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GENERATING CONCEPTS WITH MOBILE APPLICATION

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Abstract: Conceptual design is the first and very important part of the whole design process. This is the phase when the designer engineer analyses on the market existing similar products, complete them with his or her own ideas and generating new solutions. In a lucky situation the designer can generate all the possible solutions of the product. But the whole palette of all the possible solutions usually so extremely huge that a human person cannot look them through. In this case the help of the computer is indispensable. Nowadays rushing world smart phones know everything. There are applications for almost anything even for mechanical engineers to help their everyday routine tasks. In this paper the author makes a suggestion for a mobile application that is suitable for generating concepts of products.

Keywords: *design theory, design methodology, CAxx, mobile App*

1. INTRODUCTION

In previous researches a method has been developed that is capable of generating various solution variants by computer during conceptual design. [1], [2] For applying this method a computer software was developed in a VisualBasic.NET environment. The software generates possible solution variants from the user-defined functional subassemblies using the user-selected mathematical model. The set of solution variants can be narrowed with the help of a user-defined rule system, thus eliminating ineffective or not very promising solution variants. This allows faster evaluation of variations.

In the last years several student tasks have been prepared at the Institute of Machine and Product Design at the University of Miskolc in the topic of design methodology. With these tasks students have learned the basics of conceptual design. Based on their projects, a list has been created that contains frequently recurring functional subassemblies. Thus, the software that was previously created contains a list that further simplifies the user's task: we can choose elements from the existing list of functional subassemblies. With the spread of compact smartphones, simple applications have become useful tools for our everyday life and therefore the study suggests a mobile application.

2. CONCEPTUAL DESIGN

In previous studies and papers Computer Aided methodological Concept Building (or CACB) was introduced [1], [2]. In *Figure 1* logical steps of this method can be seen. Before elaborating the design task, it should be analysed. The tools of this analysis are market research and the investigation of patented solutions. In parallel with that customers' requirements should be found and defined. These requirements should be evaluated and ranked with the designer's eyes, because these are the basis of the evaluation at the end of the concept building method. All the possible functional subassemblies should be defined during the market research and the analysis of patented solutions. Product structures or

solution variants can be generated from these subassemblies. These variants should be evaluated by the designer. The optimal solution that is the result of the concept building is the one that fulfilled all the evaluation criteria.

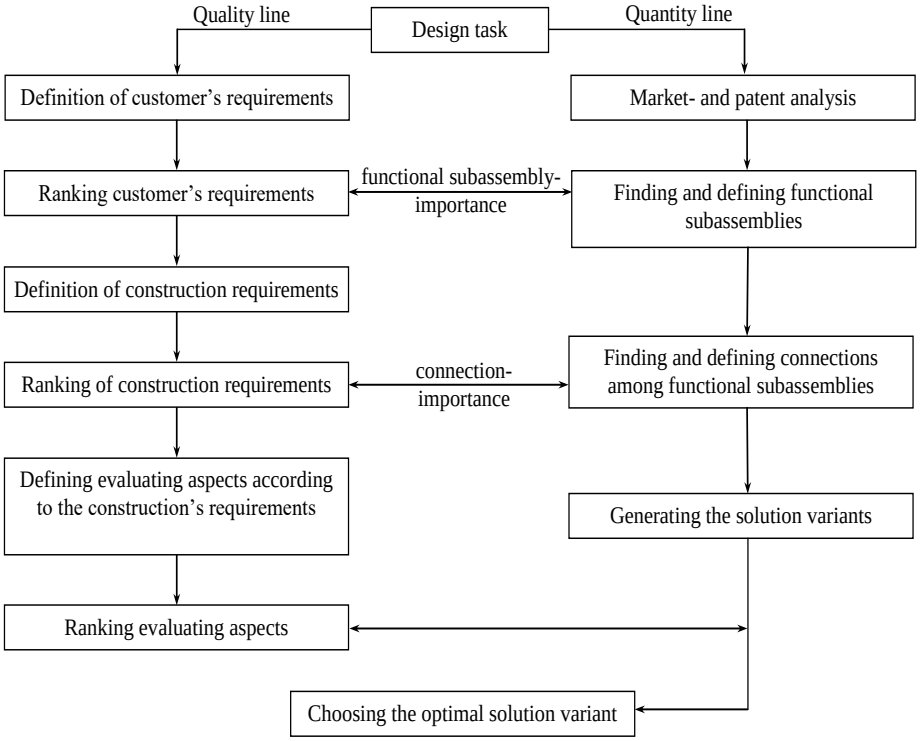

Figure 1. Logical steps of the suggested conceptual design process

Figure 1 [1] focuses on the main scope of previous researches; it summarises the phases of the conceptual design. Suggested method implies a relatively simple algorithm, so the process is adaptable for computer. The introduced method consists of a quantity and a quality line. Quantity line makes it possible the designer could pay attention on more aspects, so more functional subassemblies and this way more solutions. Quality line valuates solutions according to different view-points and tightens the solution-space, optionally for one proper solution. In the modern World of our days it significantly facilitates the task of the engineering designer.

Generating variants can be realized basically in two different ways as it is shown in *Figure 2*; on the basis of the fixed or the flexible functional subassembly set. The worked-out method basically deals with two different theories: solution variants generated by varying the functional subassemblies and solution variants generated by varying the connections among the functional subassemblies. According to *Figure 2* two mathematical solutions for both theories are suggested: the binary logics, and the generation of random numbers. As it is shown in this figure, the different generation theories can show different results. These methods do not eliminate the possibility that the results can fall in with each other.

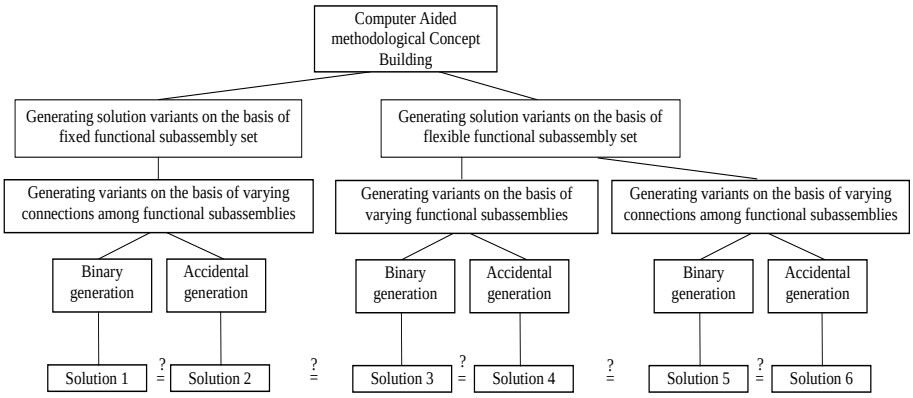

Figure 2. Generating solution variants

3. THE MOBILE APP

The mobile app is being developed in several steps with Google's Android Studio program that can be downloaded free. The first version helps students in the preparation of student projects primarily.

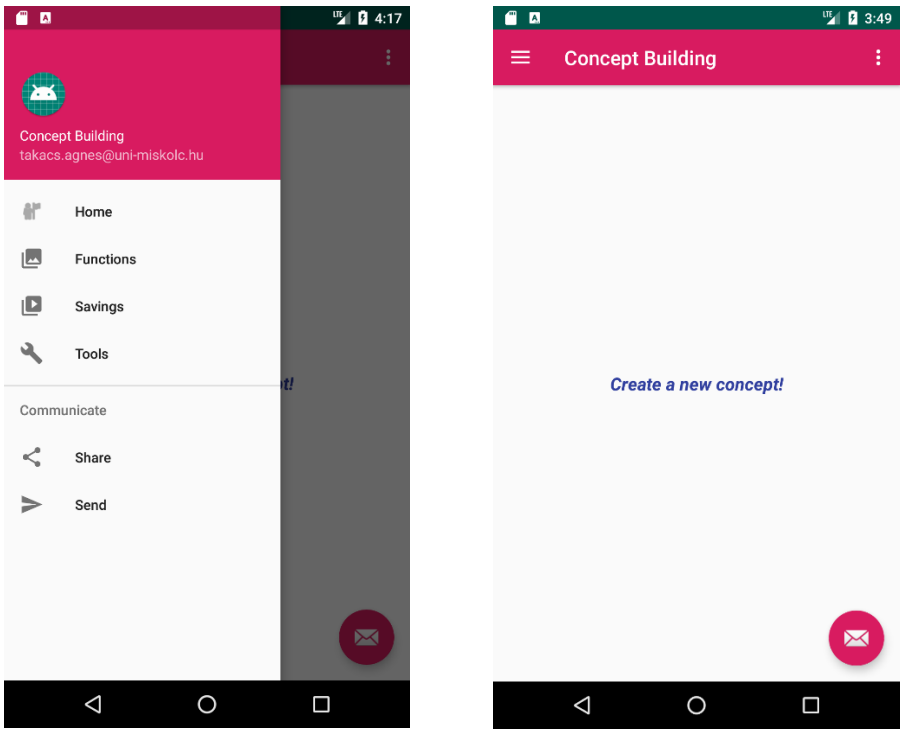

Figure 3. The first visualization of the application

The aim is that the user selects those functional subassemblies from the list of built-in functional subassemblies based on previous tasks that can be considered in the perspective of his/her project and from these functional subassemblies the user can create different product concepts. Each built-in functional subassembly has an icon that the user can drag into the image editing area of the application (right hand side of the *Figure 3*). If the user has selected all the necessary functional subassemblies, then by inserting line elements he/she can create different solution variants. The user can save them as a picture on his/her mobile device.

There is also the possibility to use templates some typical often occurring structure graphs can be found in the application. In this case, the user should only drag the icon of the required functional subassembly in the correct position. This concept can be expanded with additional elements and can also be saved on the device. *Figure 3* illustrates the visualization of the application.

4. SUMMARY

The conceptual design phase, in comparison with the other steps of the whole design process is barely supported by computer. The research intends to fill this gap. The most important aspect is to help brainstorming with an easy-to-use application on mobile devices. In the first phase of the research, the aim is that the students use the application in their own individual tasks in design methodology lessons and build concepts based on their individual ideas. A further goal is to create a version of the application that is capable of generating all the possible solution variants from functional subassemblies selected by the user and then reducing the large number of solutions based on the user-defined rule set, according to the theory in chapter 2 of this article.

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