 Introduction

This paper presents a method of supporting creativity of architects-designers by employing parametric computer software.

The method was tried out in a form of an experiment at the Faculty of Architecture of Poznan University of Technology in course of student workshops on "architectonic design of innovative spatial structures."

2 Preliminary Assumptions

Used method belongs to a group of heuristic methods. Its purpose is to stimulate sub-consciousness, imagination, fantasy and emotional engagement of students. Extending a reason-effect examination, the method aims at obtaining wide range of new fields of creation while solving architectonic problems. It develops ability of creative thinking and creativity itself. The method is a synthesis of long time didactic experience based upon use of Synectic Methods [1] and Brainstorming [2], widened by new opportunities provided by computer parametric software. Heuristic operators are abstractive graphical compositions carried out by students who use parametric software.

C. Stephanidis (Ed.): Universal Access in HCI, Part III, HCII 2011, LNCS 6767, pp. 329–337, 2011.
© Springer-Verlag Berlin Heidelberg 2011

Interactive graphical forms observed at a computer screen are interpreted as symbols which are supposed to stimulate creativity. We assume that inspirations established by such forms enable to unearth and express even the most hidden sub-conscious connotations. Pictures generated by computers, due to their contraction and variety, may make minds free from any unimportant details and apparent restrictions. Diversity of inspirations is crucial at the beginning of a process of creation and it poses a type of a platform between a description of task and a solution of problem. Stimulation of creative thinking forces unconventional connotations between ideas and it increases probability of finding of an innovative solution [3].

3 Methodical Stages

The method consists of six separated stages:

1. Determination of a 'search' field.
2. Inspirations and analogies (supported by use of computer parametric graphics).
3. Connotations.
4. Generation of ideas, making a field of use more precise.
5. Analysis of practical opportunities.
6. Practical designing solution.

Scheme of relations between above-mentioned stages is presented in the Fig. 1.

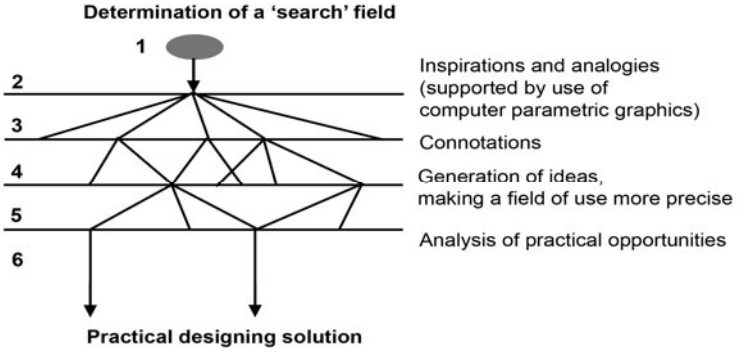

Fig. 1. Scheme of relations between main stages of the method

When determining a field of search two rules are taken into account: at first, a problem must be accurately and clearly described, nevertheless, on the other hand a task must not be too restrictive. It is necessary to remember the more detailed task is the more restricted authors of ideas are.

At the stage of inspiration the work is carried out in form of 45 minute group sessions. A group consists of 4-5 students. One of them, using a computer, creates interactive parametric pictures. Other participants, on the basis of the computer graphics generated parametrically note their connotations related to observed pictures.

The purpose of this stage is obtaining the largest number of solutions of a particular problem.

At this stage it is important to release sub-conscious connotation processes, look for inspirations from different fields of intellectual activity, even those 'located' quite far away. An effective activity is a trial of assignation of names to graphical compositions, similarly like it takes place when names are assigned to pictures of non-objective art type. Such names also stimulate other language-based connotations derived from metaphors, poetic symbols, a world of fantasy and fairy tales. A significant element of this stage is generation of a large number of connotations which could be used as basis for more practical ideas in terms of a problem solving.

Next stage is an operational action. It lies in 'excavation' of those elements which must be retained, and their gradual modification to a more realistic forms. Analogies and metaphors stimulated by abstractive computer picture are subject to intellectual transformation. Anything unclear or questionable must be accurately explained and be understood by all members of a group. At this stage one uses the Checklist method which helps to select the most promising ideas [4].

At the next stage an individual work begins - it leads to development of a practical design solution. Each student randomly selects an idea which will pose basis for further independent work. Depending on specificity of a problem students use one of the standard designing methods: Method of Successive Approximations, Decision Trees, Value engineering (VE), Multi-Criteria Decision Analysis (MCDA).

4 The Examples of the Method in Practice

The examples presented hereunder illustrate effects of the method used to solve the following problems:

1. Buildings in seismic areas.
2. Suspended Housing Project.
3. Mobile roof and wall structure.
4. Self-changing facade.
5. "Building - chameleon": a building reacting to variable environment and functional parameters.

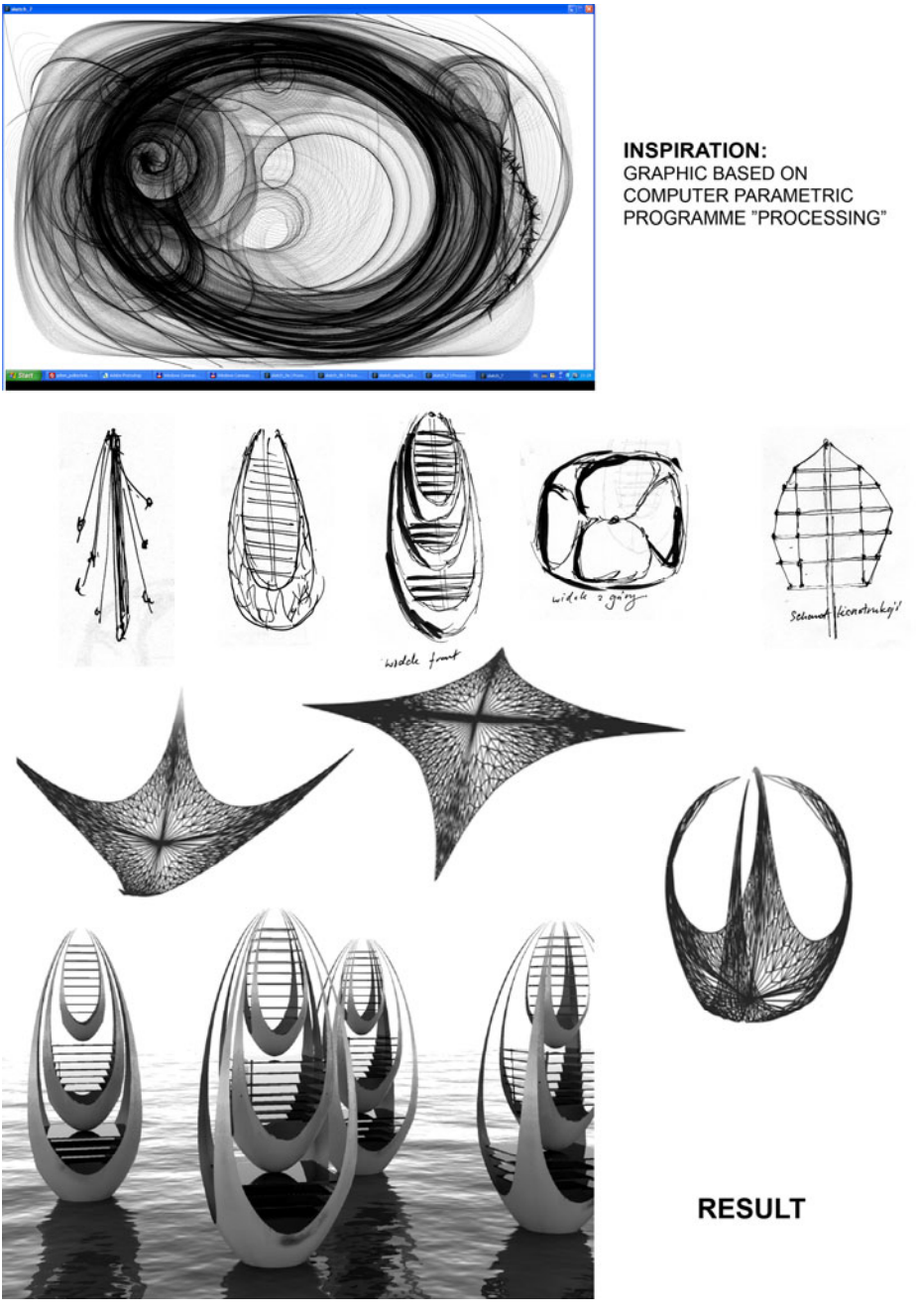

Fig. 2. Example 1: Buildings in seismic areas. Project developed at the Faculty of Architecture, Poznan University of Technology, by R. Lesniczak, under supervision of W. Boneberg

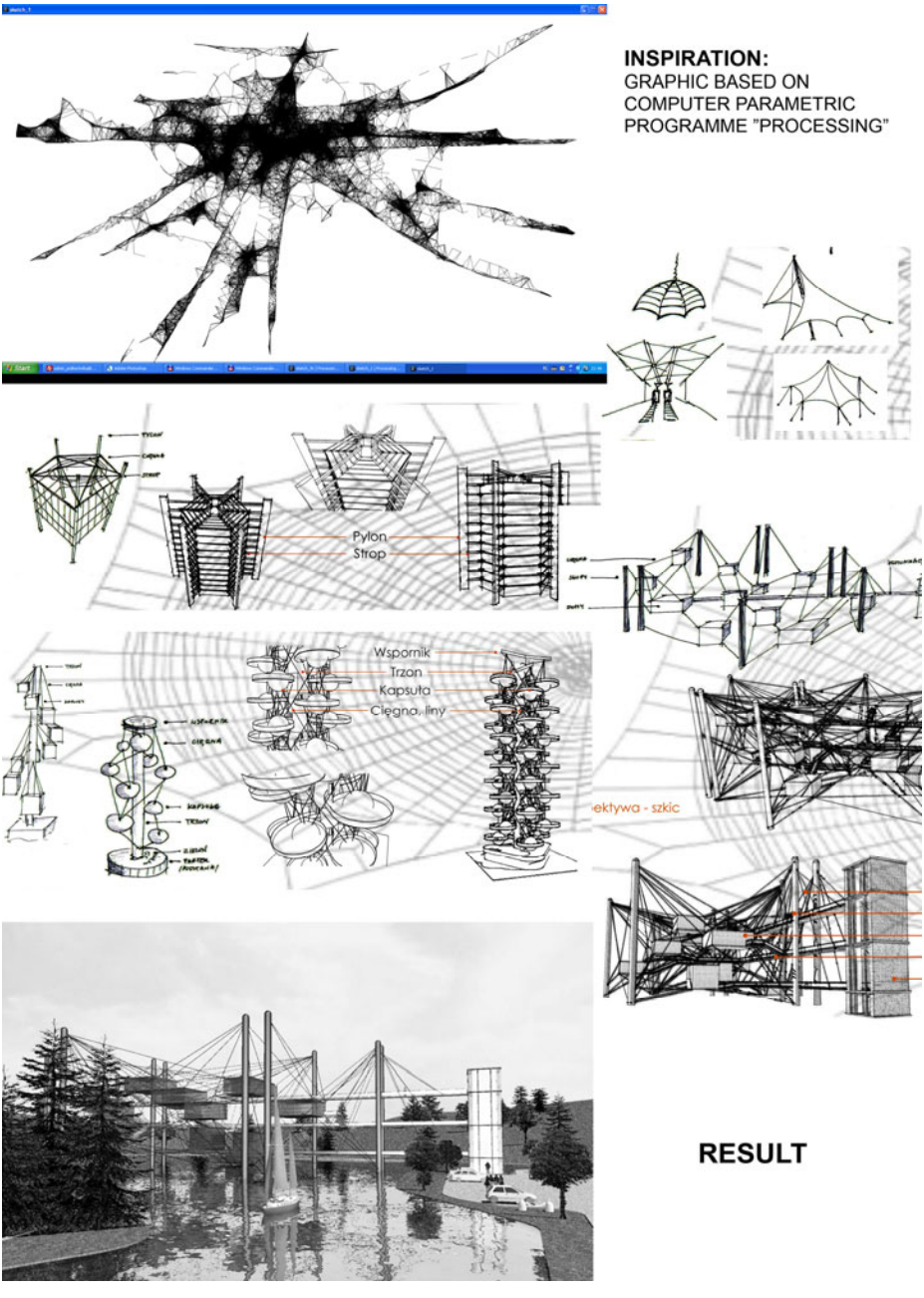

Fig. 3. Example 2: Suspended Housing Project. Project developed at the Faculty of Architecture, Poznan University of Technology, by M. Karolczak, under supervision of W. Boneberg

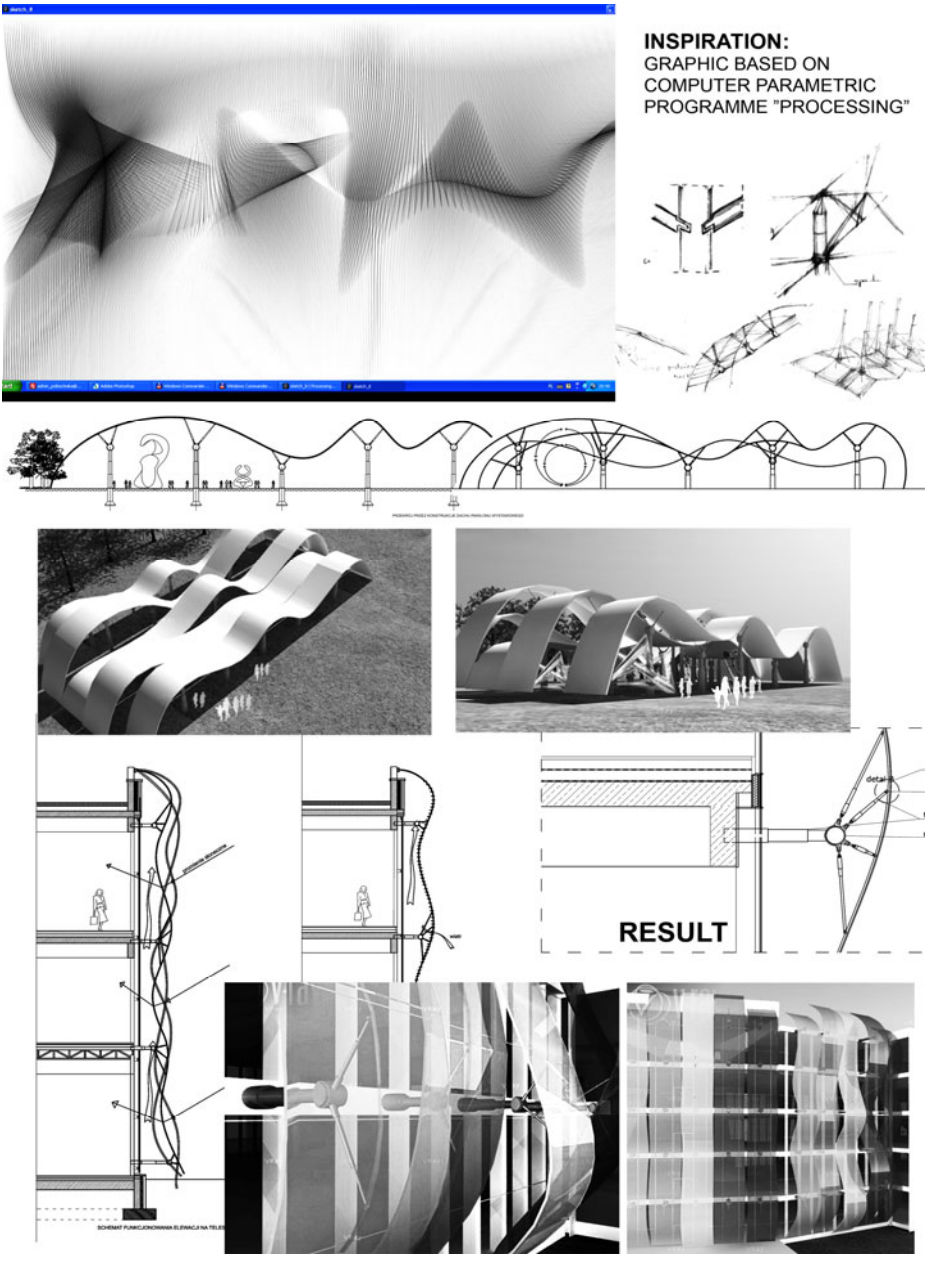

Fig. 4. Example 3: Mobile roof and wall structure. Project developed at the Faculty of Architecture, Poznan University of Technology, by I. Mlodzikowska, under supervision of W. Boneberg

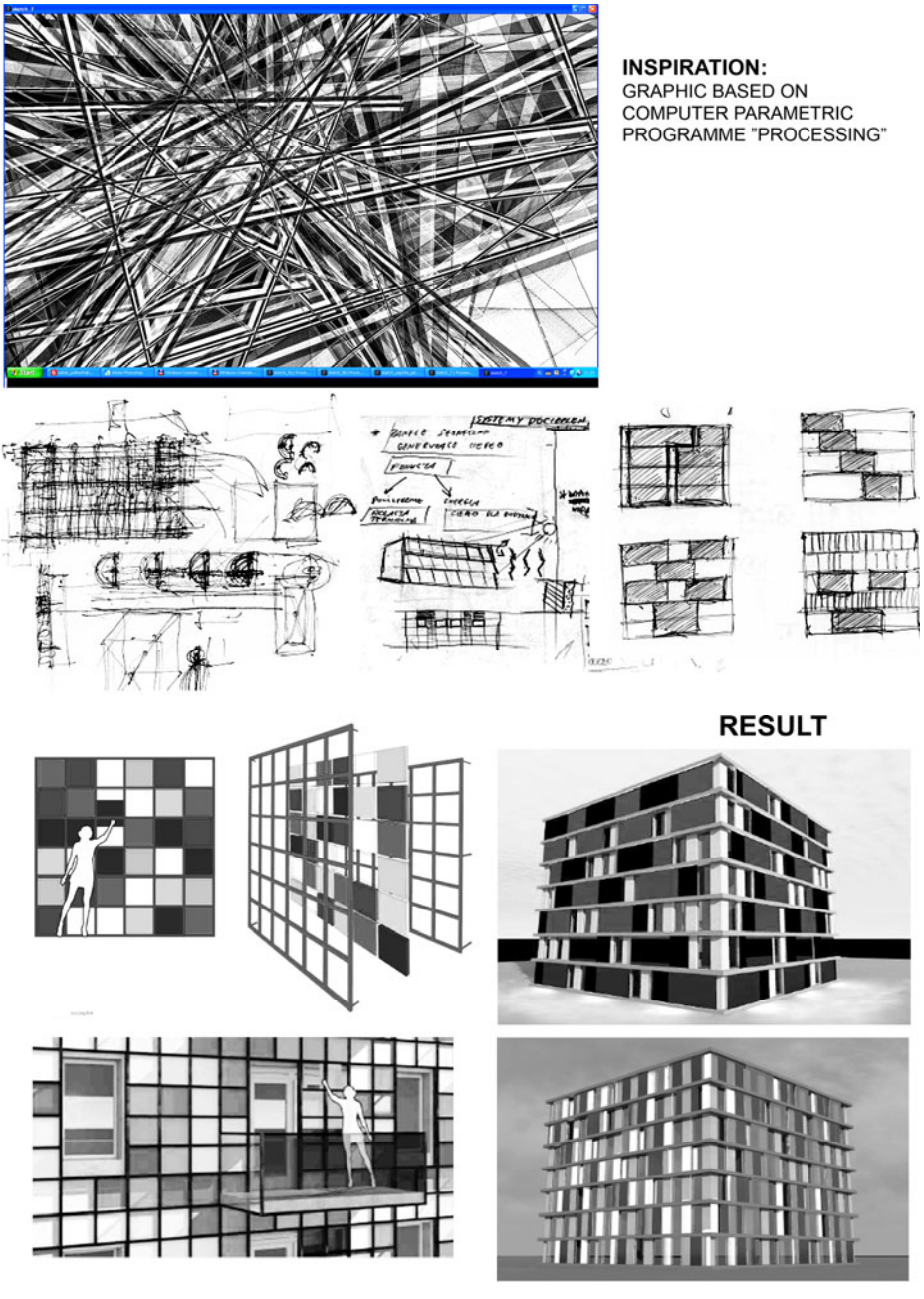

Fig. 5. Example 4: Self-changing façade. Project developed at the Faculty of Architecture, Poznan University of Technology, by J. Pieprzyk, under supervision of W. Boneberg

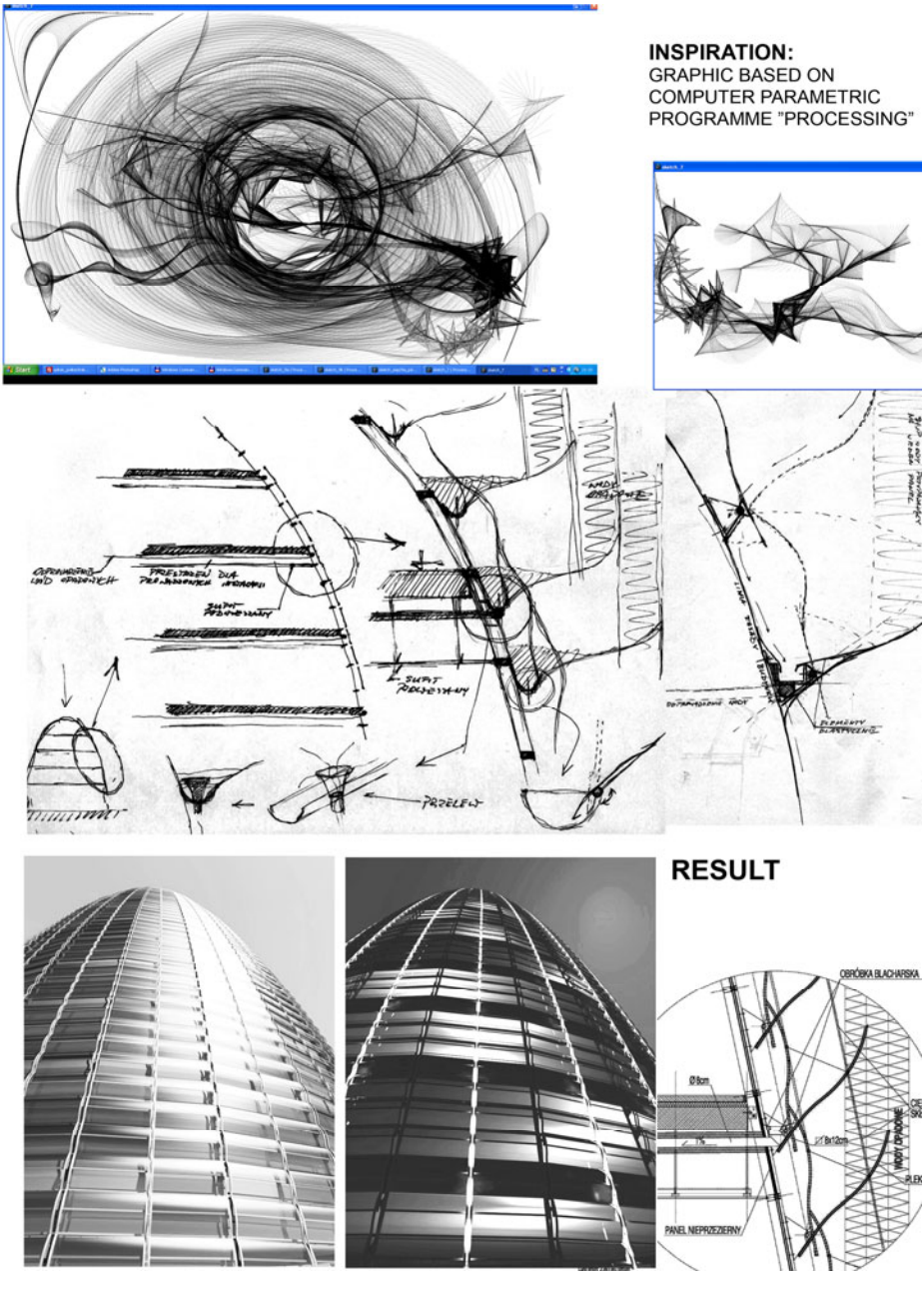

Fig. 6. Example 5: "Building - chameleon": a building reacting to variable environment and functional parameters. Project developed at the Faculty of Architecture, Poznan University of Technology, by W. Skowronek, under supervision of W. Boneberg

Summary

The above examples obtained during the experiment show effectiveness of the proposed method in comparison with the solutions of the same problems received in traditional way. Concluding, it is worth emphasizing that this is an original way of use of parametric software in the earliest stage of designing process. Current use of the parametric software is limited to advanced stages of the designing process that refer to functional, structural and compositional elements. Essence of the presented method lies in integration of abstract parametric graphics (treated as non-objective art), with idea-stimulating phase of design work which is a source of new technical solutions.

References

1. Gordon, W.J.J.: Synectics: The Development of Creative Capacity. Harper & Row, New York (1961)
2. McFadzean, E.S.: Improving Group Productivity with Group Support Systems and Creative Problem Solving Techniques. Creativity and Innovation Management 6(4), 218–225 (1997)
3. Bonenberg, A.: Ergonomic aspect of Urban and Social Dynamics. In: Vink, P., Kantola, J. (eds.) Advances in Occupational, Social, and Organizational Ergonomics, pp. 837–846. Taylor & Francis Group, Boca Raton (2010)
4. Zwicky, F.: Discovery, Invention, Research - Through the Morphological Approach. The Macmillian Company, Toronto (1969)