

Applying the technique is much simpler than understanding (or writing!) this textual description. When the vertical unit is clearly established (as in GUI's that favor a standard "normal" size), the most difficult part of the problem is choosing a grid with the "right" number of columns. This will depend on the rough layout you've developed. If your "longest" control is a set of six radio buttons, you could use a 6-column layout (if the labels were very short), a 3-column layout (where the control would be split across two rows instead of one), or even a 1-column layout (with very long labels requiring six lines, in which case the grid would probably be determined by some other control with a larger number of divisions per line). Once the proper variant on the canonical grid has been chosen, placing the remaining controls should require only minor adjustments.

Image and Representation

6

Every blink of the eye brings a picture to the human mind.

Adrian Frutiger

Signs and Symbols: Their Design and Meaning

Imagery is essential for communication throughout the product user interface. The "blink of the eye" is the span – the length of a single glance – over which the most powerful visual phenomena operate. Images are perceived as configurations that utilize many of the same the organization and grouping effects described previously. While effects such as the Gestalt phenomena operate across the entire visual field, their contribution to image recognition takes place primarily under focused attention. We find it difficult to recognize (beyond the vague sense that "something is out there") images appearing only in our peripheral vision or that are visible for very short periods of time. What the recognition process lacks in scope, however, it makes up in depth. Images we see can be recognized quickly and committed to memory with surprising persistence (many people "never forget a face").

Most of the factors considered previously – simplicity, structure, scale, contrast, program, etc. – are applicable to imagery as well. Images possess internal structure that must obey the same rules of organization considered previously for the display itself. Images appear, moreover, as part of a coordinated program when used in support of a graphical user interface. The effectiveness of the whole, is diminished by shortcomings in any of its parts. In this chapter, we add a discussion of the use of *representation* to introduce meaning to the visual display. Without effective visual representations, the graphical user interface is no more effective than a character-based interface using an unfamiliar script.



181: Contradiction between word and image is apparent in *Le Trahison des Images*, (*The Treachery of Images*) by the surrealist painter René Magritte. The image predominates, and it is practically impossible to read the caption without first recognizing the pipe. © 1993 Herscovici/ARS, New York.

Few would argue that images are not among the most important elements in a visual computing environment. Their impact on the presentation of a conceptual model, the tightness of the feedback loop between person and machine, and the apparent tangibility of a synthetic virtual space is greater than any other aspect of the application. Images are particularly important in three areas:

Identification. When serving as representations of concrete, real-world objects, images make identification easy. We learn the names of things at an early age, but we must first learn to recognize the image of the named object. When word and image collide, as in Figure 181, the image dominates perception. The picture must be seen and recognized as a pipe *before* the logical conundrum ("*this is not a pipe*") can be raised by the caption.

Expression. Imagery offers great latitude for expression and personalization in the designed artifact. Magritte could have chosen any of a variety of pipe forms and representation styles in *The Treachery of Images*. The sense of reality created by his selection of an ordinary pipe and realistic style of rendering simply underscore the contradiction being set up between word and

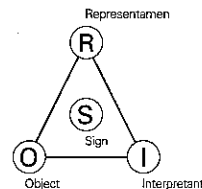
image. The dominant position of imagery in human communication confers both the greatest opportunity for success and with the greatest risk of failure. When handled correctly, however, effective use of imagery can make your product more engaging and enjoyable.

Communication. Pictorial representations cross social and linguistic boundaries with ease when the objects being represented are relatively constant across cultures. Symbols can communicate with immediacy and impact, but they are dependent upon the culture in which their meaning is established. This dichotomy is clear in Figure 181. Magritte's painting can be recognized as a pipe by anyone (at least by those in Western cultures), but only Francophones will appreciate the full meaning of the work. Communication is always affected by the context in which it occurs. To place our discussion in context, we present a brief overview of the relevant aspects of *semiotics*.

Representation (literally, to *present again*) provides the basis for all communication. We can convey (and indeed, even consider) ideas about things that are not materially in our presence only by calling forth an appropriate mental representation. The manner in which such representations are interpreted by participants in a communication system to create shared meaning can be fully understood only within the interdisciplinary context of semiotics. Mihai Nadin (1989) defines semiotics as "*the general theory and practice of signs (whose scope includes) everything that is interpreted by human beings as a sign, and defines the circumstances under which interpreting something as a sign allows for its better understanding, or for an improved use of it.*" The graphical user interface is a sign system, in which signs play the role of *intermediary* between user and program/programmer.

A sign is defined by Charles S. Peirce (1931) as, "*something that stands for someone or something in some respect or capacity.*" The sign itself is the product of a three-way *relation* between the *representamen* (that which represents), the sign's *object* (that which is represented), and its mental *interpretant* (the situated intelligence that performs the necessary substitution of signifier for signified). Nadin's (1989) diagrammatic representation (182-a) makes this triadic relationship apparent. Because each person is the product of a unique social, cultural, and experiential history, the manner in which the sign object is recalled by the representamen will be different (however slightly) for each *interpretant*. Clearly then, "*where we interpret a sign, we become part of it for the time of that interpretation* (Nadin, 1989)."

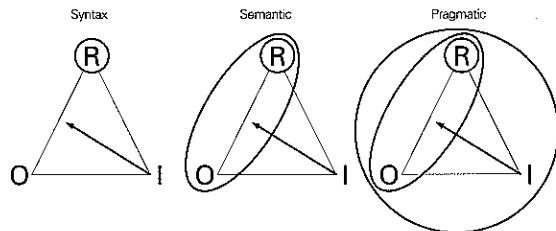
Background: Semiotics



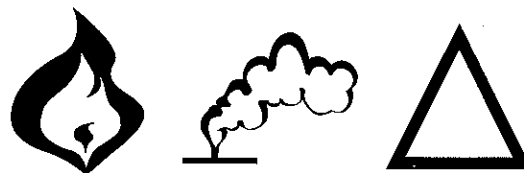
182: In Peirce's definition of the sign, the *Representamen* stands for some *Object* in the presence of a given *Interpretant*. (Nadin, 1989)

The triadic structure of the sign permits the sign process (*semiosis*) to be considered at three levels. *Syntactics* (183-a) addresses the internal structure of the representamen itself, particularly in terms of the relationships among its parts. *Semantics* (183-b) addresses the tacit relation between representamen and sign object (that is, the intended meaning of the sign). *Pragmatics* (183-c) considers the effect of the syntactic and semantic aspects in relation to a particular interpreter in their personal psychological context. Signs must be considered at all three levels to determine their appropriateness for a particular communication problem and to develop visual representations that can be expected to communicate effectively to a particular target audience.

The critical process of representation (the focus of analysis at the *semantic* level) depends on establishing a clear relationship between a representamen and its object. Peirce (1931) identifies three forms this relationship can take. An *icon* (184-a, 185-a) denotes its object by virtue of its own likeness to or



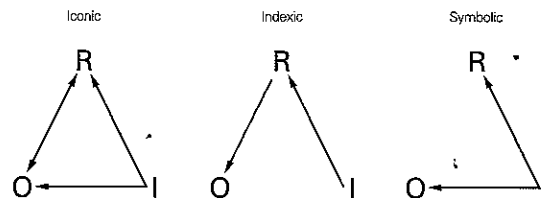
183: Sign processes can be analyzed at the level of *syntax* (a) – relations between elements of the representamen, *semantics* (b) – relations between representamen and sign object, or *pragmatics* (c) – the effectiveness of a given syntax/semantics for a particular interpretant. After Nadin (1989).



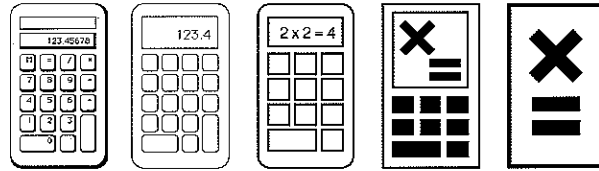
184: The concept of *Fire* can be represented visually as an *icon* (a) through visual resemblance to flames, as an *index* (b) through visual suggestion of smoke (sound, temperature, or smell would work as well, in this case), or as a *symbol* (c) such as the Medieval alchemists conventional notation.

resemblance of that object, on the basis of some quality or characteristic inherent in the icon itself. An *index* (184-b, 185-b), in contrast, refers to its object indirectly, by means of an association based on contiguity rather than on resemblance, and by virtue of its being actually affected or modified by the sign object. Either form may, over time, develop into a *symbol* (184-c, 185-c), which denotes its object by convention alone, and which thus depends on agreement between the parties in communication.

In common usage, the term, *icon*, has come to denote any small raster image appearing in a GUI display. This source of confusion has arisen because the imagery used in existing GUI's is predominantly (though by no means exclusively) iconic. We can say that the "desktop metaphor" seen in standard GUI environments such as the Macintosh Finder or Microsoft Windows, conveys the functionality of a suite of programs by analogy to the *semantics* of an office environment using an *iconic* form of representation.



185: Representation can be grounded in an *iconic*, or resemblance-based (a), an *indexical*, or affect-based (b), or a *symbolic*, or convention-based (c) relationship between object and representamen. For best results, the same form should be used throughout an image set. After Nadin (1989).



186: The ease of interpretation varies with the level of abstraction of the sign representation. As highly concrete, realistic representations are simplified, they become easier to interpret – up to a point beyond which further abstraction begins to obscure the sign's semantics. After Nadin (1989).

Finally, a given sign representation can be characterized by its degree of *abstraction* – the extent to which the *essential* qualities upon which the representation is based are isolated from the literal perceptual characteristics of the sign object. A photograph or realistic illustration provides a high degree of fidelity to a particular sign object (an instance of its class), and is usually easy to recognize as a result. More schematic representations, because they permit the selective omission of detail, are better able to represent a broader class of objects (as opposed to one of its instances) or to focus on some characteristic aspect of the object (rather than on the perceptual reality of a specific individual).

Interpretation is the process of reconstructing the meaning of a sign by identifying the sign object and grasping the significance of the connection between object and representamen. As shown in Figure 186, interpretation becomes easier (to a point) as the representation becomes more schematic. As the level of abstraction increases, the sign becomes progressively more generic, more canonical, and less complex. To complete the interpretation of a graphic sign in a GUI, the user must draw the connection between the iconic representamen and the corresponding system function. The problem is simplified when the sign object is concrete, but problems can arise if the representamen can be mistaken for the object. Understanding what a thing *represents* – as opposed to merely what it *depicts* – is a prerequisite for using the sign correctly, since the same physical representation can be used in many signs (See, for example, Figure 215 c, d). Users must recognize the icon on the display screen as a sign for the thing (e.g., an icon for a calculator program), rather than the thing itself (Nadin, 1989). Interpretation becomes more reliable when moving from left to right in Figure 188, since only the first two or (possibly) three signs could be mistaken for the object itself.

How can semiotics aid the practicing designer? First and foremost, an understanding of how signs are formed, transmitted, and interpreted can help the designer to systematically analyze a communication problem and provide the basis for the development of a coherent solution. To achieve this goal, the visual language used to represent the functionality of the system must itself be as coherent as possible, and it must be matched to the capabilities and limitations of the anticipated user. With an understanding of the user population, the designer can determine the form of representation (icon, index, or symbol) and degree of abstraction most appropriate for their existing background, skills, and tasks. Regardless of the decision taken, semiotics underscores the importance of, “*uniformly using whatever means of representation are considered adequate* (Nadin, 1989).” Because users learn the “rules” only through experience with the system, the visual language in which the rules are expressed must make them as clear as possible.

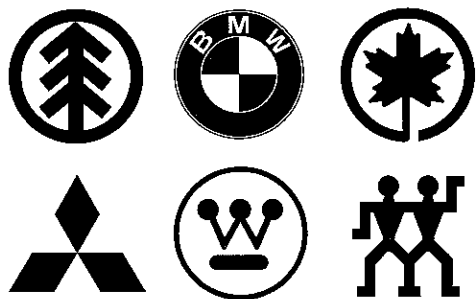
Principles

Imagery is at once the most obvious and least understood aspect of GUI design. It is rarely sufficient to simply “draw a good picture” of the thing being represented. Effective imagery must possess a perceptual immediacy that allows it to be recognized at a glance. For most images, this involves a process of careful abstraction in which all but the elements that most characterize the sign object are removed. When developing multiple images, care must be taken to maintain cohesion within the image set and to consider the physical, conceptual, and cultural context in which the images will ultimately be displayed. Mastery of these concepts is far more important than any innate “artistic” ability in developing an effective image program.

Immediacy
Generality
Cohesiveness
Characterization
Communicability



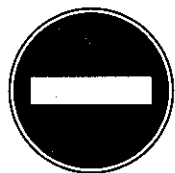
187: Many traffic signs communicate through an *iconic* resemblance to a given class of roadway feature. The high degree of *abstraction* is essential for both generality (the sign can refer to any similar curve) and recognizability.



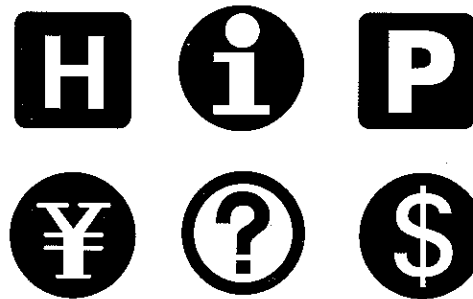
188: Bold, simplified, symmetrical imagery ensure that the immediacy needed for an effective corporate identity program will be present in these familiar pictograms. Air Canada logo is a registered trademark of Air Canada.

mediacy

Effective visual representations can be perceived effortlessly and involuntarily. Only under extremely poor viewing conditions – or during extremely short presentations – does the viewer “see” something they cannot recognize. This distinguishing characteristic of visual phenomena is apparent in the viewer’s ability to holistically and automatically extract information from the “snapshot” of the overall display that can be perceived during the span of a single glance. The impact, or “graphical power” of effective visual signs springs directly from this quality of perceptual *immediacy*. Because we need not consciously analyze the pieces of a powerful image to understand the whole, we cannot avoid recognizing the image when it confronts us. Perceptual immediacy allows appropriately designed images to force their way into our awareness. By carefully manipulating the weight, balance, and sym-



189: The immediacy of this familiar symbol is enhanced by removing the verbal label.



190: These simple logograms, while more heavily dependent on a shared linguistic context than the pictographic imagery on the left, nevertheless possess a similar perceptual immediacy by virtue of their minimal form.

metry of the graphic sign, designers produce images with the impact and memorability required for effective trademarks, brand marks, corporate identities, and signage systems.

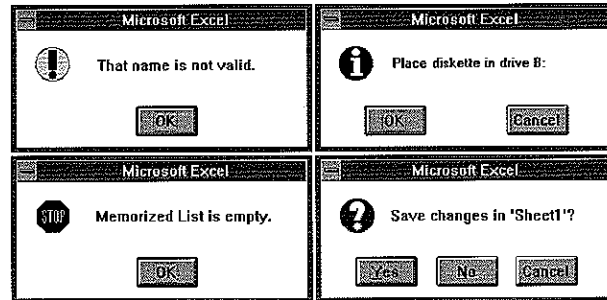
Signs to be “read” as images can be based on pictures (pictograms) or words (logograms). Each of the pictograms in Figure 188 and the logograms in Figure 190 presents a powerful graphic image because each has been reduced to the essence of the underlying sign through a process of simplification and abstraction. Note the solid forms, simplified contours, and complete absence of any internal detail. The fir tree of Boise-Cascade (188-a), the maple leaf of Air Canada (188-c), and the men of Henckels (188-f) are all highly stylized to emphasize their most important formal characteristics. The BMW mark (188-b) reduces the checkered standard of the Bavarian state to a single four-square motif, while the Westinghouse mark (188-e) recalls the image of a circuit board. The Mitsubishi (“Three Diamonds”) mark produces a strong emergent form that evokes a subtle reference to the Mercedes mark (16).

Each of the pictograms is simple and direct, bold and clear, balanced – if not highly symmetrical, and well-integrated with its ground. The same is true of the logograms. Even when effectively designed, however, logograms – which are by definition purely conventional – are less universal than pictograms. Basing visual representation on the spelling (in one particular language) of a verbal label (190 a-d) is always a dangerous game to play. These signs may

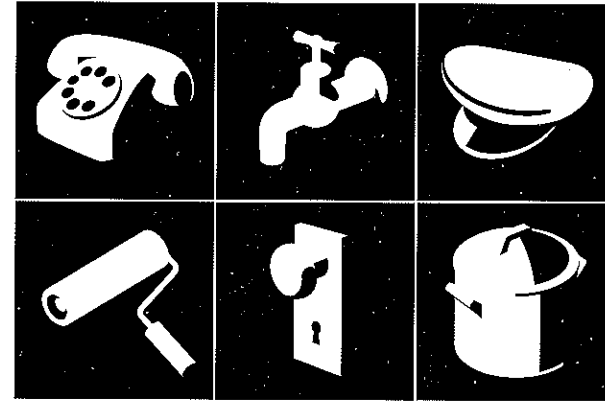
succeed in Western cultures, if only because common Latin roots have led to related spellings in many languages. For a more global pragmatics, however, this approach is an admission of failure and the practice should be avoided when possible. Note, however, that an effective graphical image *can* be constructed from an isolated verbal symbol when appropriate.

When stylized into simple geometric shapes or powerful graphic forms, pictographic images become symbols depending entirely on convention for their interpretation. While its original iconographic relation to the sign object may long since have disappeared, the symbol's ability to penetrate into the viewer's awareness – even in the midst of noise and distraction – is greatly enhanced. The quality of perceptual immediacy makes images ideally suited to public safety applications such as the labeling of hazardous materials, the signage needed for traffic control, or any other situation that demands a rapid, reliable response (189).

The graphical user interface includes many situations where the user's attention must be captured and a certain amount of context conveyed. The symbols appearing to indicate a particular class of dialog box or alert in most environments (191) are the GUI equivalent of the traffic sign. The immediacy of the image provides an important visual cue telling the user something about the nature and potential seriousness of the situation even before the detailed textual message has been read.



191: The immediacy of the supergraphic visual symbols (which arises from their size and color contrast with the contents of the rest of the dialog, as much as from the simplicity of the symbols themselves) provide important contextual information in these standard Windows dialog boxes.

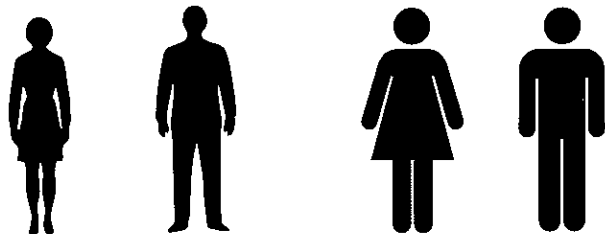


192: Visual representations can be very abstract while still maintaining a high degree of iconicity. These icons are used to represent broad categories of goods and services in the SMART Yellow Pages™ telephone directory. Design by Richard Saul Wurman and The Understanding Business.

In GUI applications, imagery is normally used (there are exceptions) to represent a class of artifacts, rather than any particular instance of that class. *Generality* describes the ability of the individual sign to represent these higher-level groupings. Images with a high degree of abstraction (192) automatically provide a general representation of a class of similar objects by removing visual details specific to any one instance. The generality of these images, moreover, allows them to be interpreted as representative of a broader class (e.g., “painting supplies”) than might be suggested by a photograph or detailed drawing of the same object (e.g., “No. 4 Paint Roller”). The images depend on highlight, shadow, and a consistent orientation of object and light source – rather than extensive detail or contour information – to convey the essential characteristics of the objects they represent.

Generality

A conscious retreat from photorealism need not result in a less recognizable image. In fact, the converse is often true. Generalization results in simpler forms that, because they contain less visual information, are easier to process, recognize, and react to. Generalization also allows elements of the original form to be selectively emphasized or de-emphasized to facilitate particular communication objectives as detail is removed from the image.

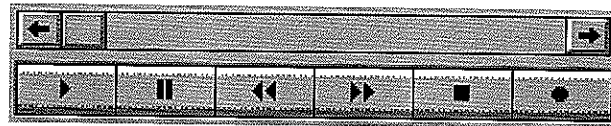


193: Two very different levels of abstraction are apparent in these icons. The realistic images on the left provide a representation that is more direct, but less general. Their accuracy strongly suggests that the icons in (a) represent *typical* individuals, rather than the more *general* populations seen in (b).

Generalization is essential when creating images of great perceptual immediacy and lasting graphical impact. The process of abstraction – upon which the generality of an image depends – leads to “better” forms that can be processed and assimilated more rapidly despite their reduced iconicity (193). It is no accident, for example, that the world’s great mystical and religious symbols, as well as its alphabets, have evolved through a process of simplification and abstraction extending over many centuries. By removing details associated with the particular, the designer can use the general qualities that remain to establish a background, or context, against which the message can be delivered. The identity program for the Mandarin Oriental Hotel (194), for example, employs a greatly simplified paper fan motif throughout. The fan itself is stripped of all detail except that needed to identify it as a member of its most general class. The internal structural details, in particular, are merely suggested – not rendered – through judicious use of negative space.



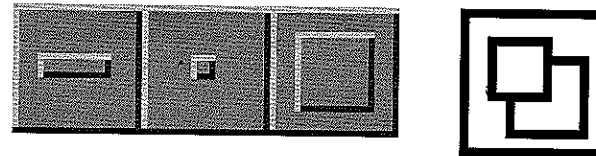
194: Simplification of the iconic representation produces a more generalized interpretation of the paper fan in this identity. Design by Pentagram.



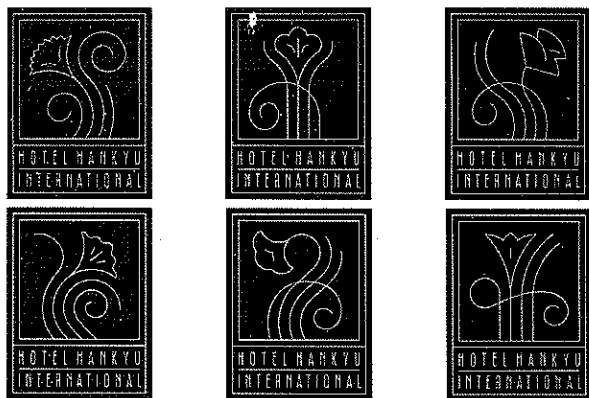
195: Simple, abstract representations such as these standard transport control symbols are generalizable not only across software applications, but across hardware platforms and product categories (e.g., consumer electronics) as well. They are widely understood when used consistently.

Generalized, conventional signs are seen throughout the human-computer interface, and indeed throughout product user interfaces in general. The familiar transport control symbols for sequential media (e.g., Play, Pause, Cue, Review, Stop, Record) have gained near universal acceptance in consumer electronics in recent years and are now used commonly in GUI applications (195) as well. Originally used in conjunction with textual labels identifying their function, these abstract symbols are now familiar enough to stand on their own. They provide an excellent example of a coherent visual language that can be adapted directly to the human-computer interface.

Many common GUI design problems, of course, have no corresponding real-world lexicon upon which to draw, so designers must invent their own visual language. The window management controls seen in most current-generation GUI’s (196) are usually good examples of abstract imagery. Due to the severe space constraints, the number of pixels available is rarely sufficient for elaborate iconic representations. This turns out not to be a problem in this case. Since window management controls appear in nearly every window, they are learned through constant exposure when their meaning is not immediately obvious. Abstract, general imagery permits the designer to trade intuitiveness for efficiency of use in the resulting symbols.



196: Generalized imagery is used throughout the GUI environment to represent standard control and feedback mechanisms. These examples from the OSF/Motif (a) and Macintosh (b) standards, are abstract symbols depending on constant exposure to ensure their understandability.

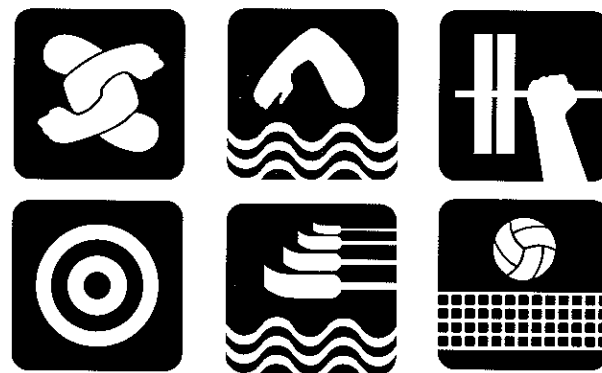


197: Cohesive image programs are created by employing the same visual primitives consistently in every image. In this identity and signage program for the Hotel Hankyu, the visual language is based on thin, organic linework, pronounced dark bias, and floral imagery. Design by Pentagram.

esiveness

Images rarely appear in isolation. Particularly in user interface applications, each image generally forms part of a larger system in which many individual visual elements must work together effectively as a group. A cohesive system arises when shared formal qualities of the images themselves can be recognized effortlessly in early visual perception. Any of Bertin's visual variables can form the basis for the emergent properties of the group as a whole. The common visual characteristics that result allow each image to be perceived as part of the larger program even as it is distinguished from the other members of the ensemble.

Cohesive image programs can be based with equal effectiveness on bold or delicate imagery, so long as a consistent visual vocabulary is maintained throughout the program. The signage programs for the Hotel Hankyu (197) and the Mexico City Olympics of 1968 (198), for example, could hardly be more different at the syntactic level. Basic perceptual processes allow the viewer to recognize these differences effortlessly, and either system stands out in its environment due both to this contrast and to its internal consistency. Mixing and matching images from these two extremes would be confusing on both the functional and aesthetic levels.



198: A similar cohesiveness based on a very different set of visual primitives can be seen in these icons for the 1968 Mexico City Olympics. Bold forms, close cropping, and light/dark balance are used consistently throughout the set. Design by Lance Wyman, Eduardo Terrazas, and Manuel Villazon.

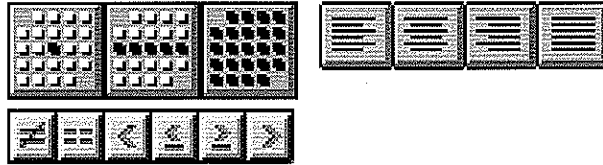
Note also the repetition of basic forms throughout both programs. The delicate forms, parallel lines and common curvatures of the floral imagery tie the Hotel Hankyu signs together as powerfully as the bold forms, undulating waves, isolated limbs, and close cropping unite the Olympics pictograms. Repetition of common forms throughout an image set helps users learn to "read" the resulting visual language and further enhance their processing of the information being presented. The waves in the Olympic pictograms, for example, make it easy to identify those icons representing water sports.



199: Coherent use of visual language is important wherever classification based on visual appearance is necessary. Their vertical orientation and turned down corner identify the objects on the right as documents, while systematic use of internal imagery identifies two levels of document category.

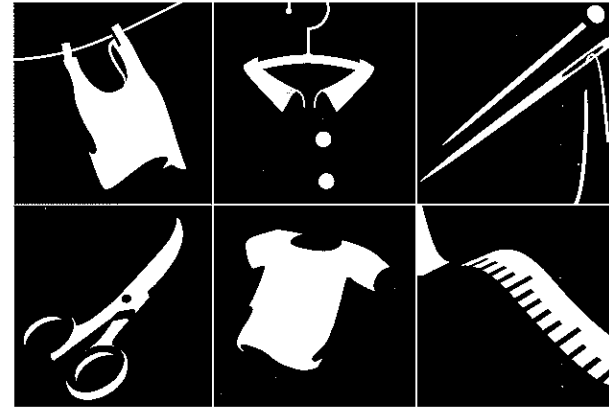
The consistent application of visual language in a coherent image program is essential to the success of a graphical user interface. The basic object categories (document, container, tool, etc.) need to be clearly and visually distinguished if a convincing artificial reality is to be created. The dog-eared document outline not only helps users distinguish the corresponding software object as a document, but also forms the basis for an extended visual ensemble of similar objects that can be recognized on the basis of their shared size, line thickness, and density (199).

Graphical applications can often benefit from coherent image-based representations as well. Figure 200 shows several excellent examples. The display selection icons for the DayMaker personal organizer (a) use a clear, concise notation to represent views of the current day, week, or month. The familiar spatial language of the calendar is leveraged by highlighting the corresponding range of cells in the icon. A similar spatial correspondence is exploited by the paragraph alignment commands seen in most word processors (b). The images use a consistent line weight and length to make the differences between the icons readily apparent. These icons contrast sharply with the equally common text style icons (e.g., Plain, Bold, Italic, Underline, etc.),



200: Cohesiveness in any image program depends on repeating elements and using common sizes, line weights, and densities. These buttons from various Windows applications use iconic imagery to represent day/week/month (a), and paragraph alignment (b), and symbols for logical inequalities (c). (Note how gratuitous dimensionality impairs the readability of the images in the left-hand column.)

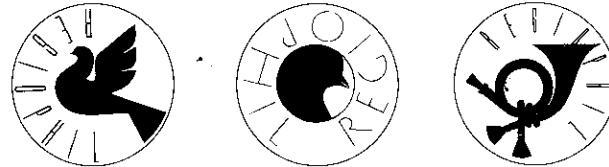
with which it is practically impossible to create a coherent visual program if the intent is to encode the visual characteristics of the corresponding style attribute in the image itself. Even when the same font and size are used, the resulting images have little in common due to their variation in the basic perceptual variables (c).



201: By focusing attention on a few essential aspects, visual representation can strongly characterize an object despite a relatively high level of abstraction. Design by The Understanding Business.

Iconic signs fulfill the representation function by calling to mind one or more essential characteristics of the sign object. Effective *characterization* requires a focus on these distinctive features. The images in Figure 201 emphasize the flexibility or rigidity of the material used in each object in the contours of each icon. The folds produce discontinuities that are accentuated by the removal of most other detail from the image and by the use of negative space to focus attention on important details. Contrasting material properties – such as the sharp, rigid needle and the limp, twisting thread or the regular unit markings and the undulating tape – enhance one another to help iden-

Characterization



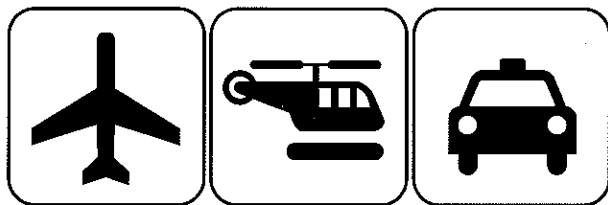
202: These stamp designs by students of Armin Hofmann use visual cues such as narrow counterforms and radial typography to emphasize curvatures that characterize their corresponding object.



203: Effective characterization depends critically on selecting a point of view from which the characteristics being represented are clearly visible. Design by Rudolf Modley.

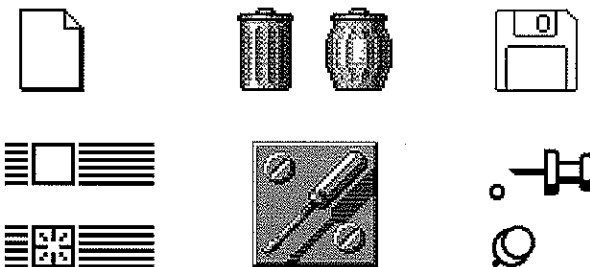
tify the object in each case. Contrasts can often be used to underscore essential qualities in an image (202). The thin linear elements and radial typography in these stamp designs make the rounded forms at each stamp's focal point appear that much rounder. The curvature of the dove's head and outthrust breast of the pigeon evoke the birds' characteristic posture and appearance, while the spiraling curvature of the horn is similarly underscored by the thin slice of negative space delineating the bell.

Choosing the right point of view can be as important as determining which qualities to emphasize, since, from some vantage point, the parts that most effectively characterize the subject may be visible poorly or not at all. It would rarely be useful, for example, to depict a chair from above or a radio from behind. Similarly, the dress of each worker in Figure 203 would be unclear from any other perspective since the frontal view – which exposes seams, fasteners, pockets, etc. – carries most of the visual information. The



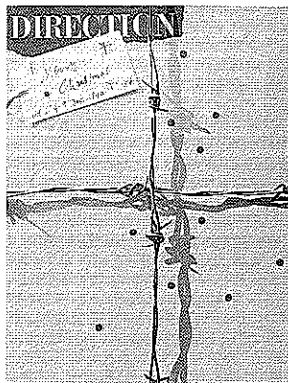
204: Effective characterization depends on choosing the right point of view, eliminating non-characteristic details, and exaggeration of defining features, as in these icons from the U.S. DOT's *Symbol Signs* program. Design by Cook & Shanosky Associates.

icons developed for the U.S. DOT (204) also show how choosing the right viewpoint can help distinguish objects. The most informative vantage point is usually the one with the most complex contour or the greatest amount of distinctive internal detail, but the viewer's experience can also influence the decision. The viewpoints chosen for the DOT icons, for example, are those from which these vehicles are seen most frequently in the viewer's everyday experience. This strategy allows the image set to exploit the viewer's familiarity with a particular characteristic viewpoint. As in the cartoonist's caricature, effective communication may demand exaggeration beyond purely physical accuracy to emphasize important components, such as the rotor blades of a helicopter or the sign on the roof of a taxicab.

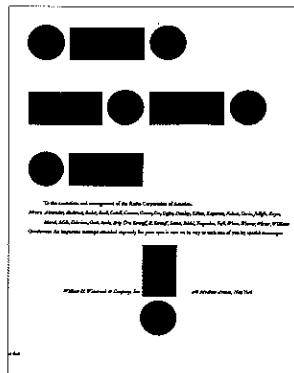


205: Expressive visual imagery from various GUI environments shows how characteristic features of the object (real or imagined) can be captured using contrast, viewpoint, and exaggeration. Changes in appearance in response to user actions add believability as well as useful feedback.

Visual representations that characterize their objects effectively can do much to add interest and vitality to the human-computer interface. Engaging visual details from real-world objects, such as the dog-eared corner on the "paper" document (205 – a) or the notch on the floppy diskette (205-c) are made more noticeable by their contrast with the rectangular contour of the rest of the icon. These enhanced representations – caricatures, if you will – do more than literal realism to create believable signs. They complement exaggerated animated representations such as the bulging Macintosh trash can (205-b) the playful "poof" of the Macintosh Close box (205-d) and the two-state setting of the OPEN LOOK Pushpin (205-e) in creating a convincing virtual world.



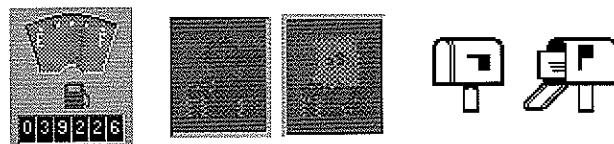
206: These designs by Paul Rand show the importance of shared context in communication. The cover on the left is an appropriate Christmas theme for a society engulfed in war, while the ad on the right is more than just a pleasing arrangement of dots and dashes to those who read Morse code.



The *communicability* of any representation depends on a shared context between sender and receiver that allows signs to be interpreted within a pragmatics comparable to the one under which they were encoded. The experience of an image is affected not only by other images in the ensemble, but also by the physical, cultural, and conceptual environment in which it appears. Two extraordinary designs by Paul Rand (206) depend heavily on context for their appreciation. In the Christmas 1940 cover for *Direction* magazine (206-a), the use of a barbed wire cross as the ribbon on a gift wrapped package (note the Christmas tree shape of the perforations) provides a stark reminder of the war engulfing Europe. Whereas today, the semantic dimension is initially obscure, in 1940, the message was immediate. The adjacent newspaper advertisement (206-b) can be enjoyed purely as a visual analogy and a playful contrast between the dot-dash pattern at the



207: Cultural dependency is apparent in these icons representing mailboxes in the U.S. (a), Denmark (b), France (c), and Italy (d). Each could be interpreted as a control box or trash can by someone unfamiliar with the local convention. Line art is the property of Apple Computer, Inc.



208: Each of these representations presents a poor analogy between sign object and system concept. The fuel gauge and odometer (a) are monotonic functions that have little in common with the actual pattern of memory or disk space usage. The "bag over the head" icon (b) means "suppress video preview," which would properly be represented as an invisible person. Finally, the ubiquitous American rural mailbox icon (c) is always used "incorrectly." The flag on a real mailbox is raised to tell the *mail carrier* that outgoing mail is present, not to tell the homeowner that incoming mail has arrived.

top and the exclamation mark at the bottom. The targeted audience, however, could grasp the design at a deeper level. Any one of them would immediately recognize the dots and dashes as the Morse code for their own company name (RCA). Context provides the key to correct interpretation.

Communicability demands that the pragmatics of a sign be considered very carefully. Precisely because we carry it about subconsciously in the form of our own life experience, the effect of context on our understanding of the world goes largely unnoticed. What is "obviously" a mailbox in one culture, for example, would be surprisingly unfamiliar to people from other cultures (207). Effective visual representations for international audiences should be based on aspects of the sign object that are truly universal within the target population (such as an envelope, in this example).

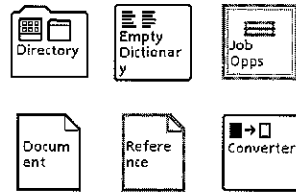
Visual metaphors can help users understand the working of their environment, but only to the extent that the mapping between image states and system states corresponds to the user's understanding of the real-world analog. In the rush to add familiar imagery to GUI environments, metaphors are



209: At the lowest level, communicability is affected by syntactic decisions. When the background color of an image is allowed to vary, the designer gives up any ability to ensure adequate contrast.

often stretched beyond recognition. The fuel gauge and odometer (208-a), for example, are supposed to represent the amount of free memory and disk space, though neither of these analogies is particularly relevant. The other examples (208-b,c) exhibit similar problems. Metaphorical signs involve a two stage interpretation between representamen and sign object, on the one hand, and between sign object and system function on the other. Only when the semantics of both relationships are clear will communication succeed.

Finally, the communicability of any visual sign depends on its physical display context. Employing narrow, colored figural elements on a ground whose color can be customized by the user, for example, will inevitably lead to situations where the icon is illegible (209). The need for adequate contrast between figure and ground is so critical to image recognition that an icon

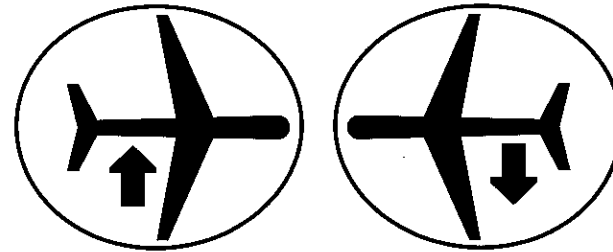


210: Competition between visual and verbal elements at the syntactic level will subvert communication regardless of a sign's appropriateness at the semantic or pragmatic level.

should never relinquish control of that portion of the background that falls within the boundaries of the image itself. For similar reasons, images rarely provide an effective display context for textual labels. In GUI applications, the addition of an internal label places additional formal constraints on a visual representation, which must depend largely or exclusively on contour information to ensure proper interpretation. The "natural" size of an image in the target environment, moreover, restricts the length of the label as well. The curious decision to place labels within icons in the Xerox Star and Viewpoint environments produces a number of bizarre line breaks (210). While the labels can be read, they are distracting enough to divert the attention from the visual qualities of the image itself. A more effective syntax would ensure that word and image complement – rather than compete with – one another in supporting the sign's interpretation.

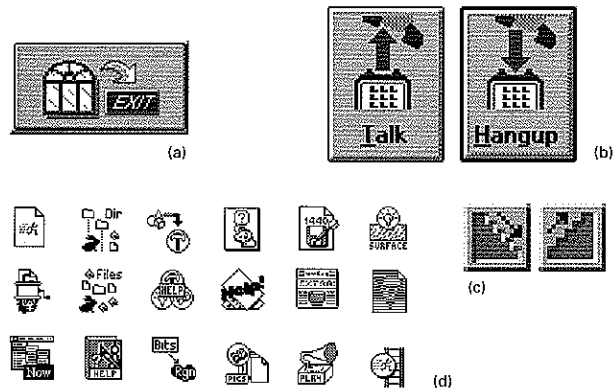
Common Errors

The advantages of imagery are realized only when the image is appropriately designed and carefully produced. Problems can arise at the level of *syntax*, which governs relationships between elements within the sign; *semantics*, or the meaning of the sign elements; and *pragmatics*, or the suitability of the image for a particular physical display and set of interpreters.



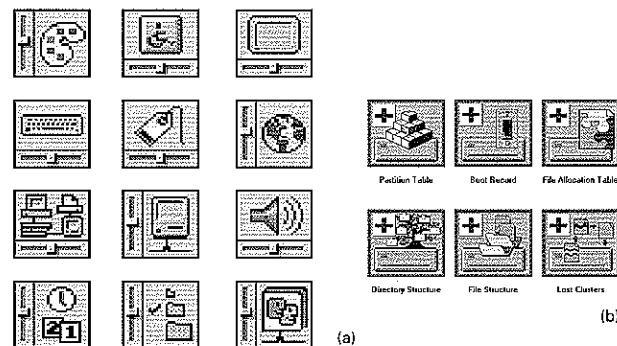
211: *Misleading syntax.* The elements of any visual representation must combine properly to form a coherent sign. Every apparent logical relationship between elements in the image should reflect an analogous relationship between the corresponding sign objects. These images from an air terminal signage program are extremely confusing because the logical relation of the aircraft to the arrow is unclear. Because the viewer assumes that all elements of the image exist within the same coordinate system, the arrows appear to be "pushing" the tail of the plane to the left in each image. The intended meanings – Take Offs and Landings – can be understood only when the viewer realizes that

while the *aircraft* is being viewed from above, the *arrow* is being viewed from the side. While the selected viewpoint makes the aircraft easily recognizable, it is a highly unfamiliar vantage point for take-offs and landings. A more natural perspective presenting the aircraft in a side view – with the nose pointed up or down, for takeoff and landing – would communicate more effectively. This representation would place the aircraft in the appropriate attitude and bring the elements of the sign into a more compatible spatial relationship.



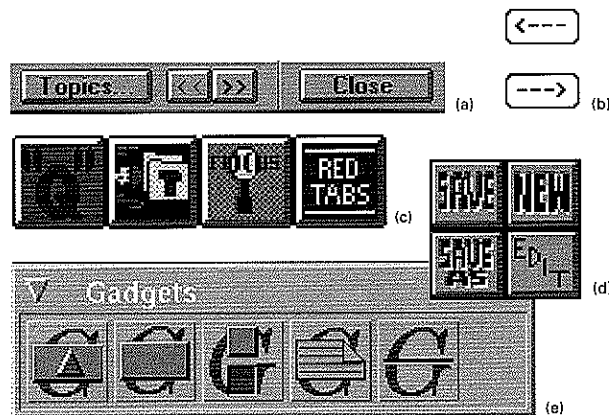
212: Poorly integrated structure. High quality images exhibit a spatial unity that ensures the parts work together to strengthen the whole instead of competing for the viewer's attention as independent elements. A well designed image never needs to be disassembled to be understood. When the parts of an image must be individually analyzed and then put back together to reach the proper interpretation, the perceptual immediacy of the image disappears completely. The "Exit" icon above (a) not only forces a serial reading, but even worse, it is ambiguous once the parts have been reassembled (does the icon mean "Exit to Windows" or "Exit Windows"?). When the visual variables needed for discrimination – primarily orientation – are identical in two signs ambigu-

ity at the syntactic level can produce the wrong response even when the semantics and pragmatics are clear. Discriminating between two images that differ only in the pointing direction of an arrow (c, d), for example, is slow and error-prone even though the correct interpretation is clear following the proper reading. The same problem arises when an image is overly detailed, or when its individual elements are so small that they become difficult to recognize on their own merits or even to group together into the same perceptual unit. In all of the monochrome examples above (c), the sensation is more like reading a newspaper than looking at a picture.



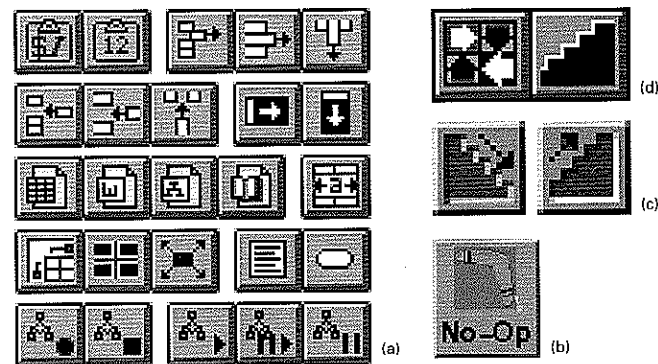
213: Dominant secondary elements. Creating composite imagery is always fraught with syntactic problems. When secondary elements are balanced correctly, they can provide valuable context without unduly interfering with the image as a whole. Unfortunately, this is easier said than done. When individual elements are too weak, the problems seen in Figure 212 quickly arise. At the opposite extreme, when secondary elements are too strong, they can so dominate perception that the rest of the information in the image can be extracted only with difficulty. Dominant program characteristics are apparent in the standard control panel icons from the Macintosh System 7 (a). The heavy, 3D slider control draws the viewer's attention from the primary image (telling them which pa-

rameters the icon controls) even as it identifies the icon as Macintosh control panel. (Note that the distracting effect of the slider is heightened considerably by its frequent alternation between horizontal and vertical orientations.) The gray pseudo-dimensionality intensifies this masking effect by lowering the contrast and making individual icons harder to recognize in the first place. The same problems are produced by the red cross and disk drive elements in the disk utility icons above (b). Together, these elements are so much more prominent than anything else in the images that it becomes difficult to ignore them and focus on the distinguishing elements of the individual icons.



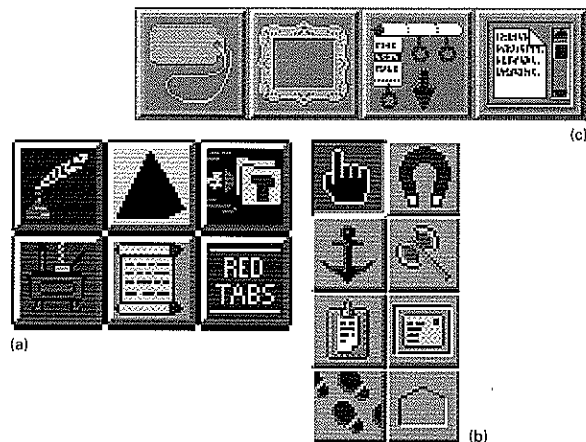
214: Using type as image. Effective visual representation depends heavily on the use of high quality images. Using poorly rendered or poorly integrated textual elements as graphical devices in a pseudo-pictorial representation is even less effective than using a poorly rendered image. Even "graphical" characters from a standard font, such as "<" and ">," (or worse, the strings "<—" and "—>") are not strong enough to serve as stand-alone graphical elements (a, b). Every GUI toolkit supports graphical as well as textual button labels, and bold, clear arrow symbols are trivial to produce. Similarly, the use of *verbal* phrases (e.g., "Red Tabs") as *visual* signs (c) ensures that any advantage of pictorial representation will be lost. Forcing these verbal symbols into a small raster image

format provides virtually no benefit from a communication standpoint — it simply makes them harder to read. Even when supported by graphical stunts such as the ubiquitous magnifying glass, the verbal label produces a weak visual sign. The idea that grotesquely distorted words serving as toolbar images (d) add any value beyond their textual menu equivalents is self-evidently absurd. A more common crutch is the use of a single character to suggest some aspect of a sign that is difficult to represent graphically (e). When the verbal element dominates, its abstract nature ensures that unintended associations will arise in addition to — or instead of — the one intended. When the pictorial element dominates, the "background" character simply adds visual noise.



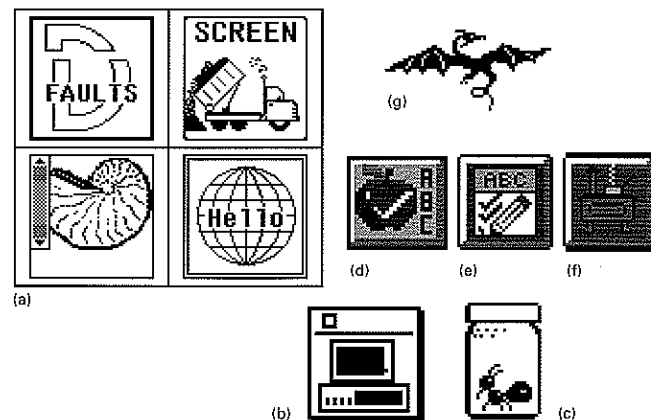
215: Using images for abstract concepts. Images of familiar, concrete objects are easy to interpret correctly. Iconic representations excel at the identification function precisely because of the directness of the relationship (resemblance) on which the sign is based. Abstract concepts, processes, or situations, because they are less tangible, depend on less direct forms of representation in which even a well-designed image may be difficult to interpret correctly. Even when the sign's syntax is clear, its semantics can be obscured by the weak, largely conventional association between the visual elements of the sign and the abstract or temporal aspects of the signified. The example above (a) shows just a few of the dozens of icons that can be added to the toolbar of a lead-

ing spreadsheet application. (How many you can identify?) Many of these examples are almost diagrammatic, yet their meanings remain unclear. Perhaps the ultimate example of a concept that is impossible to convey graphically is the *NoOp* ("does nothing") function. The boomerang analogy (b) is very weak (it would be more appropriate for *Undo*), and the visual sign would fail completely without the accompanying text. When meaning is conventional, the same image can be used in different signs. The stepped images (c, d) can be readily identified as stairs, but this does not reveal their full meaning ("sort by increasing or decreasing order" and "step through a macro," respectively). In all of these examples, verbal representations would have many advantages.



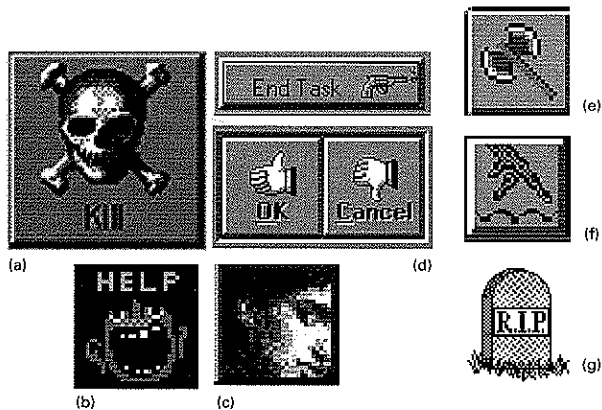
216: Images based on obscure allusions. When portraying abstract concepts, the designer often has no choice but to substitute an evocative concrete object. The semantic relation, however, is rarely a strong one, even with a well chosen metaphorical reference. When the allusion is strained or obscure, the meaning is never apparent. One of the better examples of this phenomenon is the "stove" icon above (a). This icon represents a Master Task List of things you'd "like to do someday but don't want to schedule for a particular day." The viewer is supposed to notice that the pot of boiling water – like an item on the Master Task List – is on the "back burner" of the stove, and thus make the leap to enlightenment. Few examples are this obscure, but many have similar problems.

The tool palette on the right (b) relies heavily on literal, concrete metaphors to suggest the corresponding functions. The magnet tool lets you move an entry from one page to another in an appointment book. The axe tool is used to break the links established by the anchor tool, and the footprints represent the Backtrack function...a navigational aid allowing you to retrace your steps. Even when a visual reference is fairly direct, unnecessary embellishment of the image (c) can distract if it evokes additional, undesired associations. The Label icon above, for example, seems more like a price tag, or ticket, while the Scrolled Text icon, thanks to its dog-eared paper element, misleadingly suggests a file- or document-level operation.



217: Culture or language dependencies. The pragmatic aspect of an image describes assumptions about the viewer and the viewing environment that are implicit in any visual representation. An image may "work" for some viewers, but not for others. If the image relies on inside jokes, figures of speech, slang, or other terminology that is well-known only within a particular subculture, then it will be intelligible only to members of that group. The icons for *Hello World*, *Screen Dump*, *Defaults Edit*, and *o-shell* (a), for example, use visual and verbal puns that are recognizable only to those for whom the concepts are already familiar. Other images depend on historical knowledge of an industry or product. The "DOS" icon (b) is a very literal representation of the original IBM-PC,

which bears little resemblance to the "DOS" PC's of today. Unless the viewer knows what PC's used to look like, communication is likely to break down. Similarly, the origins of the term, "debugger" (c) are familiar to most developers, but not to many end-users, while the reference to the "apple for the teacher" tradition in American schools (d) would have little meaning in cultures without this custom. Linguistic dependencies operate on many levels. Users in non-Western cultures, for example, would have trouble making the connection between, "ABC" and "spelling" (d,e). Familiarity with the figure of speech equating "back burner" with low priority is a precondition for understanding the stove image (f), while simple phonetics are sufficient for the "drag-on" target (g).



218: Offensive or suggestive imagery. Imagery that some users may find personally or culturally offensive should always be avoided in commercial products. While examples as extreme as the *Kill* icon from NeXTStep (a) are rare, it is not hard to find images that would be considered at least mildly upsetting in some cultures or to some users. Even otherwise benign icons may be offensive if they are overly intrusive (b) or even suggestive (c). Gestures too have different meanings in different cultures – the “thumbs up” sign (d) does not mean “OK” in the Middle East, for example! – and even the depiction of “disembodied” limbs (f) is considered taboo in many parts of the world. Images related to

death, injury, or violence, in particular, are almost never appropriate in an office environment. The typical user is not even aware of the “dead” software entities to which the tombstone (g) and pistol (e) icons refer, and the grisly connotations of the battle axe (f) have little to offer an office automation task. All of these images add unnecessary fear and confusion to the typical user’s experience. Today’s hardware and software environments are already intimidating for most non-technical users. Adding stress-inducing imagery can only compound the problem.

One does not put signs along a railroad track saying, “Please come to a stop.” Instead, we have very sensibly devised colored signals, which are kinds of ideograms and are infinitely more expressive and more readily understood than verbal messages. Obligated to get its message across rapidly, the poster uses the same language—the image, the true vehicle of thought.

A.M. Cassandre

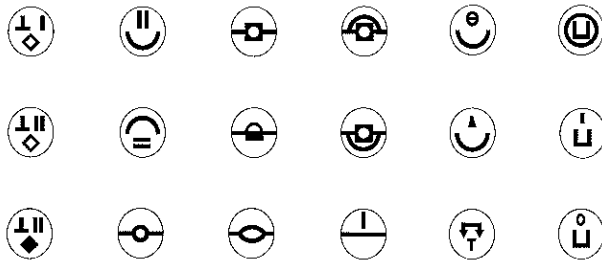
Techniques

Sound draftsmanship is a skill that develops only after years of practice, but electronic media are continually decreasing the importance of manual techniques. Far more important than a skilled hand are a sensitive eye and a knowledge of how to use visual representations correctly. These can be acquired more easily than a general proficiency in illustration. Three simple techniques can help improve the quality of your images:

**Selection
Refinement
Coordination**

- Selecting the Right Vehicle
- Refinement through Progressive Abstraction
- Coordination to Ensure Visual Consistency

Effective visual imagery can be produced (or at least art directed) even by those without a lot of natural “artistic” talent. The only real requirement is an appreciation for the role of imagery and a basic understanding of visual language (Dondis, 1984, Bertin, 1985, and Tufte, 1989, are especially enlightening to this end).



219: Even well-designed images are poorly suited to the problem of representing abstract concepts and complex processes. These elegant symbols representing common data processing operations never gained popularity or widespread use. Design by Tomas Maldonado. © Olivetti S.p.A.

Designers choose between verbal and pictorial representations every day. As the world moves to graphical user interfaces, there is a growing prejudice favoring the use of images. In many cases this represents nothing more than a naive technological determinism demanding that the graphical display be exploited to its “fullest” irrespective of task demands or user needs. It is also widely assumed, however, that images are, on their own merits, more useful, interesting, and (of course) more “fun” than verbal representations. Today’s proliferating toolbars often attempt to provide an icon for every function in the application. While they may be popular for other reasons, we have yet to hear someone claim that toolbars are helpful *because* their icons are easy to understand.

Pictorial images can be very effective in representing familiar concrete objects from the user’s everyday experience. Pictorial signs have also been shown to be far superior to verbal signs for representing inherently spatial concepts (e.g., traffic directions) under brief presentations and poor viewing conditions (Carr, 1973). Images are much less useful, however, in representing abstract concepts or operations without a familiar experiential reality. Particularly when the connection to the sign object is narrow or tenuous, based on obscure language- or culture-specific allusion, failure of interpretation can be expected. Even when carefully designed as part of an elaborate symbol system, images for abstract processes or conditions (219) are purely conventional – they must be learned before they can become useful.

Effective design respects the capabilities and limitations of the material or medium. This principle extends to choice of representation as well. Words convey nuance far more effectively than pictures. The four iconic signs on the left in Figure 220 are more ambiguous than the corresponding verbal labels on the right. The useful semantic distinctions between bar, snack shop, cafeteria, and restaurant are difficult to express visually because the tangible elements with which the viewer is already familiar – the tableware, the eating utensils, even the food – are roughly comparable in all four settings. These well designed images make the distinctions recognizable with just a little practice, but only when viewed as a set. In isolation, the individual images again seem to be applicable to more than one alternative. The verbal labels, in contrast, are immediately understood along with all their subtle connotations.

Visual interface designers face these problems on a daily basis. Even an appropriate conceptual model will fail if the user is unable to correctly evaluate and interpret the underlying system states based on the visual feedback presented (Norman, 1988). The difficulty of developing visual representations that effectively distinguish between *Save* and *Save as*, between *Cut*, *Delete*, and *Clear*, or between controls with similar or identical appearance but different behaviors, should not be underestimated. The problem is especially common in “toolbars” which, for all their popularity in the Windows environment, exhibit very little similarity across applications in the graphical devices they use to represent the same set of abstract operations (221–a). Those toolbar icons reported to be most useful typically correspond to concrete attributes of visible objects, such as font attributes, paragraph alignment, linespacing, or to concrete system objects such as printers and folders.



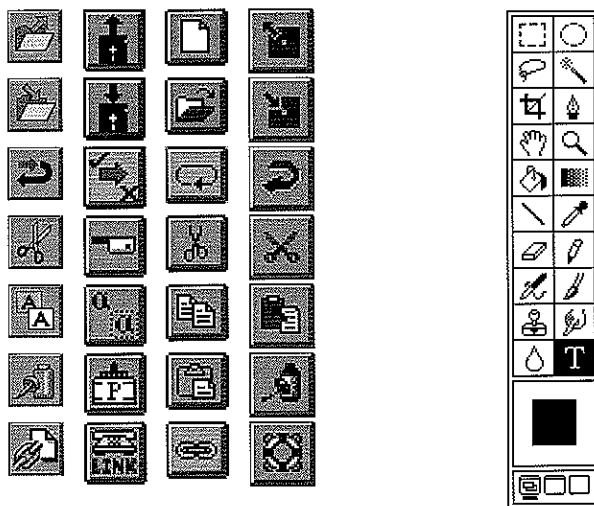
Bar

Snack

Selfservice

Restaurant

220: Words are usually more effective than images for conveying subtle distinctions or shades of meaning, even when the concept being represented is fairly concrete. After Frutiger (1981).



221: Toolbars in Windows productivity applications contain abstract commands (which are also presented as verbal menu items) that are difficult to represent clearly using images. Tool palettes in graphics applications, in contrast, represent persistent modes providing concrete visual feedback.

The visual confusion of most Windows toolbars contrasts sharply with the success of tool palettes in various graphics editing applications (221–b). Tool *palettes* differ from “toolbars” in that most of the icons they contain represent actual application modes (i.e., the “tool” you have picked up) that maintain a tangible existence of their own by virtue of their persistence and visual feedback. The changing shape of the mouse pointer, for example, is usually related to the icon (tool) corresponding to that mode. Because a tool providing proper feedback is more concrete than an abstract verbal command (which becomes visible only indirectly, by virtue of its effect on its target object), the tool palette is both more natural and more effective than the icon bar. A well-organized GUI application should place commands in menus, where the more descriptive verbal representation can be used (along with a suitably mnemonic accelerator), and reserve the visible portion of the display for important tools and direct access to properties with an inherently spatial character.

A picture is worth a thousand words, unless of course, you're talking about a picture of a thousand words

Anonymous

An essential aspect of visual imagery is the speed and directness with which recognition and identification take place. This critical advantage, however, is heavily dependent on the quality and familiarity of the image, as well as its appropriateness for the concept being represented. Choosing and using the right medium for a particular communication task is more a discipline than a technique. Four simple rules should nevertheless be kept in mind when considering these problems:

Summary: Selection

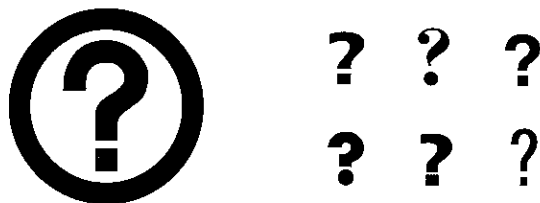
- 1 If the concept to be communicated is a concrete, familiar object or a tangible, externally obvious state, use an iconic sign.
- 2 If the concept to be communicated will be used repeatedly throughout an application or environment, consider establishing a conventional symbolic or indexical sign, especially if an existing sign can be borrowed from the “real” world.
- 3 In most other cases – and particularly when the concept to be communicated is an abstract process or a subtle transition between states – a textual label should be used.
- 4 Avoid, as much as possible, the mixing of purely textual, iconic and indexical or symbolic signs within a single image set.

Historical debate over the relative strengths and weaknesses of visual and verbal representations has focused on which vehicle is *inherently* superior. Interface designers follow this misguided path by trying to do everything *either* textually *or* graphically. The optimal representation varies with the communication problem. Fortunately, the recognizability and understandability of visual representations can be easily and economically subjected to early usability testing (cf., Nielsen, 1993, 37–40). You don't even need a functioning product – a simple list of visual (and verbal) signs can be used to gain a useful assessment.

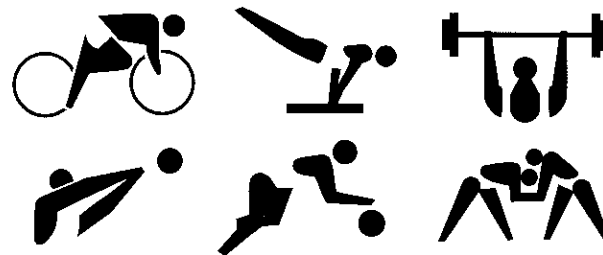


222: A gradual process of simplification and refinement can be seen in the evolution of the Pepsi-Cola identity and trademark. The familiar waveform motif has evolved from a calligraphic flourish through the bottlecap application to its use as an abstract symbol. Used by permission of PepsiCo.

Abstraction is the process by which the essential qualities of the thing being represented are separated from the actual physical object or event. By removing superficial or idiosyncratic details, the designer helps the viewer see the formal qualities that tie the representamen to its object. Good imaging, like good writing, is always the result of a careful process of revision and refinement. In visual, as in verbal communication, the objective is to distill the message to its essence. Only a crisp message will be processed efficiently and interpreted correctly. Image *refinement* depends on a continuous process of simplification, removal of extraneous detail, and regularization of irregular elements. Developing the “correct” form for a given subject and communication objective may require that you start over several times, using the most promising results of previous explorations as a starting point.



223: Typographic forms such as the question mark symbol from the U.S. DOT series (a) must be carefully adjusted when they are to be read as images. The other examples (b) are all from classic typefaces, but none have the graphical integrity to stand on their own.

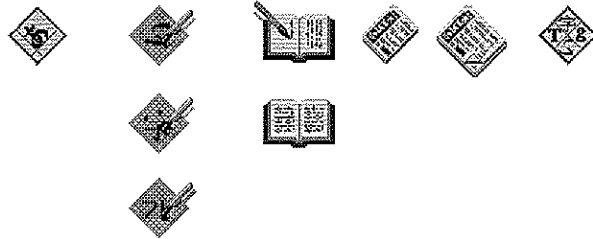


224: These pictograms for the 1964 Tokyo Olympic Games convey a simple elegance through effective use of negative space. By using the background as part of the image, these icons reach a higher level of abstraction and engagement. Design directed by Masaru Katsumi.

The visual history of a trademarks or product identity reflects the same process of refinement – albeit one stretched out over many years – seen in the movement from concept to finished design for a single product. The Pepsi-Cola identity (222) has evolved over nearly a century from the ornate, decorative logotype on the left, to the increasingly stylized and graphically powerful mark on the right. Note how each revision has incorporated the flourishing forms seen in the original logotype. At each revision, however, the flourishes have become increasingly independent of the lettering style as the style has grown bolder and more modernized. The most recent design increases the focus on the flourish and circle (i.e., bottlecap) motif that forms the core of the product identity.

As visual forms are refined, they become simpler, bolder, more direct. Comparing the question mark seen in the U.S. DOT symbol (223-a) set to the unaltered examples on the right (223-b) shows the degree of refinement needed to produce the *Information* symbol. Each of the smaller question marks is part of a beautiful, classic font, yet none have the proportion, balance, or graphical power, to stand alone effectively as an independent visual symbol. The individual characters in a text font are always subservient to the whole, since letters must be designed to work well together rather than as individual elements. (This is why text characters make poor substitutes for graphical elements in a GUI.) The U.S. DOT question mark, for example, cannot be found in any existing text or display font because it has been hand tuned to meet the special requirements of a large display graphic.

Highly refined images operate on many levels. Most importantly, they work effectively at the lowest levels of perceptual processing, where their simplicity enhances the perceptual immediacy of the image. One refinement technique exploits the figure-ground reversal phenomenon that so interested the Gestalt psychologists (Wertheimer, 1958). Figure-ground relationships can be consciously manipulated, as in the pictograms for the 1964 Tokyo Olympics (224). By making the areas of positive and negative space approximately equal, and using both to represent essential elements of the figure (or better yet, separate, but complementary figures), the image can be made to exhibit a playful instability between the alternate interpretations. Using “negative space” (defined by the absence of ink) effectively can create visual interest even as it simplifies the resulting image. The eye delights in completing the image by filling in the “missing” contours.



225: These icons for localized desktop utilities from Nihon Sun depend on careful refinement to convey subtle distinctions within categories. The icons in the second column, for example, represent font editors for Chinese, Japanese, and Korean, respectively. The subtle application of color and texture provides visual cues that help establish category membership. (See also Color Plate 10).

Careful refinement allows subtle relationships to be established between elements in an image set. Many successful monochromatic icon series fail when color is applied because the colors either work poorly together or break up the internal structure of the icon set. The detailed icon set in Figure 225 shows how the careful application of a few colors, used meticulously and purposefully, can produce the minimum adequate contrast in the background elements while permitting the foreground elements to be sharply distinguished.

A good map tells a multitude of little white lies; it suppresses truth to help the user see what needs to be seen.... the value of a map depends on how well its generalized geometry and generalized content reflect a chosen aspect of reality.

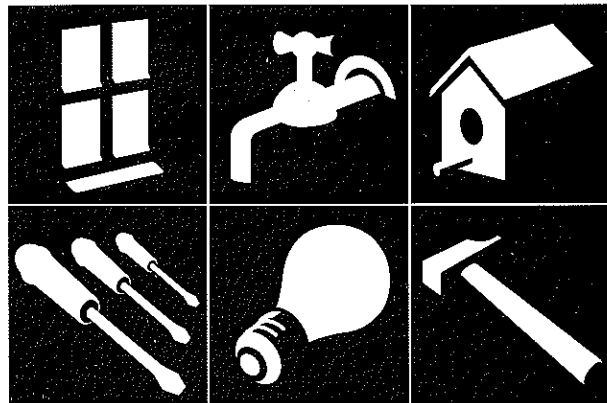
Mark Monomier
How to Lie With Maps

Abstraction begins with a literal representation and works backward to extract the essence of the target object. Beginning with an accurate representation eliminates subtle errors in scale or proportion that can undermine the effectiveness of the final image. Don't assume you “know” what something looks like: always find a high-fidelity original upon which to base your work. When the right original has been found, the process can proceed:

**Summary:
Refinement**

- 1 Determine the appropriate level of abstraction for your image set, based on the subject matter, audience, and display resolution.
- 2 Begin with an image seen from the viewpoint including the most characteristic contours. The source can be a photograph, drawing, or sketch of the object from the desired point of view.
- 3 Use the *trace overlay technique* to rapidly develop a series of drawings derived from the initial image. Omit details until only the most essential or characteristic elements remain. Experiment with different combinations of elements to identify those that best characterize the object.
- 4 Simplify complex shapes into regular geometrical forms where possible. Repeatedly tracing the outline of the shape through multiple layers will itself tend to regularize the image.
- 5 Eliminate contour information that is not required for recognition of the object. Experiment with negative space to suggest contours.

Image development is visual design in a microcosm and many of the techniques discussed previously are relevant here as well. Note, for example, the direct incorporation in the last three steps of the simplification techniques of Reduction, Regularization, and Combination. Scale, contrast, and proportion are important as well, and must be manipulated carefully and consistently both within and across images.



226: These icons from the Pacific Bell SMART® Yellow Pages share a common image orientation and viewpoint, as well as a similar level of abstraction. Awareness of the program can aid in the interpretation of images that might otherwise be obscure. Design by The Understanding Business.

Coordination Ensure Visual Consistency

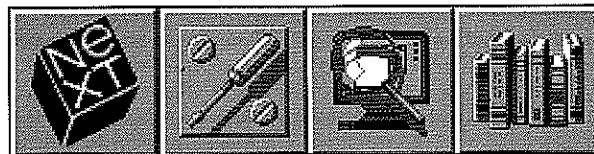
For a set of images to work together effectively, they must share a coherent language of form that makes the interrelatedness of every image in the group immediately apparent. This level of integration can be achieved only by consistently manipulating the perceptual characteristics of each image to balance similarity and differentiation across the ensemble. The most important parameters to standardize are the dominant visual variables of size and value (often described as the “visual weight” of the image). Consistent application of the rest of Bertin’s (1985) visual variables is almost as important, as are the use of a consistent point of view and level of abstraction.

Most images in GUI applications are roughly consistent in size, if for no other reason than that UI toolkits prefer to deal with bitmaps in digitally “natural” sizes. While care should still be taken to ensure that image scales are optically – as well as physically – equated, real problems are seen more frequently in the visual weight and level of abstraction of the images. These qualities often vary wildly within an icon set, and they almost always vary substantially across icon sets in the same environment. While some lack of cross-application coordination is unavoidable, the use of style rules and platform standard imagery can help to define a coherent direction.



227: In this final example from the SMART® Yellow Pages series, the formal choices differ substantially (e.g., orthographic vs. perspective views, extreme vs. moderate abstraction) from those in Figure 226, yet the same *internal* consistency is apparent. Design by The Understanding Business.

The imagery in Figures 226 and 227 (see also 192 and 201) shows the level of integration that can be achieved within an image set by combining elements of the same formal vocabulary. In the first set, where each object is represented by a few planes or surfaces with simplified exterior contours and virtually no interior detail, the unifying factors are the level of abstraction, oblique orientation, and perspective view. Note how the consistently positioned light source underscores both the common orientation and point of view. The second set relies on an absolute uniformity of line weights and a consistent, linear drawing style. These images too show a minimum of inter-

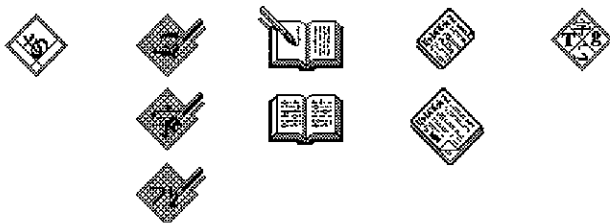


228: Perhaps in hope of compensating for the lack of color in the display, images from the initial NeXTStep release were strongly biased toward maximum concreteness. The detailed iconic representations make the cube symbol of the corporate identity appear somewhat out of place.



229: These icons from OpenWindows 3 use orientation as part of a visual language. Oblique images of documents and media designate tools or devices rather than the documents or media themselves.

nal detail and are likewise consistent in both their orientation (45 or 90 degrees) and their flat orthographic presentation. Icons in existing GUI applications have rarely used abstraction as effectively as in these image sets. The original NeXTStep icons (228) provide a good example of the opposite, representational extreme. The NeXTStep environment began with a highly-illustrative, sharply dimensional style that maximized the impact of their high-resolution grayscale display. Because only four colors were available, the resulting images are more effective than many current GUI icon sets that use color with far less restraint.



230: This monochromatic version of the Nihon Sun icon set (225) shows the concern for visual compatibility with existing OpenWindows icons (229, see also 204). Orientation cues are used in the same way, and existing formal elements such as books and brushes are incorporated or adapted.

The multi-colored Nihon Sun desktop icons (225) were designed to use color effectively in an 8-bit environment. To integrate cleanly with an existing set of monochromatic icons (229), a monochromatic version (230) was created simultaneously. This set was required to work consistently with the visible language of the existing monochromatic icon set. The new icons were also required to be compatible with the new color imagery. The new, slightly more illustrative image program as successfully integrated with the existing icon set by adopting similar size, orientation, line thickness, and point of view.

[In designing image sets, the designer] is looking for the most characteristic visual quality of the object being represented in each case together with the maximum consistency of treatment.

Peter Wilbur
Information Design

Consistency is particularly important in an image set. Because they are such powerful attractors to begin with, images can totally dominate the display if allowed to flower in all its glorious variety. It is better to relate the images visually so that they form a perceptual layer of their own. Users can then attend to the images when necessary and ignore them when appropriate. Achieving consistency in an image set is simply a matter of equating as many of the images' visual qualities as possible:

Summary:
Coordination

- 1 Begin with sketches of a full set of images that have been sufficiently developed to establish the visual characteristics of each image.
- 2 Use a similar or identical point of view and type of perspective for each image. Determine the predominant viewpoint and redraw any divergent images from the new perspective.
- 3 Use a similar form of representation and level of abstraction (i.e., don't combine icons with symbols).
- 4 Use a consistent size, orientation, layout, color, and overall visual weight for each image. Use a layout grid to help ensure consistent internal structure across images.
- 5 Wherever possible, use the *same* elements – including line weights, curvatures, textures, and forms – throughout the image set. In fact, it is not difficult to completely redraw the entire image set using standard components once a formal vocabulary has been defined.

This technique will help you produce image sets that are functional as well as aesthetically pleasing. Regularity within the image set helps distinguish its members from images outside the set. Regularity also makes the individual members more identifiable, since their distinguishing characteristics stand out more strongly as local inconsistencies. Extending the set by adding new images is simplified as well since the design constraints are clear.