**THE PRINCIPLE OF „FORM FOLLOWS FUNCTION“ IN GUI DESIGN**

M.Sc. Anguelova S. 1
Faculty of Mechanical Engineering – Technical University - Sofia, Bulgaria 1

**Abstract:** The paper presents a series of exercises on GUI design, specific GUI components and analysis of GUI functionalities. It demonstrates the results of experimentation on the application of the FFF principle (principle of “Form Follows Function”) in the fields of GUI design. We compiled these exercises with the aim of making our students comprehend and become conscious of the fact that the GUI design has its dimensions and that the choice of particular GUI components at the stage of GUI conception is entirely driven by the functional requirements of the system being designed.

**Keywords:** GUI DESIGN, GUI COMPONENTS, ANALYSIS OF GUI, GUI METAPHORS

1. Introduction

According to Wikipedia “Form follows function” is a principle associated with modern architecture and industrial design of the 20th century which states that the shape of a building or object should be primarily based upon its intended function or purpose. The first mention of the phrase could be ascribed to the American sculptor Horatio Greenough, who in 1852 was relating it to the organic principles of architecture. But it was the American architect Louis Sullivan who picked it up, in 1896, in his article «The Tall Office Building Artistically Considered». Sullivan actually said "form ever follows function", but the simpler (and less emphatic) phrase is the one usually remembered. The full quote is thus:

“It is the pervading law of all things organic and inorganic, Of all things physical and metaphysical, Of all things human and all things super-human, Of all true manifestations of the head, Of the heart, of the soul, That the life is recognizable in its expression, That form ever follows function. This is the law.”

In other words, “Form follows function” (FFF) means that design is not just for the look, it is something beyond, helping us to use the products. The above mentioned principle can also be applied to the structure and functionality of a software product and should represent overall engineering requirements for its design [6].

2. Specifics of GUI design

The art and design elements that go into a GUI of a software application / interactive system are extremely important, since the GUI represents both the identity and function of the product. [2]

Users are more and more aware of what software products represent and tend to notice subtle differences in their appearance and behavior. In GUI (Graphical User Interface) design this implies a big number of details that we need to handle, including choosing the right menu items and their correct naming. Good product design supposes the use of appropriate mental (conceptual) models and metaphors.

Generally, the user already has a mental model that describes the task a specific software is enabling. This model arises from a combination of real experiences, previous experience with other software, and with computer systems in general. Before designing an application's interface, it is necessary to determine the user's mental model of the tasks the user is expected to perform. For example in drawing graphic objects, the metaphors include pencils, eraser, brushes, palette etc. In the ideal situation an appropriate mental model results in a nice, clear and intuitive user interface.

The mental model the users have should infuse the design of the application's interface. It should uniform the layout of the application's windows, the selection and organization of icons and controls in the toolbars, and the functionality of the panels. In addition, the user's mental model should be supported by striving to incorporate features such as familiarity, simplicity, discoverability. [2]

In general explicit actions that clearly state the result of manipulating an object and implied actions (like direct manipulation, so called Drag and Drop, See and Point for example) convey the result of an action through visual cues or context and the metaphors for such components are direct. Controls are those graphic objects that cause instant actions or visible results when users manipulate them such as push buttons, radio buttons, checkboxes, text fields etc. are easier to be presented in comparison with the most of more abstract GUI components.

Metaphors are the elements of the user's mental model. They are used to represent concrete, familiar objects and ideas, to make them obvious, so that users can apply set of expectations to the computer environment.

Metaphors should suggest a use for a particular element, but that use doesn't have to limit the implementation of the metaphor. It is important to find a balance between the metaphor's suggested use and the computer's ability to support and extend the metaphor [2, 3].

3. Experimentations during exercises

The essential for us in the case of a GUI design is that we are always interested in the perception of its components and their composition as a whole, since human’s perception of the piece is based on our understanding of all the pieces working in harmony [4].

So the objectives were related to the experimentation at different levels of abstraction of a GUI as an interface framework, holding concrete information content. This experiment is carried out with groups of Master degree students within their laboratory work in Design of GUI and in essence is the testing of FFF approach working with abstract more notions.

The idea standing behind the presented series of exercises is to understand the relations between the form of presentation of some GUI components and their functions.

Within the first exercise which is analytical the students are given with some typical examples of GUI components
more general or more specific the function of which they have to guess giving some range of their own suggestions.

Within the second of the series of exercises performed with the students the aim is to guess the meaning standing behind of an icon (precisely its prototype), that depicts a notion with high degree of abstraction namely “cosiness”.

Most users are familiar with standard components for specific functions, so they already know how to use them in specific applications. It’s essential to use standard elements and only if a new behavior is needed, than is necessary to design a new element for it [1]. But what about when a notion with a high level of abstraction as the one presented below is needed to become a GUI component. In GUI design besides the use of standard and already common components it is important to be able to introduce new and unknown components. It is obvious that these components in fact are a real challenge for designers and digital artists. During a brainstorming session and team idea mapping a data cloud is generated, presenting the collective mental model of the students about the notion “cosiness”.

![Fig. 1 Data cloud of “cosiness” generated by the group of students after the brainstorming session and after the team idea mapping.](image)

Here below are presented some of students’ prototypes for a software icon which could serve for starting a specific application with the name “Cosiness”.

![Some of students’ interpretations of “cosiness”](image)

3. Conclusions

GUI designers should concern themselves with all aspects of concept, functionality and layout before they create a GUI for a product. The application of the FFF principle and the classification of the content according to its levels of abstraction could give them a usable and reliable approach for the GUI design process. The results from the experimentation show that the students find that when applied correctly the FFF approach drives them to rationalize the fundamental concepts and principles of design and help them organize more easily the layout of specific GUI.

4. Literature

6. [http://en.wikipedia.org/wiki/Form_follows_function](http://en.wikipedia.org/wiki/Form_follows_function)