

1 7.2 Icon Design

2 1 Introduction

3 In this essay, I am going to discuss some aspects of visual perceptual mechanisms
 4 careful application of which can support effective icon design and assist visual
 5 search in Graphical User Interfaces: *simplicity* principle to facilitate visual attention,
 6 Gestalt principles for perceptual organization and usage of color as preattentive
 7 feature.

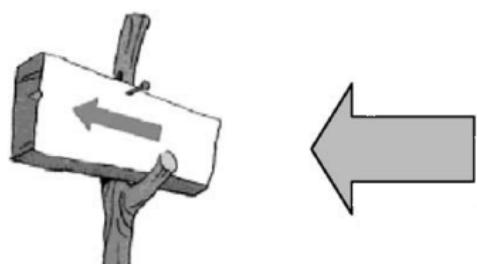
8 2 Perceptual Mechanisms

9 2.1 Visual Attention: Simplicity

10 The graphical user interface includes many situations where the user's attention
 11 must be guided [7]. One of these situations would be visual search in icons, which
 12 may take essential time in tasks on different visual displays. Therefore, factors that
 13 may possibly slow down visual search should be taken into consideration [6].

14 One of these factors was found to be icon complexity: "the more complex icons
 15 are the longer search times on an interface is likely to be" [5]. Icons are regarded
 16 as complex if they contain a lot of details, and simple if only few elements are used
 17 [8]. Reducing its formal and conceptual elements to minimum supports *simplicity*
 18 principle of design. Thus, in addition to aesthetic advantages of applying this
 19 principle for icons, the functional benefit would be optimizing search time [7]. For
 20 example, there are two styles for the "previous" button design in Figure 1. If the
 21 goal is to improve visual search performance, and the target group is not children
 22 that do not mind spending time exploring the system, then it is advised to use type
 23 of design such as the one on the right. [3]

Figure 1: The left icon is more complicate than the right. [3]

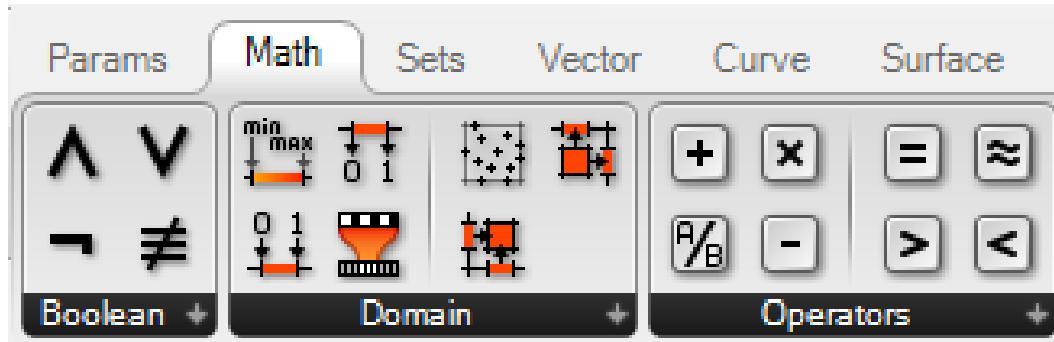


²⁴ **2.2 Perceptual Organization: Gestalt Principles**

²⁵ Perceptual organization is effectively described by Gestalt principles [12] [10]. The
²⁶ principles identify many different factors that regulate which visual elements are
²⁷ perceived as going together in groups [10]. In visual search, if perceptually grouped
²⁸ items are accepted together, the search can be performed within the group. In other
²⁹ words, the grouping of items reduces the number of items to be searched [9].

³⁰ In addition to the powerful *proximity* principle, that states that things that are
³¹ close together are perceptually grouped together, *similarity* principle applied to
³² icons provides consistent visual appearance to the icons of the same nature and
³³ users would naturally group them together. [2]. Features such as color, line thick-
³⁴ ness and structure can be used to keep icons consistently within the same icon
³⁵ group. See Figure 2 for an example of grouping of icons using Gestalt laws.

Figure 2: Grouping of icons through Proximity and Similarity principles in Grasshopper software [1]. There are three groups: “Boolean”, “Domain” and “Operators”; the last two have subgroups. All three groups use different designs elements and positioned in groups of 3-4 icons. Color is used in icons of the “Domain” group.



³⁶ **2.3 Color Perception: Preattentive feature**

³⁷ It has been concluded by numerous researchers, that all the components of a Graph-
³⁸ ical User Interface, including icons, should be designed in monochrome first, and
³⁹ then the color can be applied. Strong color with high saturation may be effective in
⁴⁰ small regions (up to 2 mm in diameter), but should be avoided in large regions [4].
⁴¹ Design of an effective icon within the limitations of a small area of pixels requires
⁴² clarity, simplicity, and careful consideration of what the user will see at the usual
⁴³ viewing distance. [4]

⁴⁴ Color is an element that is preattentively processed and “pops out” [12] when
⁴⁵ used as “unique feature” [11]. Thus, color should be the last element added to

46 icons design, and then used only minimally to reinforce symbolism and guide users' 47 attention [4]. Figure 2 provides an example of effective color application.

48 **3 Conclusion**

49 Knowledge of human visual perceptual mechanisms can provide an effective im- 50 plementation in the field of icon design. In this essay, I have presented how un- 51 derstanding of visual attention, perceptual organization and color perception and 52 careful application of some related principles can improve visual search for icons 53 in Graphical User Interfaces.

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