

A Practical Approach to Icon Taxonomy

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Abstract. There have been various studies and attempts for classifying icons according to semiotic principles. Comparing these systems with each other, it seems the discussion is verging on semantics as much as it is on semiotics. What is needed is a more concrete and practical system. One that can be adopted by designers, even without a very profound understanding of semiotic theory. This paper proposes a practical approach to icon taxonomy and presents survey data that has been gathered to validate some of the basic assumptions of the system.

Keywords: Interface · Icon · Interface design · Taxonomy · Semiotics

1 Background

According to Charles Sanders Peirce all signs can be classified into **icons**, **symbols** and **indexes** based on the signs relation to the referent. In this system an icon is limited to a representation that resembles its object. An index carries an actual connection to its object. A symbol in contrast has no visual connection to its object [1].

In the context of interface design the icon has acquired a more general meaning where it stands for any visual representation that denotes an action, a setting or a content type. Compared to semiotics it covers all the three major phenomenological categories.

There have been various studies and attempts for classifying icons. Webb et al [2] wrote an article about potential ways for evaluating icons already in 1989. The authors recognized three main icon categories:

1. **Picture** – Realistic depiction of system object or function. These are most detailed and easiest to interpret and remember.
2. **Symbol** – Emphasize critical feature by analogy or symbolism. These are simplified and most affected by context.
3. **Sign** – No intuitive connection between icon and referent. These are abstract, simple and association must be learned.

Wang et al. [3] compare this system with others such as Rogers [4], who recognized four main types **resemblance**, **exemplar**, **symbolic** and **arbitrary**, or Lidwell et al's [5] system of **similar**, **example**, **symbolic** and **arbitrary**. All-in-all they compare nine different existing systems and propose one of their own. But categories overlap and different researchers use different terminology sometimes to describe what in essence is the same thing. What is needed is a more concrete and practical system. One that can be

adopted by interface designers and professionals even without a very profound understanding of semiotic theory.

2 A Practical Approach to Icon Taxonomy

Per Mollerup [6] has devised a system for classifying trademarks that is a good benchmark for designing a practical approach to icon taxonomy. To build this system Mollerup has defined the following five rules a functional taxonomy must comply with.

1. It must consist of classes that are distinct. The differences between the classes must be clear so there is no room for misunderstanding to which class an item belongs to.
2. The characteristics the classes are based on should be used consistently and each step in the classification should be based on a single principle of division.
3. There should be no overlapping between classes. Parallel (co-ordinate) classes should be exclusive.
4. Co-ordinate classes should be able to collectively cover all possible entries.
5. The classes should be relevant to the purpose of the taxonomy.

Proposed Basis for a Classification System. Following these rules, two basic classifications for icons can be proposed:

1. Is the icon abstract or concrete?
2. Is the icon logical or arbitrary?

The next step is to figure out how these two classifications could relate to each other, and can they somehow be used to construct a taxonomy tree. To clarify these relations following assumptions need to be considered:

1. An **arbitrary** icon can be either **concrete** or **abstract**.
2. A **logical** icon can only be **concrete**. And therefore an **abstract** icon can not be **logical**.

The second assumption is the weaker one, since the interpretation of whether or not something is concrete can be very subjective. For instance – is a geometric arrow concrete or abstract?

3 Survey Results

The functionality of the proposed main classifications and their relations were tested in an online survey. The purpose of the survey was not to collect extensive data from a variety different user demographics. The majority of the participants were designers, design students and IT professionals, with just a few exceptions. 119 participants took part in the survey, 79 of which were Finnish. In all there were participants with 22 different nationalities ranging from United States and Germany, to Iran and China.

58 % of the participants were male and 42 % Female. The majority of the respondents (49 %) were 30 to 40 years old, with the entire range being between 10 and 57 years.

The participants were asked to describe their skills in using digital devices on a five step range: very good, good, average, poor, or very poor.

66 % of the respondents described their skills as very good, 28 % good, and the rest 6 % average.

They were also asked how often they found it difficult to understand the meaning of interface icons or buttons. This was also measured on a five step range: very rarely, rarely, occasionally, often, or very often.

29 % of the respondents replied very rarely, 40 % rarely, 29 % occasionally, and 2 % often. So it seems, that even skillful users sometimes encounter problems in understanding interface icons.

Importance of Context. The survey asked the participants to classify a set of twenty icons (Fig. 1) through two questions:

1. Is the icon abstract or concrete?
2. Is the icon logical or arbitrary?

In addition to this, they were asked to shortly name what they thought each of the icons stands for, i.e. what is its meaning or function. The purpose of this question was to verify, that the user had correctly recognized the icon. It was clear from the answers, that some of the icons could be understood in a variety of ways, and others were not always recognized at all. The lack of context is one important factor in this. For instance, the magnifying glass was recognized as both a search and magnifying tool. Similarly, the cross icon that stands for closing or deleting, was also recognized as the symbol for irritating substances.



Fig. 1. The icon set that was used in the survey

Accuracy of the Classification. The total number of icon classifications was 2380 (119 participants classified 20 icons). Out of these, there were 242 cases where the icon had not been correctly recognized. Therefore, 89.8 % percent of the data was valid, and this part of it was analyzed further.

One of the main motivations for this study was to find out how strong correlation there is in concrete icons being dominantly logical, and abstract ones being arbitrary.

Table 1 shows the percentage of replies that classified each icon as concrete and logical. So that 0 % concrete equals 100 % abstract and 0 % logical equals 100 % arbitrary.

Table 1. Summary of the survey data

Icon	% Concrete	% Logical	Icon	% Concrete	% Logical
Calculator	99,1	90,6	Play	14,4	58,5
Close X	2,3	36,8	Power	9,1	24,2
Copy	83,1	77,1	Printer	98,1	91,3
Cut	96,6	94,1	Record	9,1	20,2
Eject	10,7	36,9	Reload	13	59,3
Fast forward	14,3	65,5	Rewind	14,3	65,5
File	94	76,1	Save	94	70,9
Folder	98,2	92	Search	87,8	81,6
Paste	81	58,3	Stop	4,8	21,2
Pause	7	23,5	Trash can	99,2	97,5

The differentiation between concrete and abstract icons is very strong. All of the icons were either below 14.4 % or above 81 % concrete. The differentiation in logical versus arbitrary was not as clear. There was a cluster of strong logical icons, among which the strongest icons were trash can (97.5 %), cut (94.1 %), and printer (91.3 %). There was also a very clear correlation with concrete icons being logical.

Abstract and Arbitrary. In abstract icons, there appeared to be two clusters. One comprised of strongly arbitrary icons. The other cluster of icons was above 58 % in the logical scale. This group consisted of the arrow icons of the survey: play, fast forward, rewind, and reload. It is clear, that arrows were considered as abstract representations. Yet they are so commonly used, that users intuitively understand their meaning. The origin of the arrow symbol most likely derives from the concrete archer's arrow object. So the case seems to be, that the appearance of the arrow has just become so simplified and abstracted, that it is no longer considered concrete.

Arbitrary and Concrete. In this icon set there were no occurrences of icons that are clearly arbitrary and concrete at the same time. The paste icon comes closest to this, being 81 % concrete and only 58,3 % logical. It would seem, that icons are most commonly in this group, if the metaphor or descriptive relation of the icon (signifier) and its signified is weak from the beginning, or becomes unclear over time.

4 Summary and Future Work

The preliminary survey confirmed the proposed main classifications effective in the sense that the data showed clear differentiation between the alternatives. In addition, certain correlations were discovered, such as concrete icons being logical and abstract icons being mostly arbitrary.

Starting to build a clean and simple taxonomy tree from these two main classifications is still a challenge since there was some surprising overlapping in the data, such as the existence of a group of icons that were classified as abstract and logical. Dividing the main classes into subclasses should also be examined. The logical icons could for instance be divided to descriptive and metaphorical ones.

Another interesting aspect and challenge for the classification is how icons can lose their logical meaning over time. This phenomenon is apparent in the case of the classic floppy disk save icon that is still commonly used in some software, despite the fact that it no longer bears no logical meaning to younger users.

The project website www.iconresearch.net provides further information about the surveys and the research topic.

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