PIIMPAPER01 PART THREE VTCAD

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

INTRODUCTION: This document is one of a series of web-available papers dealing with issues of visualization and information design. The initial document of this specific series — PIIMPAPER01, PART01 — contains a detailed introduction to: VT-CAD, *A Visualization Based Objective Taxonomy of Informative Representations for the Classification, Analysis, and Design of Visualizations.*

The shortened name: Visualization-Based Taxonomy For Informative Representation, is used for the title of the papers in this series; this is further abbreviated to: VT-CAD, as used within the paper. The primary assertion of VT-CAD is this: despite the range, from the most apparently simple to most complex, every informative visualization can be deconstructed into four major categories. The four categories are: Pictorial Imagery, Quantitative imagery, Relational imagery and Symbolic imagery. Most images utilize only one of these four categories, but some use up to all four — composed into a single informative construct.

A simple mnemonic allowing the categories to be easily recalled is the referencing of their sequential alphabetical order: P; Q; R; S — (P)ictorial, (Q)uantitative, (R)elational, and/or (S)ymbolic.

Each of these four categories can then be further divided into two sub-categories. One sub-category is referred to as high-constraint imagery, and the other sub-category is referred to as low-constraint imagery.

The underlying division between high- and low-constraint aspects relates to the presence, or the lack of presence, of inherent structure. (Examples of which are taken up shortly). The entire set of four categories multiplied by the two sub-categories within VT-CAD yield eight total classifications. (The deeper specifics of how these classifications are defined, and the general logic of the taxonomy are fully described in — PIIMPAPER01, PART02 —of this series.)

These eight classifications, depending upon how they are composed together (by either layering or influencing each other within a single image type) ultimately build every informative visualization generated or imaginable.

The selection of images that follow represent a kind of "gold standard" of examples. There are 50 in all. Each is presented with a brief description and an identifying citation. Importantly, a schematic accompanies each image.

Schematics for VT-CAD may be generated in four different manners: textual abbreviations, specifically arranged color-coded devices, numeric codes, or simplified drawings. The textual and the color-coded devices examples are used in the series of images that follow. The name given to the assembly of the color-coded devices is: Icon Schematics.

The icon schematic is the crux of VT-CAD's utility. These schematics allow for rapid classification, comparative analysis, and the ability to modify the design or generate new designs based upon the structure of said schematic.

The icon schematic in conjunction with any selected image reveals the informative essence of that image (or detail of that image). The icon schematic is a shorthand of the informative aesthetic. VT-CAD allows such an actionable intelligence to be derived, analyzed, and transferred to modify other images toward improved communicativeness.

A brief overview containing 12 key aspects of how the icon schematics are constructed and decoded follows. Again, this is covered in depth in part two of this series (soon to be made available on the PIIM website). Please also see the endnotes that follow the examples.

1. Informative content, toolsets, and representations.

2. The basemap and the superfice

3. Pictorial, Quantitative, Relational, and Symbolic imagery

4. Considerations of High- and Low-constraint functions

5. Related sub-structures of the classifications

6. Devices representing the classifications

7. Colors used to identify the categories and classifications

8. Pairwise device-sets

9. Assembling the devices into icon schematics

10. Reading a simple icon schematic

11. Assembling the devices into icon schematics

12. Super-high-constraint devices.

PIIMPAPER01 PART THREE VTCAD

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

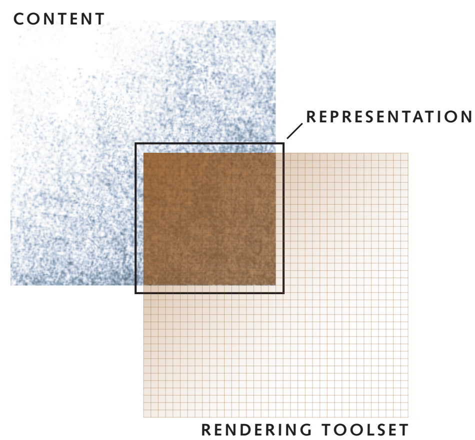
THE PURPOSE OF VT-CAD, A VISUALIZATION TAXONOMY:

VT-CAD is a taxonomy. Its primary uses include classifying, analyzing, and designing informative visualizations. The full, academic title is: A Visualization-Based Objective Taxonomy for Informative Representation supporting the Classification, Analysis, and the Design of Visualizations. The abbreviation is easier: VT-CAD. William Bevington developed VT-CAD with the significant input of Dr. Arno Klein.

Information, in its elemental and intrinsic sense, is non-tangible. We call this “primary” information. Such primary information (content) becomes tangible (as a representation) when rendered through some kind of toolset (speech, writing, GUIs etc.) For the purpose of VT-CAD we are mostly unconcerned with any particular kind of rendering toolset. Instead, VT-CAD focuses on the resultant imagery.

VT-CAD was developed to address “informative” imagery as opposed to “expressive” imagery. Informative imagery is generally aimed at user-enablement concerning insight, analysis, and decision-making.

These slides are an introduction to the key elements of VT-CAD. In order to fully benefit from the “Icon Schematics” that accompany the on-line image collection please refer to PIIMPAPER01, parts 01 and 02. (Available on this PIIM website.)

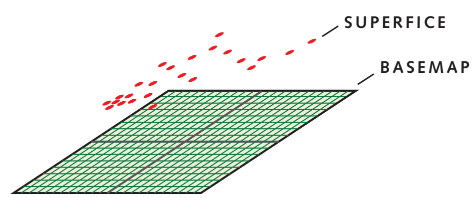


THE BASEMAP AND THE SUPERFICE:

Informative visual representations may be composed of any number of layers. The positioning of the composed elements within, or across any layer, may be so organized by an underlying structures that may, or may not, be visible. Every informative visual representation has a structural schema that can be determined through a deductive analysis of the image. Also, any schema may inductively be used to create a representation.

Examples of underlying structures that organize elements include: non-visible lines that position letters into a row, visible Cartesian grids that accurately position dots in a graph, or earth imagery by which icons are positioned. We call these organizing base-structures, basemaps. Usually a single kind of basemap organizes all the elements, but there can be instances of composite basemaps.

All the “upper” layers and elements positioned by the basemap are referred to as the superfice. Superfice elements are always visible. Unlike the basemap function, which is usually singular, the superfice may be composed of many levels. Humans have little trouble reading through, and cognitively assimilating many layers of data that depend on one underlying construct, but multiple organizing constructs within the same schema are challenging.



PIIMPAPER01 PART THREE VTCAD

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

PICTORIAL, QUANTITATIVE, RELATIONAL, AND SYMBOLIC IMAGERY: The most initially controversial assertion of VT-CAD is that all informative visual representations are composed of no more than four potential types of imagery. This took many years, and the consideration of thousands upon thousands images to confidently argue.

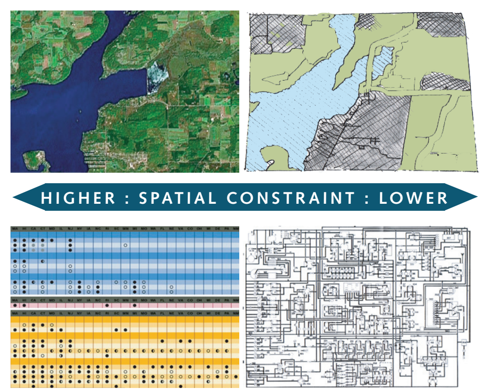
Again, although richly informative representations may be seemingly composed of many types of imagery they can all be classified under just four major categories. The four categories are: Pictorial Imagery, Quantitative imagery, Relational imagery and Symbolic imagery. A simple mnemonic pertaining to remembering the categories is that they can be recalled by their sequential alphabetical order: P; Q; R; S — (P)ictorial, (Q)uantitative, (R)elational, and (S)ymbolic.

It is true that the range within each category is prodigious, yet a boundary of a kind does exist. Pictorial includes highly accurate through highly interpretive images that appeal to our human sense of perceiving real things. Quantitative include grids and value-assigned icons. Relational include tables as well as link-and-node diagrams. Symbolic includes letterforms, pictographs, and symbols.

CONSIDERATIONS OF HIGH AND LOW CONSTRAINT: Each of aforementioned categories is then divided into two sub-categories. One sub-category is referred to as high-constraint imagery, and the other, low-constraint imagery. The underlying rational between high- and low-constraint aspects relates to the presence, or the lack of presence, of inherent structure. The set of four categories (P, Q, R, S) multiplied by these two sub-categories yield eight total classifications within VT-CAD.

A salient feature of VT-CAD is that each of these eight classifications has an associative and unique structural principle that identifies and defines it. In order to leverage the value of VT-CAD for classifying, analyzing, and designing schematics for better representing data it is necessary to understand these associative structures.

Pictorial imagery is supported by a structure akin to dots or pixels. The smaller and more "traceable" to reality these elements the more constrained the image. By deleting, resizing, or reorganizing these elements the picture moves toward low-constraint. In this sense the structure supporting pictorial imagery is somewhat analog as it moves from highest accuracy to low accuracy (but perhaps more informative) imagery. The other categories differences are more polarized.



PIIMPAPER01 PART THREE VTCAD

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

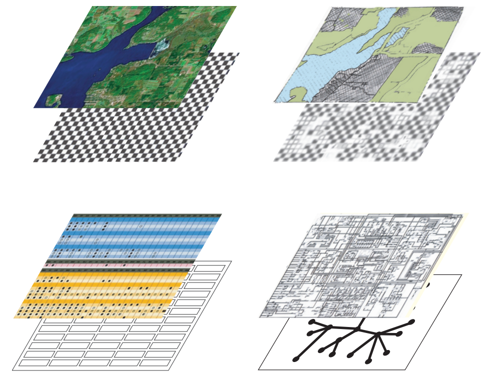
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

RELATED STRUCTURES OF THE CATEGORIES: Each of the eight classifications has a relative structure that influences the way it is visually realized. Pictorial has already been discussed and can be seen in the image to the left. The high-constraint example is made up of a fine mesh of accurately placed sub-elements (pixels, variable dots, etc.). Conversely, the low-constraint example shows considerable distortion. One of the key features of visually informative representations is that sometimes accuracy is traded for more desirable cognitive benefits.

The example below shows the structure of high-constraint relational imagery (a series of columns and rows) and low-constraint relational imagery (node and link structure). The nodes and links relate, yet they are not constrained to each other by proximal consistencies.

Not shown are symbolic structures where high-constraint is simply a line (that must of course be broken into columns when it supports long lengths of text). Low-constraint symbolic is simply a dot that references a visual symbol.

Quantitative high-constraint structures are represented by Cartesian frameworks and their ilk (often usually apparent in informative representations). Low-constraint quantitative images are represented by fields of two or more free-floating elements that have assigned numeric values.

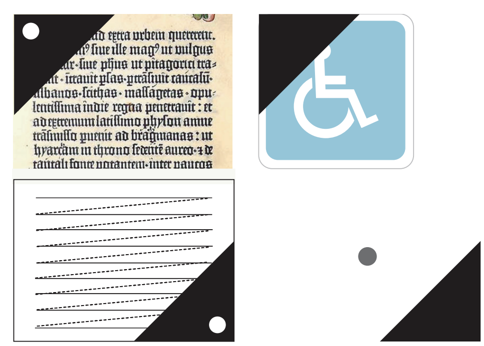


DEVICES REPRESENTING THE CLASSIFICATIONS: In order to leverage the logic of VT-CAD it is useful to create schemas that can identify any informative visual representation. One can then compare these schemas (be they text or diagrams) to classify, analyze, or even design similar or modified composite imagery. The syntax for such an identifying schematic needed to be rich enough to properly evaluate and define the visualizations in question, yet, not overtly complex.

One schema utilizes coded language, e.g.: L-C-S Symbolic >: H-C-B Quantitative. This would mean, for example, a Low-constraint superfice symbolic positioned by a high-constraint basemap quantitative (dots over a Cartesian graph). This system is more useful to machine logic than human interpretation; it is used in some of our printed examples.

The schema applied to the collection of images identified here employs a set of icons that we call Devices. The collective of devices (representing any particular visualization example) is called an Icon Schematic.

In the illustration to the left the set of four devices representing the four states of symbol imagery are shown: High-constraint superfice function symbolic, low-constraint superfice function symbolic, high-constraint basemap function symbolic, and, low-constraint basemap symbolic.



A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

COLORS USED TO IDENTIFY THE CATEGORIES AND CLASSIFICATIONS: Colors are used to identify the four categories. The colors are: Green for Pictorial, Yellow for Quantitative, Red for relational, and Black for Symbolic. Mnemonic devices support the choices to permit memorization of color to category. Color choices were made primarily for strength of graphical display and for the ease by which users will learn to associate a particular color to its category.

Green is used for pictorial imagery, or the rules of pictorial imagery. Green was chosen for pictorial imagery as it is representative of the natural and the real.

Yellow is used to indicate quantitative imagery, or the rules of the quantitative. Yellow was applied as a mnemonic referencing caution's associative color: yellow. It conveys the notion of using extreme care when handling statistical and numeric data.

For relational imagery the color red is used; Red for Relative, Red for blood-red relations. A mnemonic that needs no further assistance!

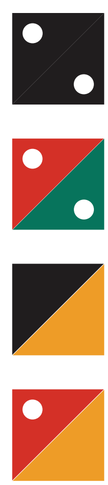
Black relates well to symbolic representation as it is long associated with the aspect of printing text and it is the overwhelming default color for logo and symbol depiction.

PAIRWISE DEVICE-SETS: Devices representing the classifications are in triangle form. This triangle can be placed in only one of two ways: with its right angle to an "upper-left" position and its hypotenuse running upward from left to right. Or, with its right angle in a "lower-right" position with its hypotenuse also running upward from left to right.

In the upper left position the device is representative of superfice functions, i.e., always visible imagery that is positioned by something "below" it.

In the lower right position the device is representative of basemap functions. In this case the "image" may actually be non-visible as it supports superfice elements "above" it.

The hole-punch indicate high-constraint, the solid shape, low-constraint. These 16 elements have a relatively specific language. When the two forms are joined a solid square is form. These squares are called, pairwise device-sets. Pairwsie device sets have a very specific meaning. One could think of the separate devices as pictographs and the pairwise device-sets as ideograms. The sixty-four possible device sets cannot all be defined here; some are common, others rare or non-useful. PIIMPAPER01 Part 02 contains a full description set.



PIIMPAPER01 PART THREE VTCAD

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

ASSEMBLING THE DEVICES INTO ICON SCHEMATICS: This is an icon schematic composed of devices of differing types. It contains two singular triangular devices, representing (in this case) symbolic imagery. In addition to the single elements are two pairwise device-sets.

These devices, singular or as pairwise device-sets are composed into columns.

Bar devices separate the rows in the columns.

The icon schematic is read from the bottom up, and on each row, from left to right. So, in this example, the green pairwise device-set is positioning the yellow/red pairwise device-set and the black device. The yellow/red pairwise device-set is, in turn, positioning the black device above it.

This example is interpreted as follows: An illustrated map (the meaning of the double-green pairwise device-set) is positioning a quantitatively modified network (the meaning of red/yellow pairwise device-set) with text elements (high-constraint superfice symbolic device[s]). This composite, in turn, is positioning a set of icons (low-constraint superfice symbolic device[s]).

The meaning of the color-coded bar device is explained in the next slide.

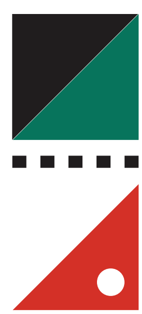
READING A SIMPLE ICON SCHEMATIC: Icon schematics can be only be composed of these kinds of devices: Singular devices, pairwise device-sets, and bar devices.

A bar device may be singular or connected. They are either solid black, solid red, or dotted black. When solid they signify a visible basemap. A dotted bar indicates a non-visible basemap. A red bar indicates that the image element(s) in question are color-coded: a color-coded network or series of icons, for example.

At the left is a very simple icon schematic. It is read as follows:

A non-visible high-constraint basemap relational image (i.e., a grid of possibly uniform areas) is positioning picture/symbol element of some kind. Remember that all pairwise device-sets are ideographs with specific meanings. This one is indicative of a set of similar pictorial elements that are somehow joined with referencing icons, not an uncommon combination in informative imagery. Specifically the pairwise device-set is called an: icon-annotated pictorial pairwise device-set.

An interesting aspect of this icon schematic is that it is telling us that these annotated images are arranged, or positioned by, a grid, but that the grid is not visible.



A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

ASSEMBLING THE DEVICES INTO ICON SCHEMATICS: This is an icon schematic composed of devices of differing types. It contains two singular triangular devices, representing (in this case) symbolic imagery. In addition to the single elements are two pairwise device-sets.

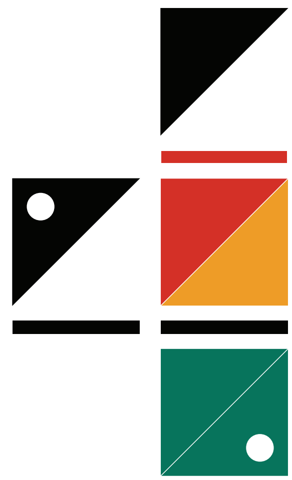
These devices, singular or as pairwise device-sets are composed into columns.

Bar devices separate the rows in the columns.

The icon schematic is read from the bottom up, and on each row, from left to right. So, in this example, the green pairwise device-set is positioning the yellow/red pairwise device-set and the black device. The yellow/red pairwise device-set is, in turn, positioning the black device above it.

This example is interpreted as follows: An illustrated map (the meaning of the double-green pairwise device-set) is positioning a quantitatively modified network (the meaning of red/yellow pairwise device-set) with text elements (high-constraint superfice symbolic device[s]). This composite, in turn, is positioning a set of icons (low-constraint superfice symbolic device[s]).

The meaning of the color-coded bar device is explained in the next slide.

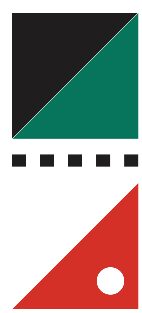


SUPER-HIGH CONSTRAINT DEVICES: By looking through a series of informative representations with their associated icon schematics a sense of consistency of types begins to emerge. In this web-enabled collection we have included a number of New York subway maps. These maps have similar characteristics: they all employ cartogrammic maps as organizing backgrounds, and they all display a series of color-coded network lines running across their surface.

The icon schematics look similar, but they all have critical differences. It is interesting that the most famous of these, Vignelli's late 1960's, early 1970's version, is represented by the most elegant and compact icon schematic.

No image has been found that could not be represented by the language and componentry of the icon schematics. In fact, many of these images were chosen as challenges to the system, yet were identified using VT-CAD.

Viewers will find an additional kind of high-constraint device in the imagery. These are examples with an added ring around the punch-hole. This means super-high constraint. It is used to depict signal or algorithm generated imagery; or, in symbolic devices, it means a "noiseless" signal/channel visual depiction.



PIIMPAPER01 PART THREE VTCAD

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

ABOUT PIIM: PIIM is a Research, Development, and Professional Services facility within The New School and located in New York City. PIIM's mission is to advance the field of Knowledge Visualization through academic and commercial pursuits.

PIIM researchers and staff disseminate their expertise in information categorization, knowledge representation, information taxonomy development, information logic and ranking/scoring, knowledge visualization, and Graphic User Interface (GUI) and User Experience Design (UXD) by developing powerful tools and methods for decision makers and analysts. PIIM's work seeks to increase decision maker and analyst cognition of complex data sets via efficient experiences and visualizations.

In both its own research and in its engagements with government agencies, corporations and other organizations, PIIM pushes the boundaries of information, engineering and visual design to develop new ways of thinking about information — and to build and deliver corresponding real world solutions.

ENDNOTES: We sincerely hope that this PIIMPAPER has been of benefit to the reader. Our purpose in making these papers available is to stimulate interest in the craft of information design, and to promote the creation of the highest level of insight into informative sources. Good communication empowers all concerned. A lack of informative transparency can undermine a mission. It does so because the stakeholders are unaware of better information design opportunities. Thankfully, when one sees how the same information can be arranged so well, or so poorly, there is never a return to less revealing information constructs.

In a manner, the very process of interacting with information causes more and more information to be generated. This is why practitioners must think with non-linear methods and cast a net of containment over the whole, by doing so they may ascertain patterns that permit reduction. There is a joy in working with creative individuals while they collectively struggle to reveal just what kind of logical key can generate info-insightfulness. That is what these models are; however, though they have been formalized to withstand just a bit more criticism then one may find from one's supportive peers in a late-night session!

QUESTIONS ABOUT PIIM SHOULD BE ADDRESSED TO:
Brian Willison, Director,
Parsons Institute for Information Mapping
willisob@newschool.edu

QUESTIONS ABOUT THIS PIIMPAPER SHOULD BE ADDRESSED TO:
William Bevington,
Reference: *PIIMPAPER01–03:*
Identifying Images with Icon Schematics
bevingtw@newschool.edu

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

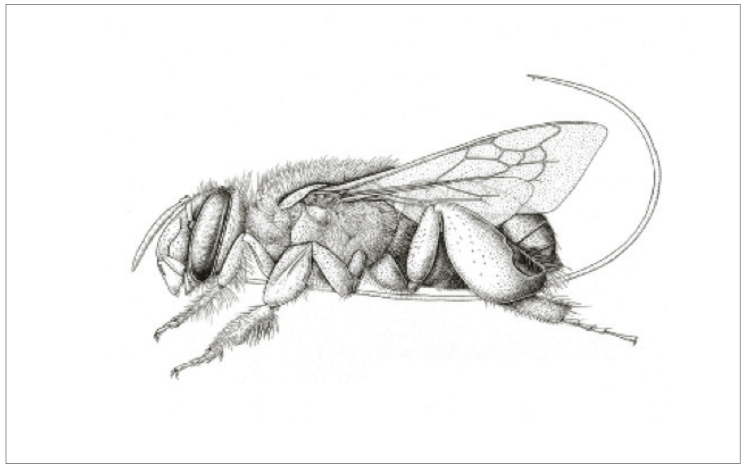
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

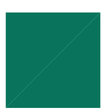
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



© 2003 BARRETT KLEIN
EUGLOSSA HUGONIS

L-C-S PICTORIAL

Scientific illustrations, such as this entomological study, are often presented as "free-standing" images. Although possessing high levels of accuracy, this image is considered a low-constraint depiction because the artist may render such a specimen with idealized modifications. The drawing is self-referenced and is not placed in any kind of background. Therefore, it is depicted with a single green device (pictorial) in the superfice location only. This depiction indicates that it is a floating element that does not rely on any basemap for contextual reference.



© 2008 LINDA ROSSIN
SILHOUETTES ALONG THE SHORE [D]

PICTORIAL [PDS]

The majority of realist, figurative, pictorial imagery is identified with this simple icon schematic. In this detailed miniature by Linda Rossin (approximately 7 x 12.5 cm.), the artist has freely blended natural themes to an expressive purpose. This particular example is composed of the low-constraint pictorial image identifier in both the superfice and the basemap locations. The result is a pairwise device-set in the form of a simple green square — representing a fully contextual pictorial image that is not geographically or map-referenced.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

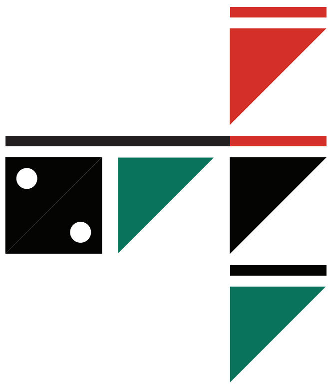
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

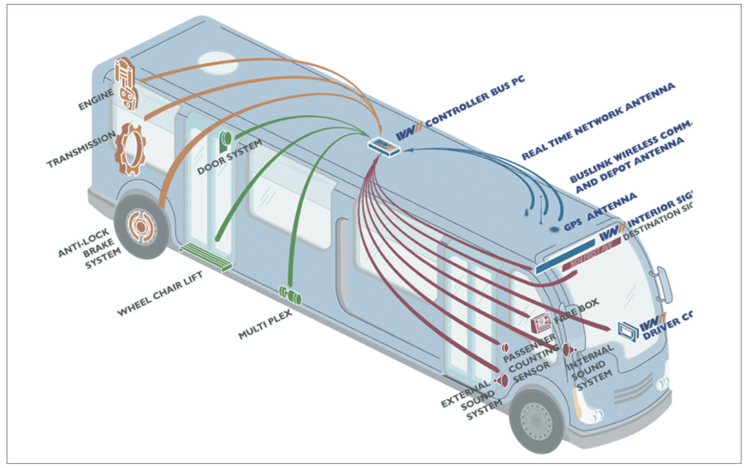
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

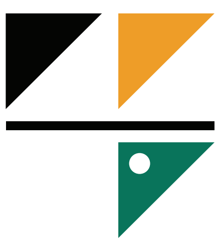
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



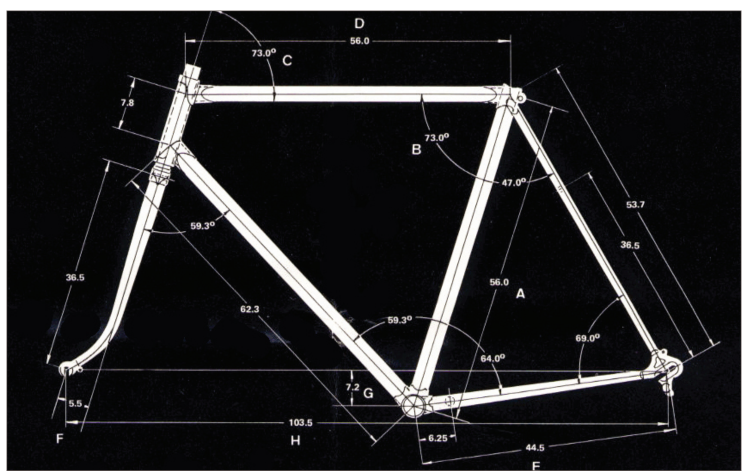
[CC] L-C-S RELATIONAL
>: [CC] L-C-S SYMBOLIC
+: L-C-S PICTORIAL
+: FORMATTED TEXT [PDS]
>>: L-C-S PICTORIAL [SBF]



In this example a low-constraint pictorial device serves to represent a stylized bus illustration. The illustration (which is not placed in any greater context) references a collection of icons, textual sets, and small images. In order to convey the relational interconnectivity of these elements, a network (a low-constraint relational image) is referenced to them. The network is color-coded to reflect aspects of mechanical, electrical, and information technological qualities. The assemblage is designed for viewing ease and informational reference, certainly not accuracy!



L-C-S QUANTITATIVE
>: L-C-S SYMBOLIC
>>: H-C-S PICTORIAL [SBF]



This informative image depicts a precisely drawn bicycle frame that possesses an absolutely consistent measurement scheme. The quantitative elements are depicted as arrows that are annotated with relative measurements. One does not generally think of arrows as quantitative devices (i.e., glyphs), however, in this informative visualization they are serving as such. The image of the frame is not set in a greater background context so it is depicted through a superfice device. (Although the superfice is serving in a kind of basemap function by referencing the elements above it.)

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

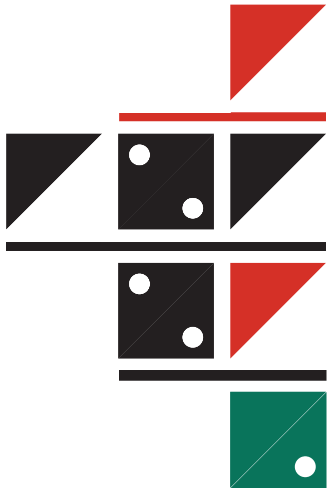
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

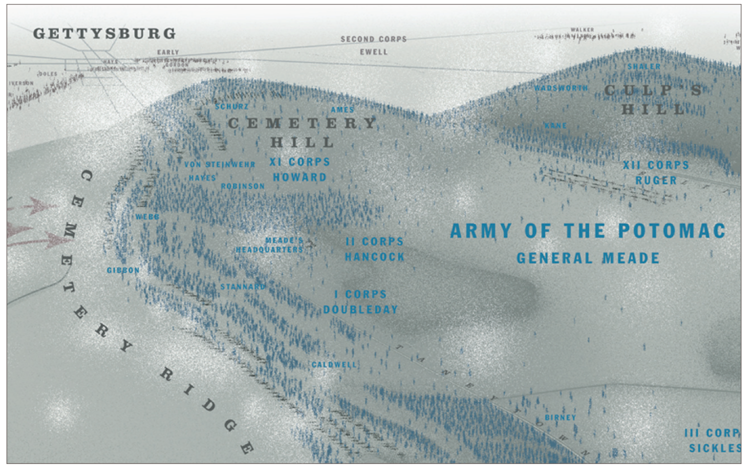
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



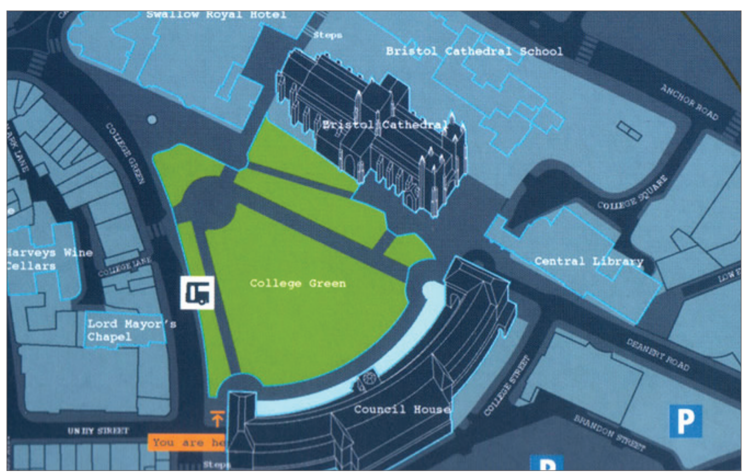
L-C-S RELATIONAL
>: [CC] L-C-S SYMBOLIC
+: [CC] FORMATTED TEXT [PDS]
+: L-C-S SYMBOLIC
>: L-C-S RELATIONAL
+: FORMATTED TEXT [PDS]
>>: GEO-PICTORIAL [PDS]



© 2001 CHRISTIAN DRURY / TNS
MAP OF THE GETTYSBURG BATTLE [D]

This map detail presents a view of Gettysburg, Pennsylvania, during a pivotal conflict of the US Civil War. The white haze serves a dual purpose: it visually indicates the smoke from spent gunpowder while conveying an emotive quality respecting the intensity of the battle. The smoke from the ordnance is iconographic, as are the color-coded troops. The map positions place-names and a distant road network. "Above" these elements are symbols depicting the conflict — also note the directional network coming in from the left, which conceptually sits atop the entire composite.

FORMATTED TEXT [PDS]
>: H-C-S SYMBOLIC
+: L-C-S PICTORIAL
+: L-C-S SYMBOLIC
>>: [CC] GEO-CARTOGRAMMIC [PDS]

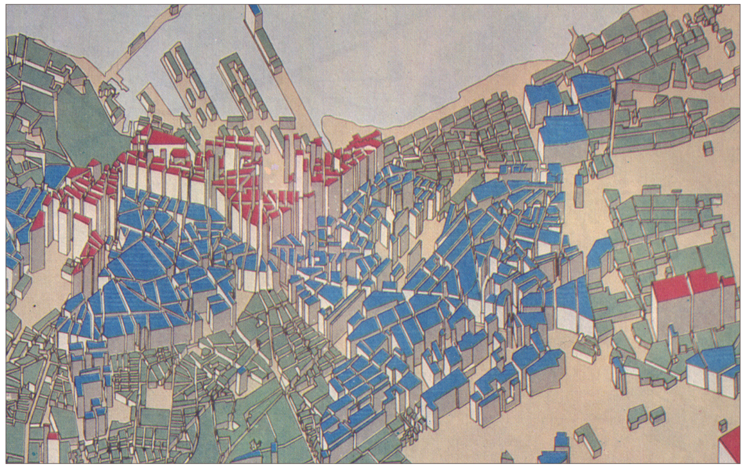


BRISTOL CITY COUNCIL, BRISTOL, ENGLAND
[D]
DESIGNED BY METADESIGN, C 2000

Accuracy may be the ultimate requirement for targeting, but for general reference, distortion is often desirable. In this example, geography merely "informs" a high-constraint relational structure. The pairwise device-set at the bottom of the icon schematic indicates this aspect: the geography underpins a contiguous relational matrix of solid-filled areas. Such a method is representative of many cartogrammic-based images. All of the informative elements (e.g., street identifiers, isometric pictures, and street sign icon locaters), are positioned by the underlying cartogram.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

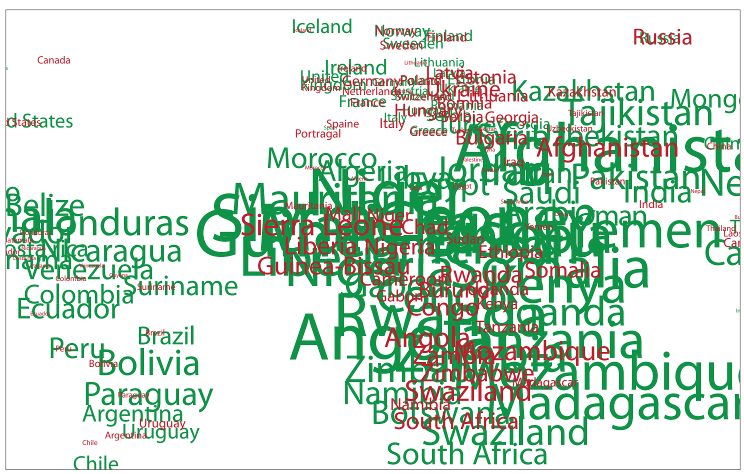
THE NEW SCHOOL
PARSONS INSTITUTE FOR INFORMATION MAPPING
68 5th Avenue
Room 200
New York, NY 10011
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



TOPOGRAPHIC/CARTOGRAMMIC VIEW OF CASABLANCA [D]
US ARMY ENGINEER TOPOGRAPHIC

[CC] Q-SCALED PICTORIAL [PDS]
>>: GEO-PICTORIAL [PDS]

This map is populated with a set of simplified building images. The buildings are color-coded to reflect three different height (quantitative) characteristics. In the accompanying VT-CAD icon schematic, this difference is conveyed through a pairwise device-set composed of a pictorial low-constraint device (in the superfice position) and a quantitative low-constraint device (in the basemap position). The buildings are positioned on a map that is represented by a pairwise device-set for earth-referenced maps; a rapid sense of the urbanization of Casablana is revealed.



© 2008 STEFAN KNECHT / TNS
WORD MAP COMPARING INTERNATIONAL PER CAPITA ANNUAL BIRTH VS. DEATH RATES [D]

[CC] Q-SCALED TEXT [PDS]
>>: [NV] H-C-B GEO-REFERENCED

THE NEW SCHOOL

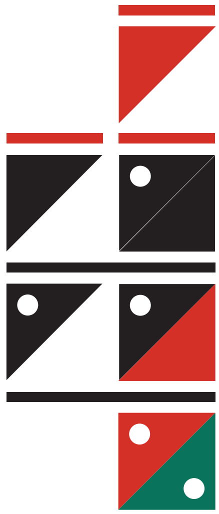
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

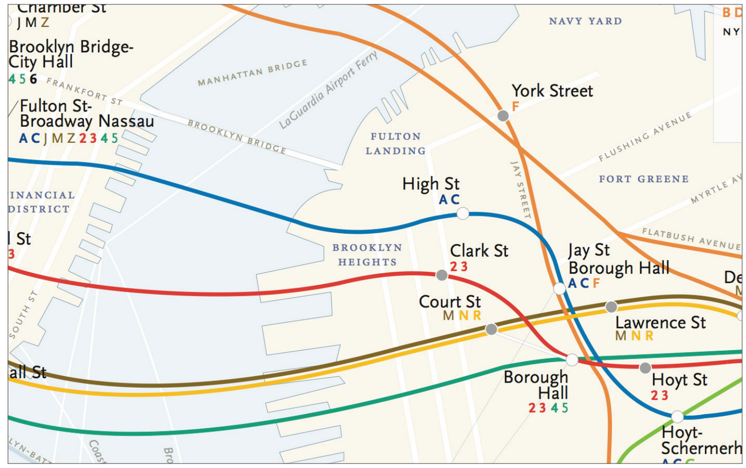
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

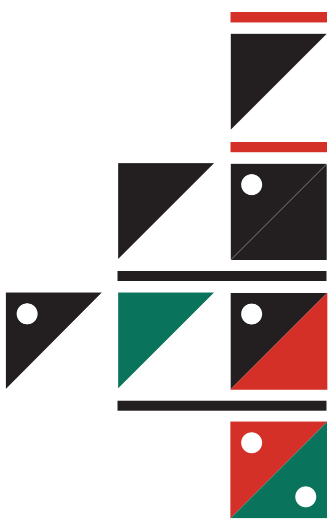


[CC] L-C-S RELATIONAL
>: INDICATOR-TEXT COMPOSITE [PDS]
+: [CC] L-C-S SYMBOLIC
>: TEXT SUPPORTED NETWORK [PDS]
+: H-C-S SYMBOLIC
>>: GEO-CARTOGRAMMIC [PDS]

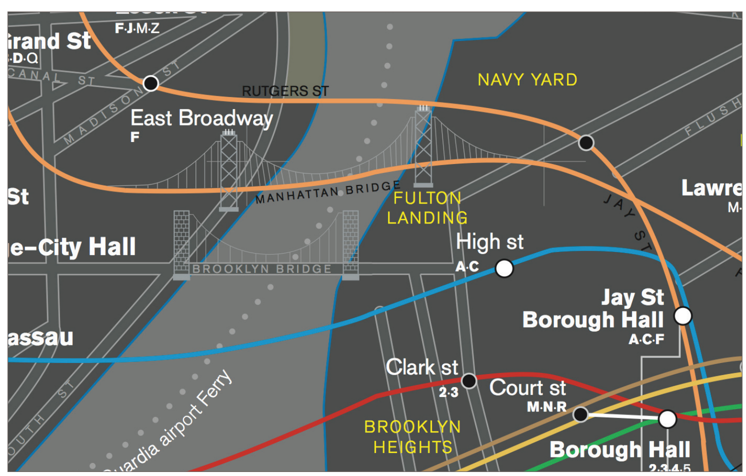


© 2002 TAKAAKI OKADA / TNS
NEW YORK SUBWAY MAP [D]

Highly interpretive geo-based maps provide an excellent reference for network depictions. This visual representation of the New York subway system utilizes softly arced network lines and a palette that is comforting to the eyes. The visualizations is intended for the purpose of assisting in physical navigation. Icon schematics that identify this kind of visualization include many symbolic and relational elements. The basemap is more realistic than most in this category but still may be classed with the Geo-cartogrammic relational map, pairwise device-set.



[CC] L-C-S RELATIONAL
>: INDICATOR-TEXT COMPOSITE [PDS]
+: [CC] L-C-S SYMBOLIC
>: TEXT SUPPORTED NETWORK [PDS]
+: L-C-S PICTORIAL
+: H-C-S SYMBOLIC
>>: GEO-CARTOGRAMMIC [PDS]



© 2001 K. SEO / TNS
NEW YORK SUBWAY MAP [D]

This version of a network (low-constraint relational) Geo-cartogrammic relational map uses a dark background, an unusual technique for public transportation displays. The dark background would translate well for screen applications as this permits an advantageous luminescence to the network imagery. Expressive elements are also added in the form of pictorial line drawings for bridges. A text supported (formal) network is further referenced with simple pictorial line images; this is reflected on the second-from-bottom line in the icon schematic.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

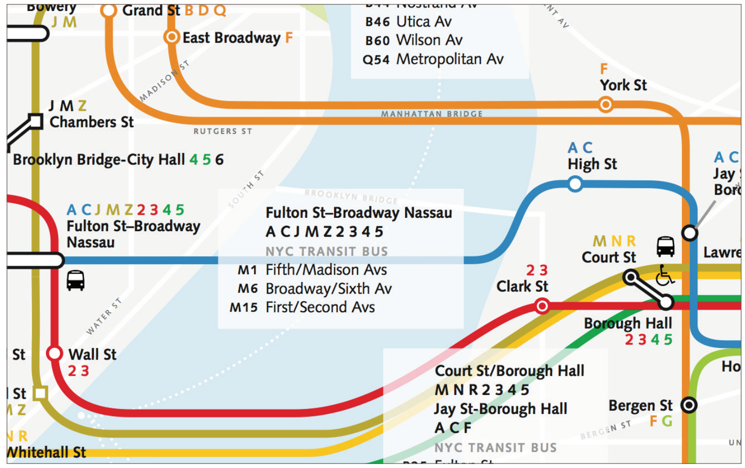
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL
PARSONS INSTITUTE FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

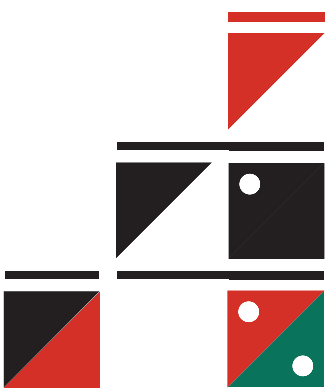
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

[CC] L-C-S RELATIONAL
>: [CC] INDICATOR-TEXT COMPOSITE [PDS]
+: [CC] L-C-S SYMBOLIC
+: L-C-S SYMBOLIC
+: L-C-S RELATIONAL
>: TEXT SUPPORTED NETWORK [PDS]
>>: GEO-CARTOGRAMMIC [PDS]

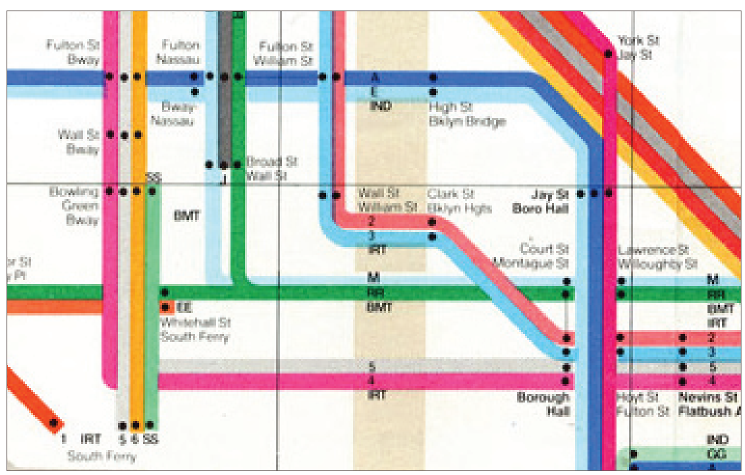


© 2002 CHRISTIAN MARC SCHMIDT / TNS
NEW YORK SUBWAY MAP [D]

This subway map utilizes a Geo-cartogrammic relational map and a slightly more formalized layout for the network lines referenced to it. The network appears almost road-like, minimizing the negative noise between link elements. Several kinds of iconographic elements are added, including bus connections. There is also a sub-network, interlinking the main networks in the diagram. (The call-out text references are not included in the icon schematic, as these are essentially separate visual elements that annotate the primary informative visualization.)



[CC] L-C-S RELATIONAL
>: INDICATOR-TEXT COMPOSITE [PDS]
>>: GEO-CARTOGRAMMIC [PDS]
[&SL] >>: IDENTIFIED MATRIX [PDS]



© 1966 MTA, NEW YORK STATE
NEW YORK SUBWAY MAP [D] (DESIGN BY MASSIMO VIGNELLI,
VIGNELLI ASSOCIATES)

This is the celebrated, albeit discontinued, New York City Subway map created by Vignelli Associates. Vignelli's original plan was to create a series of maps ranging from extreme variants of highly interpretive to highly accurate maps. In this manner, different types of public users' tasks could be addressed. Extreme examples of rationalized designs are always vulnerable to criticism of non-true scale despite their increased value once general familiarization is gained. This informative visualization has two basemaps, one is the geographic the other a referencing relational grid.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

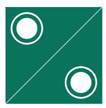
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

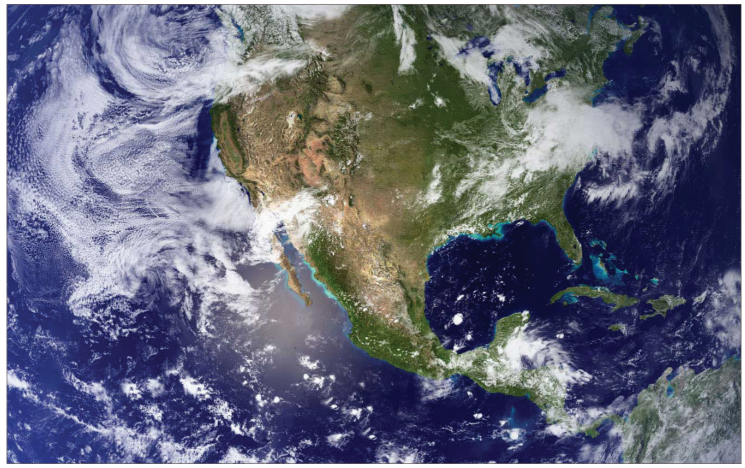
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

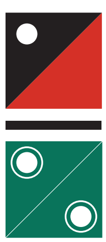


[SG] GEOSPATIAL-PICTORIAL [PDS]



NASA IMAGERY

This composite device indicates a super-high constraint pictorial pair. In all cases, this indicates the depiction of signal-generated imagery. The device has a ringed indicator to signify this. Two factors are extant: the first is the use of accuracy-oriented, image capture technology (light or other signal) to obtain the image, and the second factor indicates the lack of human-instilled, post-capture distortion. The ringed indicator signifies no human modification to captured image (except for uniformly applied algorithms, as for example, with hyper spectral imagery).



TEXT SUPPORTED NETWORK [PDS]
>>: [SG] GEOSPATIAL-PICTORIAL [PDS]

© 2008 GOOGLE CORPORATION
SCREEN CAPTURE OF:
HYBRID ROAD AND SATELLITE IMAGERY

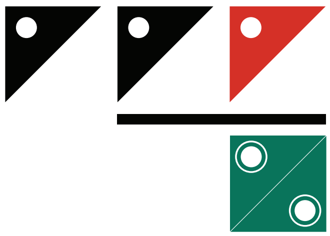
This is a screen capture of the now ubiquitous web-available imagery. The high-constraint relational image, in this case a road map, is precisely (or as current technology allows) "locked" to a signal generated, earth-referenced basemap.

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

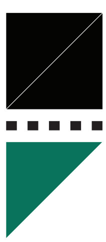
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



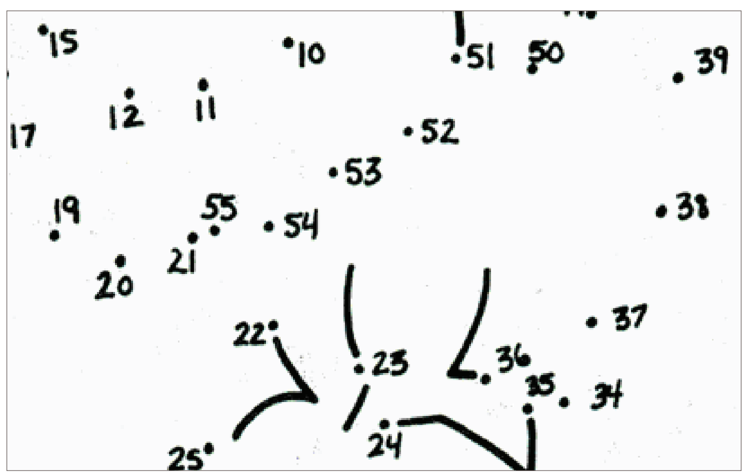
H-C-S RELATIONAL
+: L-C-S SYMBOL
+: H-C-S SYMBOL
>>: [SG] GEOSPATIAL-PICTORIAL [PDS]

© 2007 ACTIVISM PUBLISHING, INC.
SCREEN CAPTURE OF GAME INTERFACE

This is a screen capture of a gaming interface. Here the concept of "targeting" aligned to a high-accuracy imagery is apparent. The super-high-constraint pictorial pairwise device-set is supporting a collection of elements. These include; high-constraint relational imagery with iconographic and text elements. One text element reads, do not fire on any target marked by a strobe, those are friendlies.



ICON/INDICATOR + SYMBOL COMPOSITE [PDS]
>>: [NV] L-C-S PICTORIAL [SBF]



© 2003 POINT SEBAGO RESORT
CONNECT-THE-DOTS CHALLENGE

Some imagery is intentionally left incomplete. Connect-the-dot games and paint-by-number matrices are two examples. The basemaps are intentionally non-visible, as the user supplies the context (the whole point of the exercise). This image also illustrates the usage of a pairwise device-set respecting the double low-constraint symbolic example. Dots associated with numbers being such an example; the numbers represent conceptual ideas of value associations, one does not phonetically pronounce them — they are not phenograms.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

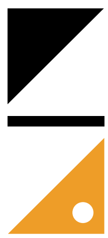
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

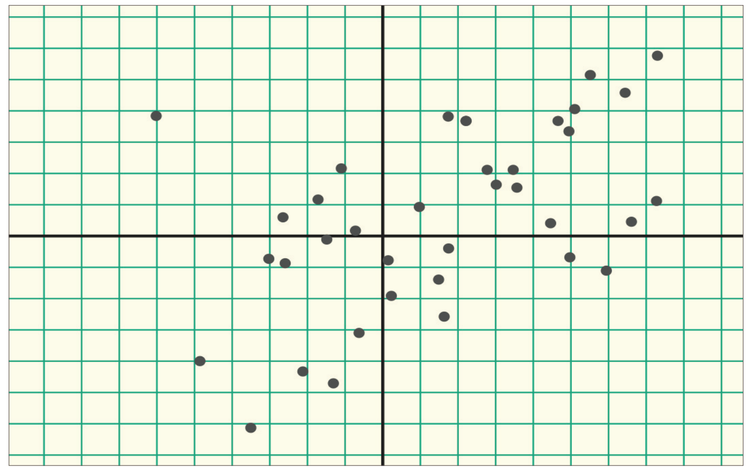
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



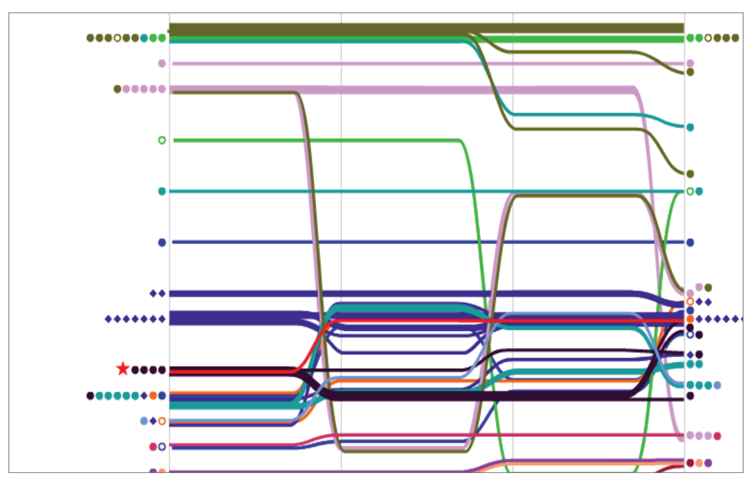
L-C-S SYMBOLIC
>: H-C-B QUANTITATIVE



© 2003 PIIM/TNS (ARNO KLEIN)
QUANTITATIVE BASEMAP TEST IMAGE

A set of (here undefined) quantitative, coordinate grid lines support simple icon devices: dots. The dots are clearly referenced to a visible set of coordinates, if this Cartesian framework were not visible, yet extent, the dots would be in the same location. The difference is demonstrated in the Icon Schematic by the presence of a solid bar, or a dotted bar, above the basemap element.

[CC] C-POSITIONED LINE GRAPH [PDS]
+: [CC] L-C-S SYMBOLIC
>>: H-C-B QUANTITATIVE



© 2002 SENTIA GROUP
EVENT-OUTCOME SCORE GRAPHIC [D] (DESIGN: WM. BEVINGTON, SIU CHONG)

A set of coordinate values supports the quantitatively-referenced network display. A useful feature of this rendering is that the lines are connected to “dots” that run across full values of the grid. This minimizes the “spaghetti-effect” and allows far more entries to be decipherable. This is a common icon schematic, although the basemap element is not shown joined with its reference values, and, as noted, the lines follow a kind of unconventional railroad pathway.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

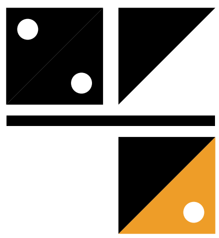
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

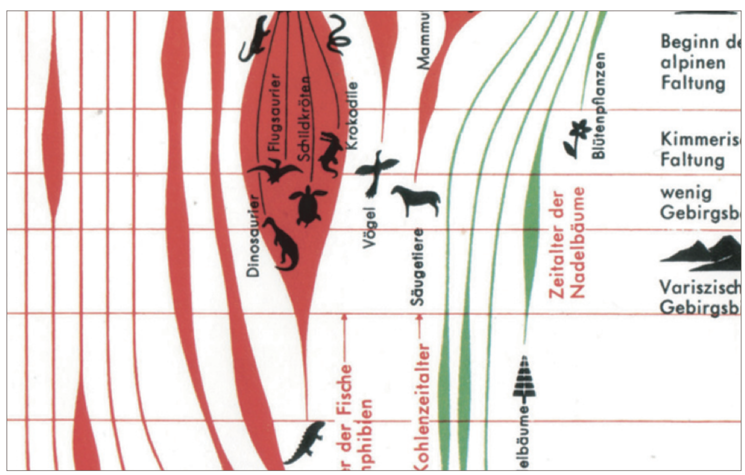


L-C-S SYMBOLIC
+: FORMATTED TEXT [PDS]
>>: IDENTIFIED COORDINATES [PDS]

C. 1939 WORKS PROJECTS ADMINISTRATION TIME STAMP (COLLECTION OF WM. BEVINGTON)

This compact and elegant informative image conveys a significant amount of information. An icon-referenced, quantitative matrix (designed as a 12-hour time scale reference) supports several elements to covey both time and location aspects. This is done through a combination of icon and text. The text conveys day, date, and location. The document-object of concern receives the physical marking with the stamp — supreme informativeness!

L-C-S SYMBOLIC
+: H-C-S SYMBOLIC
>: [CC] Q-SCALED NETWORK [PDS]
>>: IDENTIFIED COORDINATES [PDS]



GOLDMANNS GROSSER WELTATLAS, HERBERT BAYER (REPUBLISHED, GRAPHIS DIAGRAMS, WALTER HERDEG, 1981) EVOLUTION TABLE AND TIMELINE

In some cases, divisions of time convey relational depictions — in other examples time segmentation is for quantitative accumulations. Time as the cause permitting change is self-evident in this chart concerning evolution. A pairwise device-set showing how a low-constraint relational network is informed by a low-constraint quantitative consideration is used here. This type of data display (represented in the icon schematic by the Red/Yellow square) is a popular tool of information designers.

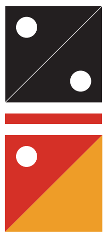
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

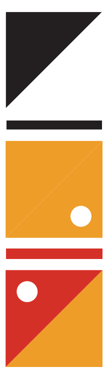


FORMATTED TEXT [PDS]

>>: [CC] Q-SCALED RELATIONAL MATRIX [PDS]

NEWSMAP: MARCOS WESKAMP, TREEMAP (C. 1998): BEN SCHNEIDERMAN
BEN SCHNEIDERMAN QUOTATION: DEPARTMENT OF COMPUTER SCIENCE, UNIVERSITY OF MARYLAND

The "Treemap" is a quantitatively informed relational matrix generated by a consistently applied algorithm. Treemaps were created and developed by Ben Schneiderman. The term initially seems misinformative: one expects something of a tree-root inspired node and link diagram. However, the name makes sense considering Schneiderman's goal, "node-link diagrams grew too large to be useful, so I explored ways to show a tree in a space-constrained layout… 'Treemap' described the notion of turning a tree into a planar space-filling map…"



© 2005 LAB ESCAPE BASED ON TREEMAP IMAGERY (C. 1998): BEN SCHNEIDERMAN

L-C-S SYMBOLIC

>: Q-POLYGONNIC COMPOSITE [PDS]

>>: [CC] Q-SCALED MATRIX [PDS]

At the base of this visualization, quantitative attributes inform a relational matrix. The pairwise device-set combining high-constraint relational and low-constraint quantitative image identifiers convey this. This is a particularly informative arrangement: each quadrant in the relational imagery contains two further quantitative sub-images. These include a market performance graph over time and heat-map elements determining activity and +/- intensity.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

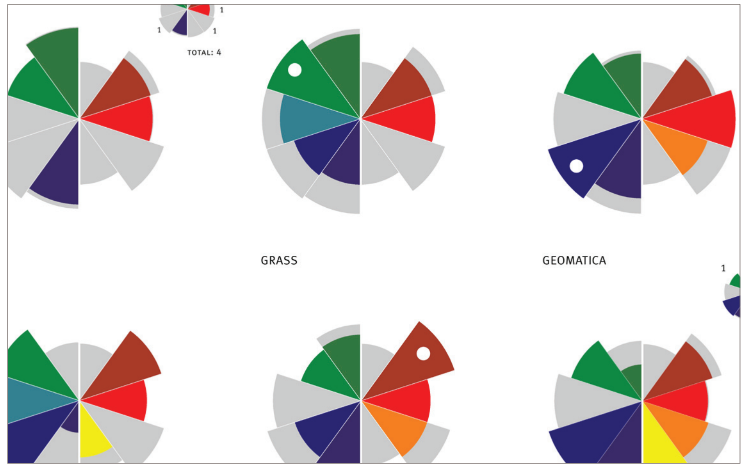
THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

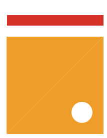
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

H-C-S SYMBOLIC
>: RELATIONAL Q-MATRIX [PDS]
>>: [NV] H-C-B RELATIONAL

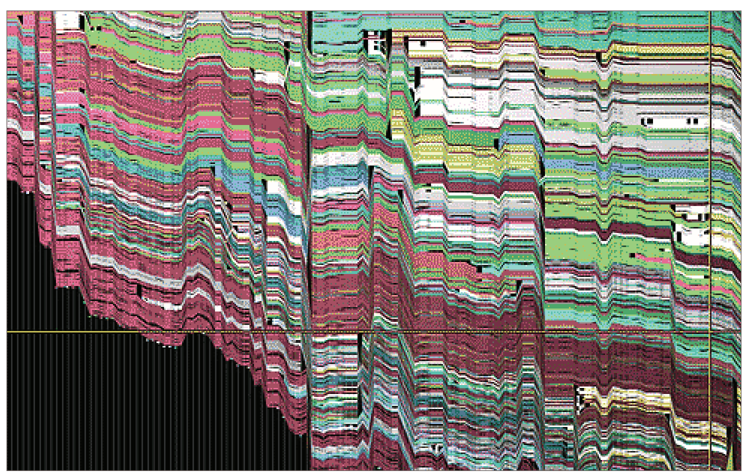


© 2003 PIIM/TNS (KLEIN + BEVINGTON)
RELATIONAL-QUANTITATIVE MODIFIED PIE CHART

Standard pie charts may confuse readers due to the fact they normalize all data into the same outward shape when comparatively studied. A standard pie chart uses relational imagery, influenced by quantitative considerations. The quantities are reshaped to the degree of the arcs. In this modified pie chart, the dependencies are shifted. Here, the values reshape the diameters of the pie elements. The shape is therefore leveraged to play a very informative role. By emphasizing shape over color, a higher level of cognitive interdependency is portrayed.



[CC] Q-POLYGONNIC COMPOSITE [PDS]



DESIGNERS: FERNANDA B. VIEGAS, MARTIN WATTENBERG
HISTORY FLOW (MODIFIED STACK GRAPH)

Here, a high-constraint quantitative basemap supports a matched low-constraint quantitative superfice where the sum of values over time are depicted. This is a stack-graph; the areas of increase are shown as solid volumes (being volumetric stack-graphs do not permit the presentation of decreasing values over time). This sophisticated version illustrates quantities within, and crossing categories: a categorical, cross-flow, stack graph.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

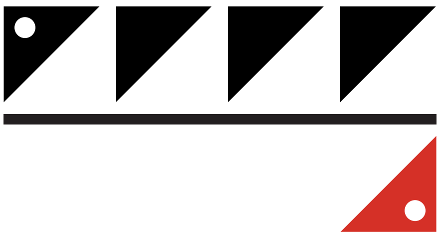
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

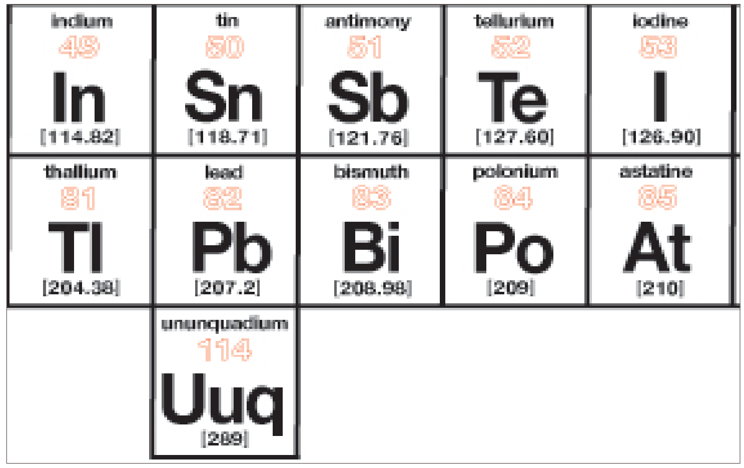
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

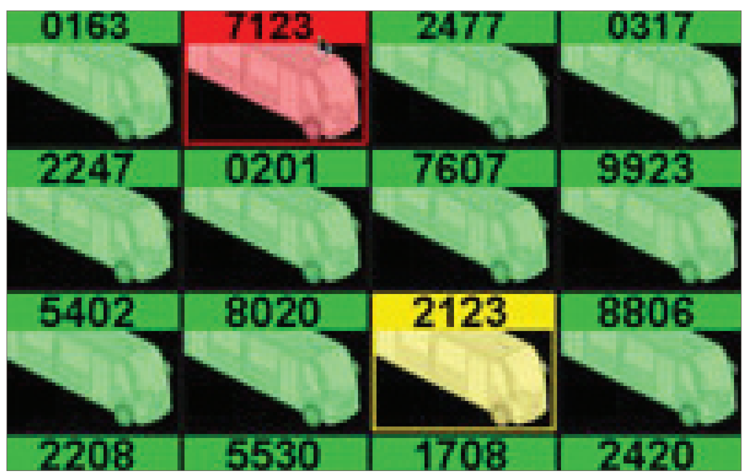


[3X] L-C-S SYMBOLIC
+: H-C-S SYMBOLIC
>>: H-C-B RELATIONAL

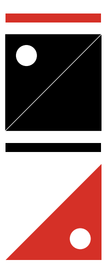


© 2003 PIIM/TNS (CARRIE MAE KREYCHE)
15 UNITS FROM PERIODIC TABLE OF ELEMENTS

In the field of information Design, Demitri Mendeleev's Periodic Table of Elements provides a reference point for design excellence. Using a tabular layout, Mendeleev built upon pre-existing maps of chemical elements for the purpose of classifying and comparing the known elements of his time. Although the design is simple, the structure provides insight into unknown examples. As we learn from this example, the basemap chosen when displaying data can permit prediction into projected areas of the design.



© 2004 CLEVERDEVICES
DEPOT LOGISTICS CONTROL APPLICATION [D]
(INTERFACE DESIGN BY SIU CHONG, SPIRE ID)



[CC] INDICATOR-TEXT COMPOSITE [PDS]
RT: H-C-B RELATIONAL

This is a detail of an interface for tracking sub-optimal conditions on buses arriving at a depot site. An automated system cross-compares all the data in real-time with every other vehicle then in service. Using the logic of "anomolytics," the system self-detects when any bus goes out-of-range. Depot operators are informed through a local wireless network as the buses complete their routes. A simple composite of colored icon and numeric identifier conveys the information. The combination of icon with text is usually seen on a map. Here, it is depicted in a relational display.

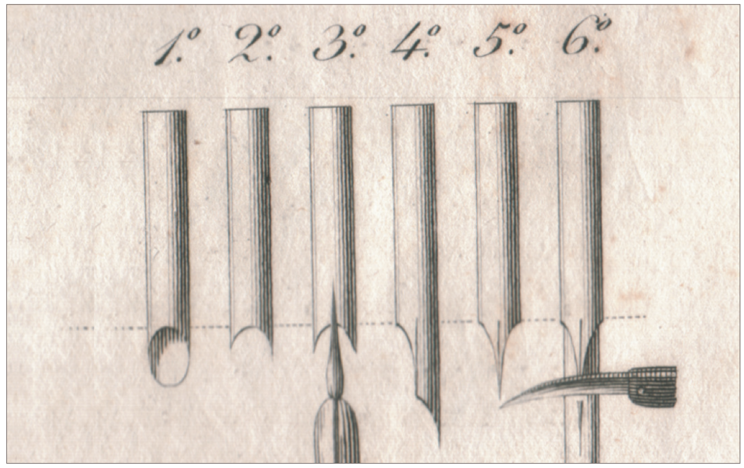
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

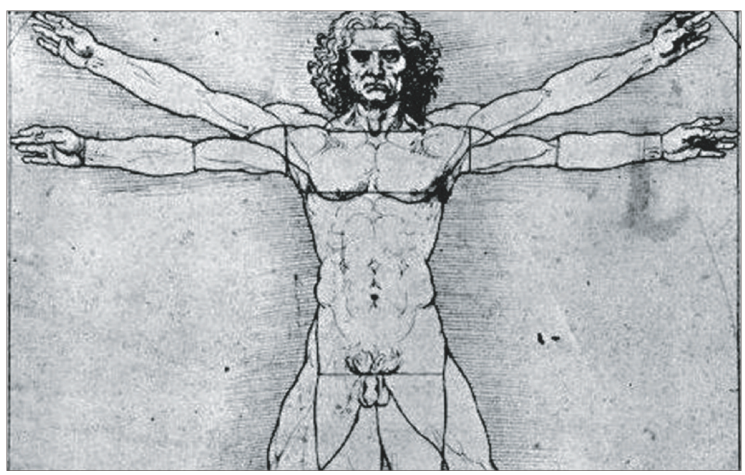
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



(COL. OF WM. BEVINGTON)
19TH CENTURY ITALIAN PENMANSHIP MANUAL

ICON ANNOTATED PICTORIAL [PDS]
>>: [NV] H-C-B RELATIONAL

This set of relationally organized images depicts the process of cutting a quill for the purpose of fine penmanship. The singular images are in an unnatural relationship to one another; informativeness takes precedence over a more natural rendition. The relational high-constraint basemap is non-visible; it supports a sidewise collective of images linked to icons (the figures).



LEONARDO DA VINCI, VITRUVIAN MAN
GALLERIE DELL'ACCADEMIA, VENICE

RELATIONALLY [C] PICTORIAL [PDS]

Da Vinci's Vitruvian Man is an ideal example of informative expressiveness. The drawing is chiefly scientific, but it is underpinned by the concept of divine proportion — the perfection of projected natural measures. Over 15 interrelated measures are conveyed through the use of a pictorial low-constraint image (superfice position), paired to a relational high-constraint basemap device. The image conveys scholarship through a picture/relational structured image where both are visible to the viewer.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

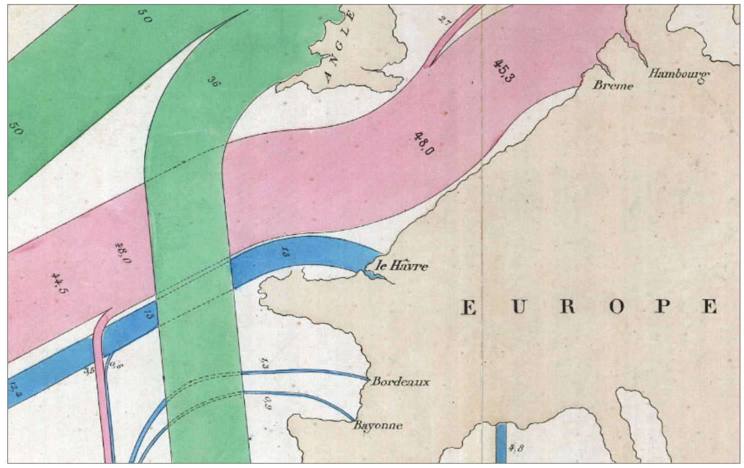
THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

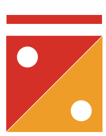
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

L-C-S SYMBOLIC
>: [CC] Q-SCALED NETWORK [PDS]
+: H-C-S SYMBOLIC
>>: GEO-PICTORIAL [PDS]

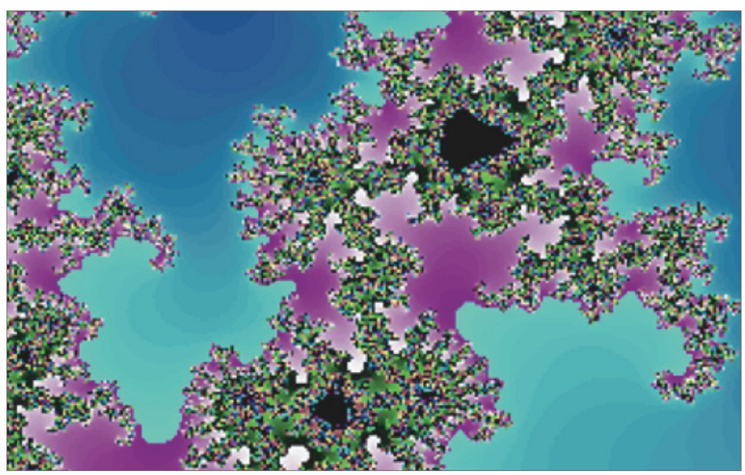


1862 CHARLES JOSEPH MINARD
THE EMIGRANTS OF THE WORLD

A constrained but highly idealized map of the major countries in play during a period of free and forced emigration is depicted. Minard often used this technique of varied-thickness (quantitatively informed) networks throughout his series of informative visualizations. His work is superbly representative of well-conveyed insight to the viewer from rich data complexities. In this detail, color-coding, quantitatively informed networks, and further clarification through applied figures are apparent.



[CC] [AG] RELATIONAL MATRIX [PDS]



MANDELBROT SET, AFTER BENOIT MANDEL-BROT

Scientific imagery, such as this fractal depiction, demonstrates the perfect high-constraint interplay between the quantitative and the relational. As with super-high-constraint pictorial imagery, this type of representation relies on visuals generated from computer processes. True fractal art usually refers to images that have little or no post-processing (i.e., human re-interpretation or enhancement) beyond the colorization of field areas for clarification.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

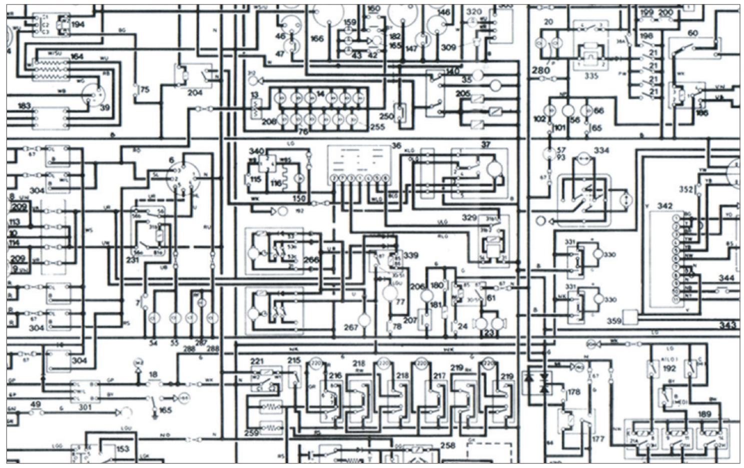
THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

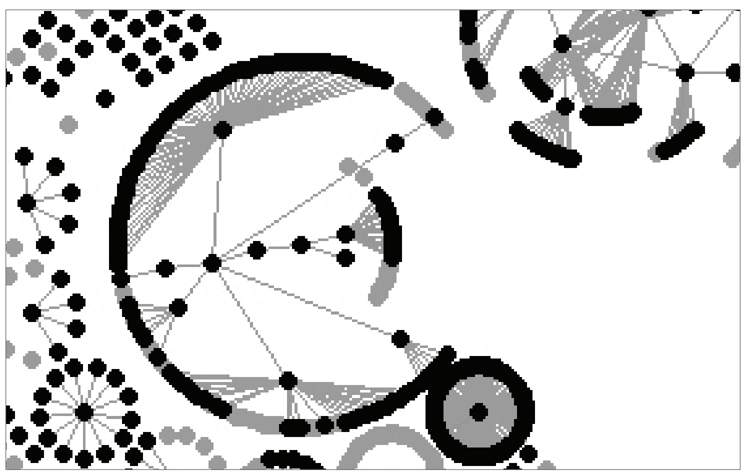
INDICATOR SYMBOL COMPOSITE [PDS]
>>: H-C-B RELATIONAL
[&SL] >>: IDENTIFIED MATRIX [PDS]



© JAGUAR CARS
WIRING DIAGRAM DETAIL FOR JAGUAR XJ6

Wiring diagrams depict networks that are physically realized; in the simplest form, the nodes are components and the links are wires. Originally, these type of diagrams were simplified pictures; electrical engineers simply drew diagrams that presented the approximate location (in a vehicle) where the wires ran. As electrical systems became increasingly complex, they were depicted as unconstrained networks. Often these are superimposed with another network image that permits items to be found through a key, as in this example.

[CC] L-C-S SYMBOLIC
>: L-C-S RELATIONAL
+: H-C-B RELATIONAL]
>>: [NV] H-C-B RELATIONAL



1997 GRAHAM WILLS, NICHEWORKS
NETWORK SYSTEM ALLOWING SUPER-ORIENTATION

Extensive networks often provide serious challenges in readability, while simple networks may not provide sufficient information to a particular workflow. Graham Willis' solution permits what may be termed super-orientation — allowing a user to rapidly drill down for additional information. Nicheworks utilizes a system of organizing very complex networks through layers of simple networks. This example is an exception to fluid, free-flowing network depictions in that the networks are essentially representing deeper networks and are, therefore, organized in a constrained way.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

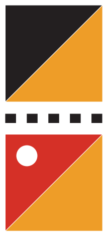
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

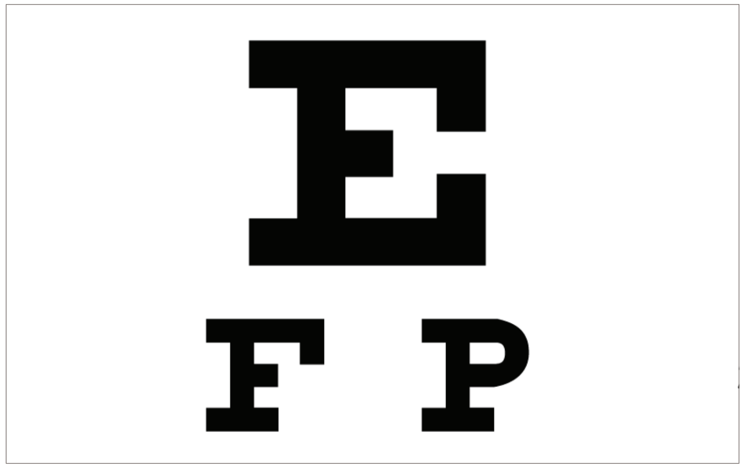
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



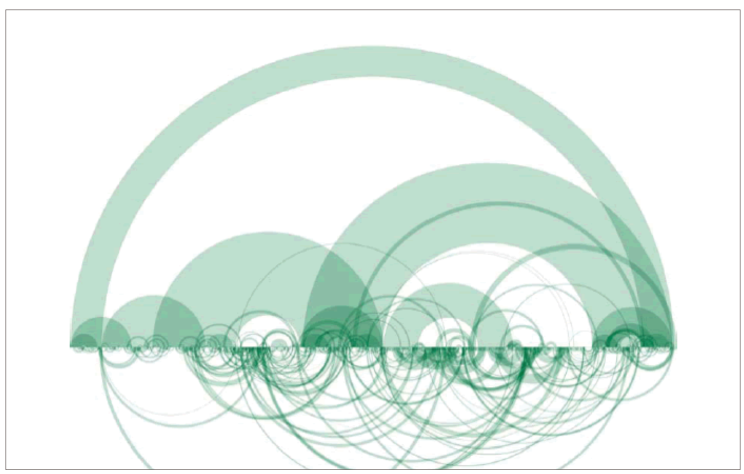
Q-SCALED SYMBOL [PDS]
>>: [NV] Q-SCALED RELATIONAL MATRIX [PDS]



© 2003 PIIM/TNS (SAYOKO YOSHIDA)
DISTANCE READABILITY DIAGRAM TEST CARD

Symbols imbued with a quantitative value, or when purpose-scaled, are represented with a pairwise device-set combining a low-constraint superfice symbolic device with a low-constraint basemap quantitative device. In this example, the underlying logic of the grid (non-visible) that supports the symbols is of the same character; the relational areas are similarly impacted by a quantitative value. This is further represented in the icon schematic with another pairwise device-set.

Q-SCALED NETWORK [PDS]
>>: [NV] H-C-B RELATIONAL



MARTIN WATTENBERG, ARC DIAGRAM

Martin Wattenberg conceived of a new kind of visualization through the generation of what he termed “arc diagrams.” They are specifically designed to generate representations of “patterns of repetition in string diagrams.” Unquestionably elegant and informative, they provide insight into patterns more normally heard than seen. Although Wattenberg did generate these through algorithms, engineering artists, such as Kohei Sugiura, had drawn such diagrams in the past. Arc diagrams are easy to covey using icon schematics. The network is informed quantitatively.

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

® 1972 IBM LOGOTYPE
DESIGN BY PAUL RAND

L-C-S SYMBOLIC

The IBM logo went through a number of iterations from its initial proprietary form of 1956. This current version was released in 1972. Branding involves the conscious effort by a controlling entity to give "voice" to an otherwise near-meaningless symbol shape; conveying meaning in stand-alone form. Many of the lasting identities were the work of single individuals of persuasive insight; today a far more market research approach is used in developing brands and persuasive stand-alone symbols. Icons, logotypes, and logos are often free of meaning until such meaning is applied.

© LITARN
SKULL AND CROSSBONES, AKA JOLLY ROGER
SYMBOL

L-C-S SYMBOLIC

This elegantly contemporized skull and crossbones low-constraint pictorial image carries a triad of well-established meanings: pirates, poison, and danger. History and common usage have been its marketers. As with any other stand-alone symbol, its basemap is its own position even though, when placed into context, that meaning may shift to a small or large degree.

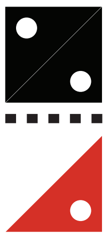
A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

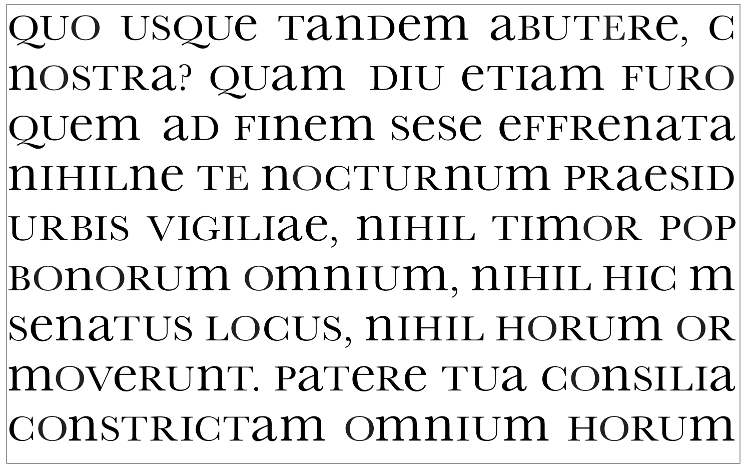
THE NEW SCHOOL
PARSONS INSTITUTE FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

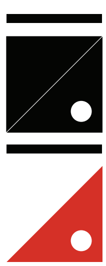


FORMATTED TEXT [PD]
>>: [NV] H-C-B RELATIONAL

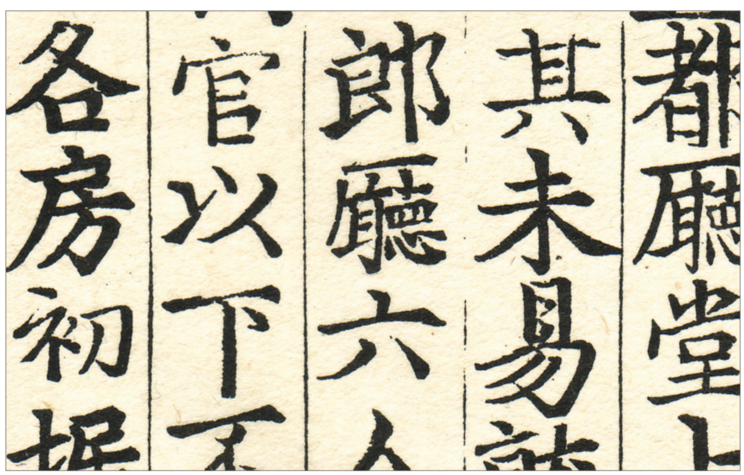

quo usque tandem abutere, c
nostra? quam diu etiam furo
quem ad finem sese effrenata
nihilne te nocturnum praesid
urbis vigiliae, nihil timor pop
bonorum omnium, nihil hic m
senatus locus, nihil horum or
moverunt. patere tua consilia
constrictam omnium horum

© 2008 PIIM/TNS (JOHN MCLORD)
TYPE SPECIMEN BASED ON BRADBURY THOMPSON'S ALPHABET 26

From an original collection of perhaps 21 base forms came the Roman alphabet. Although some forms may have had pictographic origins, the letters convey sound. By the time Gutenberg set his 42-line Bible he cast 290 forms (including ligatures). Bradbury Thompson considered the concept of reducing the number of required forms back to the minimal possible: 26. This example uses Baskerville as the base font and follows Thompson's plan regarding the use of either an uppercase form or a lowercase form. The lines are then composed into columns.



FORMATTED SYMBOLS [PD]
>>: H-C-B RELATIONAL



1652 CHINESE CHARACTERS SET FROM WOODEN TYPE
EARLY KOREAN TYPOGRAPHY, SOHN POW-KEY
(NOTE: EXAMPLE IS OF CHINESE CHARACTERS)

Chinese characters are the embodiment of both painting and writing. From an informational standpoint, they are pictographs and ideographs — picture-grams and idea-grams that have stand-alone meaningfulness. When composed into text, their stand-alone meanings may shift, hence, their dependency (when not used purely as single character statements, or art form), on an underlying linear basemap. Sometimes, examples may exhibit the use of separating lines between the rows of characters.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

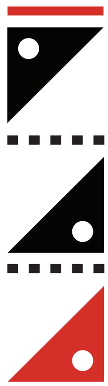
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

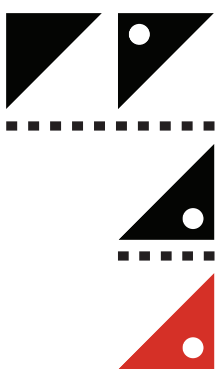
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



[CC] FORMATTED TEXT [PDS]
>>: [NV] H-C-B RELATIONAL

C. 1450 GUTENBERG 42 LINE BIBLE

Printing from movable type with either Eastern characters (pictograms and ideograms) or Western characters (Greaco-Latin phenograms) would appear to be a technically similar undertaking. However, a major difference does exist. Unlike Chinese characters, which are designed to be set on a quad, Western characters have varying widths; Gutenberg's adjustable mold was the technical triumph that permitted this problem to be overcome. The variable set width is a form of digitization within digitization and signified a critical advancement in the march of informative visualization.



H-C-S SYMBOLIC
+: L-C-S SYMBOLIC
>: H-C-B SYMBOLIC
>>: H-C-B RELATIONAL

1447 SOKPO SANGJOL HANGUL CHA
KOREAN TYPESETTING MIXING PHENOGRAMS AND PICTOGRAMS
EARLY KOREAN TYPOGRAPHY, SOHN POW-KEY

Under the reign and authority of Korea's King Sejong the Great (1397 – 1450), a sound-symbol set was created for his subjects. Called Hangul, this Korean "Alphabet" was inspired in both design and logic. It brought the ability to communicate sound visually to the Korean masses. Early printed manuscripts depict both Hanja (Chinese) and Hangul. This detail of a 450 year-old manuscript shows the side-by-side uses of pictographs (Hanja) and phenograms (Hangul). As with modern Japanese, this means that a pairwise device-set must be split so both image indicators may be referenced to a shared basemap.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

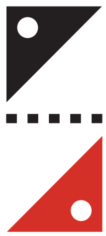
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

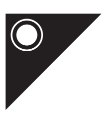
T: 212 229 6825
F: 212 414 4031
piim.newschool.edu



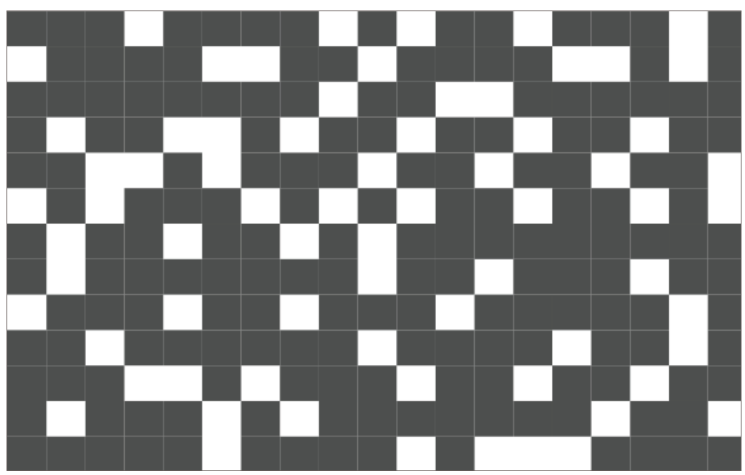
H-C-S SYMBOLIC
>>: [NV] H-C-B RELATIONAL

(COLLECTION OF WM. BEVINGTON)
C 1935, TYPE SPECIMEN SHEET,
STANDARD BOLD

Visual representations purposed as samples for the design industries abound. In these cases, the content of the visualization is less important than the mere visual aspect. Type specimen sheets are such an example. In the age when type was a luxury and designers had to carefully specify type so as not generate a single undesired letter, type specimen sheets were crucial design tools. In these examples chiefly created for display, the text does not rely on a basemap of line so much; instead, a relational basemap supports their arrangement.



[HR] BINARY SIGNAL STREAM [PDS]



© 2002 PIIM/TNS (SAYOKO YOSHIDA)
BINARY ICONOGRAPHY TEST VISUAL

Signal generated imagery in the geospatial arena has a device to convey the notion of super-high-constraint. Within the symbol category, the same descriptive opportunity exists. In this case, it relates to symbol sets that, being depicted, are perfectly constrained within their channel. Visually depicted binary code is an example. The "line" that serves for the symbol's category is divided into perfect segments and the signals within that segment are limited to 100% objective forms that can either be one, or the other.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION:
IDENTIFYING IMAGES WITH ICON SCHEMATICS

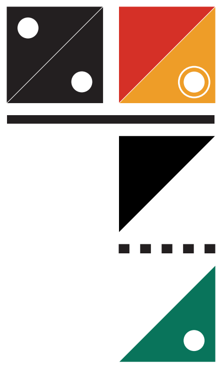
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

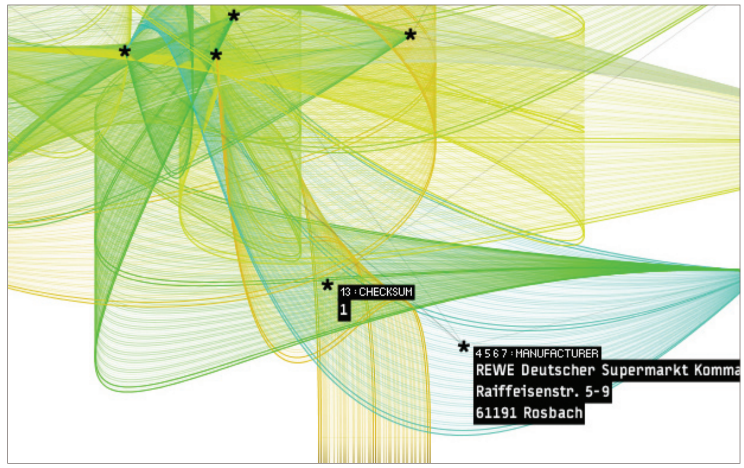
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

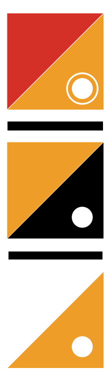


[CD] [AG] Q-NETWORK COMPOSITE [PDS]
+: FORMATTED TEXT [PDS]
>: L-C-S SYMBOLIC
>>: [NV] H-C-B [GEO-]PICTORIAL

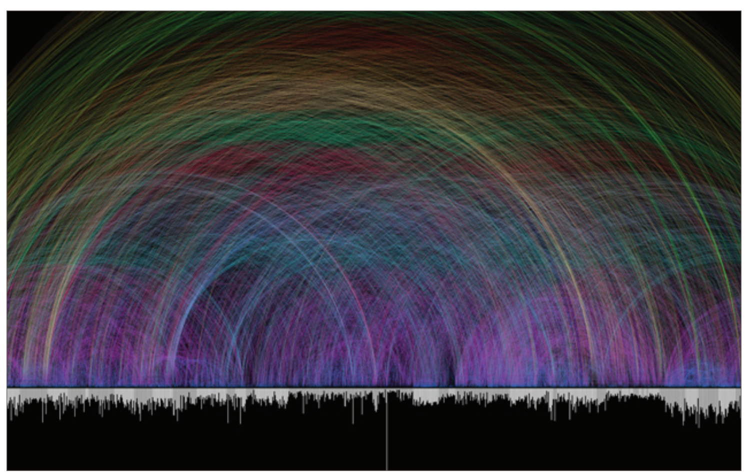


© 2008 DANIEL A. BECKER, BARCODE PLANTAGE
NETWORK GENERATOR

Based on values, origins, and identifying aspects of barcodes, this application generates a network between such codes. As a product identification code is a "thumbprint" of any given object so labeled, every single entry produces a unique visualization. The resulting images do convey information, but such information is more in the realm of data-driven computer art. Alternatively, users may be seeking patterns of obscure insight that may be ascertained through massive data comparison. A map lies at the base of the imaging, as every product has a corporate "sponsor" somewhere on earth.



[CD] [AG] Q-NETWORK COMPOSITE
LINEAR-QUANTITATIVE [PDS]
>>: H-C-B QUANTITATIVE



© CHRIS HARRISON, CARNEGIE MELLON UNI-VERSITY
W/ CHRISTOPH RÖMHILD, NORTH ELBIAN
EVANGELICAL LUTHERAN CHURCH
VISUALIZING THE BIBLE

This exquisite image is based on Martin Wattenberg's arc diagram logic. The designers purposely sought beauty but did so under the "rules" of informative visualization; they did not modify the underlying data (text from the Bible), and they ran that data through an algorithm free of subjective re-interpretation. The bar graph at the base of the diagram represents the number of verses in a chapter, a rare case of a symbolic basemap being made visible! The image depicts a total of 63,779 cross-referencing arcs.

THE NEW SCHOOL

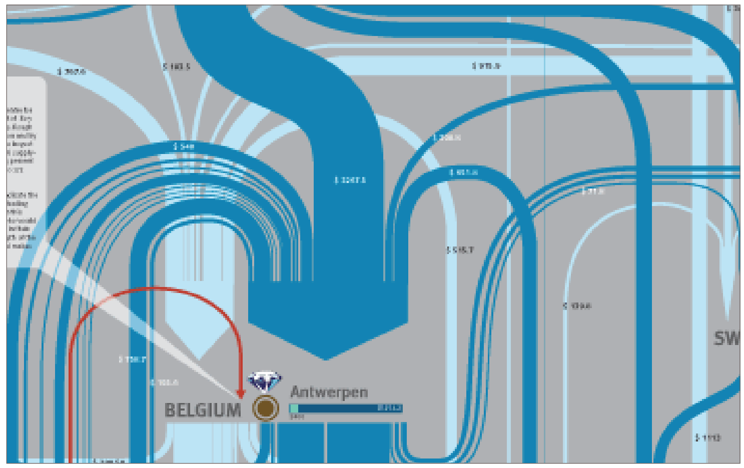
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

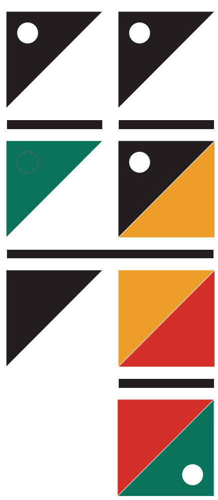
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

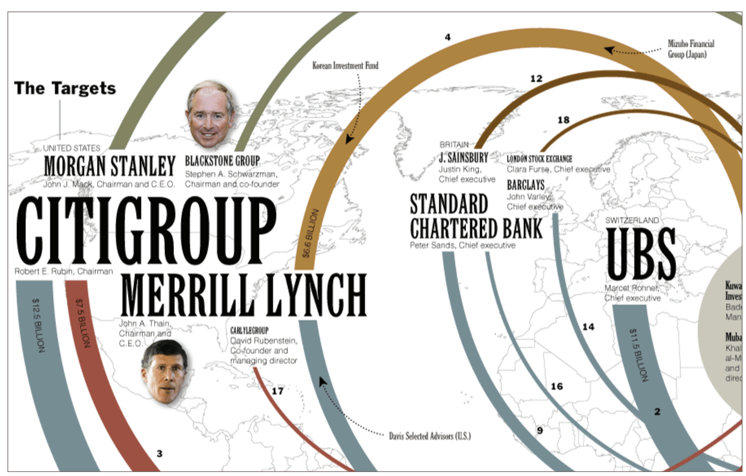


© 1999 AUGUSTINE CHUNG / TNS
THE DIAMOND TRADE 1999

H-C-S SYMBOLIC
>: Q-SCALED NETWORK [PDS]
>: L-C-S SYMBOLIC
+: L-C-S PICTORIAL
+: H-C-S SYMBOLIC
>>: GEO-SCHEMATIC [PDS]

The prominent feature of "Diamond Trade 1999" is the color-coded network representing the international value flow of uncut and cut diamonds. This type of network is represented by the relational/quantitative pairwise device-set that is leveraged in many "surprisingly" informative visualizations. Every category of imagery finds its way into this comprehensive overview of power, money, conflict, and diamonds. The network is supported by a (very) low-constraint map depiction. The map supports parallel elements of country and city references and a slew of icons and small images.





© 2008 THE NEW YORK TIMES,
DESIGN: GUILBERT GATES, RESEARCH: MICHAEL DE LA MERCED
THE NEW GLOBAL WEALTH MACHINE

FORMATTED TEXT [PDS]
+: H-C-S SYMBOLIC
>: Q-SCALED TEXT ELEMENTS [PDS]
+: L-C-S PICTORIAL
>: Q-SCALED NETWORK [PDS]
+: L-C-S SYMBOLIC
>>: GEO-SCHEMATIC [PDS]

This informative visualization packs in all the bells and whistles, to some degree purposely appearing over-informed. The composite is a mixture of pure information design (which strives to present data visualization in a more objective manner) and information graphics (which often must consider aspects of display and marketing). At its core, it is a coarse geographic basemap with a network and multiple-tier nodes. This core of informitiveness is well annotated with textual details.

A VISUALIZATION–BASED TAXONOMY FOR INFORMATION REPRESENTATION: IDENTIFYING IMAGES WITH ICON SCHEMATICS

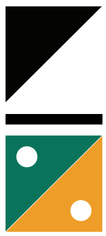
WILLIAM BEVINGTON, PIIM, THE NEW SCHOOL

THE NEW SCHOOL

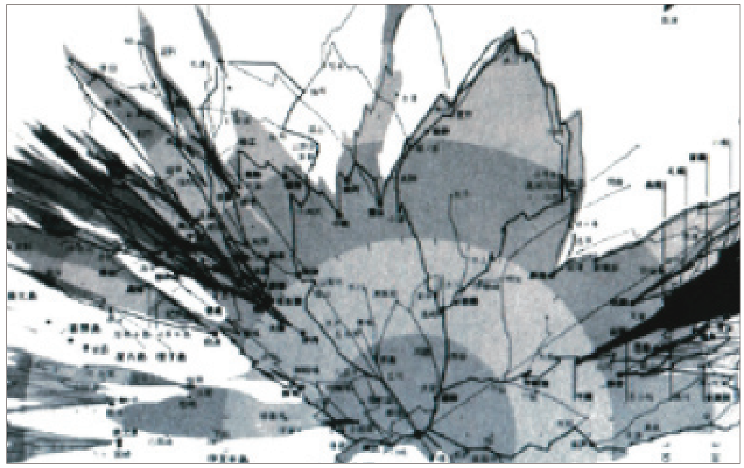
PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

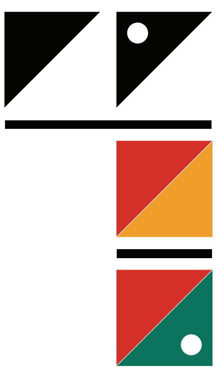


L-C-S SYMBOLIC
>: Q-CONSTRAINED GEO-DISTORTED [PD]



1969 KOHEI SUGIURA
MAP DEFORMED TO TIME OF TRAVEL

Employing time tables of both train and airline travel, Kohei Sugiura distorted a map to conform to uniform time-based distances. This example is particularly supportive of the experimental uses for VT-CAD; here, a high-constraint quantitative basemap is supporting a low-constraint pictorial superfice. From the aspect of accuracy, the map is a disaster; from the point of cognitive value in conveying travel options, it is a brilliant, unexpected solution, and a highly informative image.



H-C-S SYMBOLIC
+: L-C-S SYMBOLIC
>: Q-SCALED NETWORK [PDS]
>>: GEO-SCHEMATIC [PDS]

© 1969 KOHEI SUGIURA, KAJIMA INSTITUTE,
SD MAGAZINE
FLIGHT DENSITY DEPICTION

Here, an example of a quantitatively informed network is used to elegant utility. By drawing the networks as a series of elegant arcs: the individual noise of each connection is minimized, an expressive sense of flight is conveyed, and an overall pattern — providing additional informativeness — is created. Sugiura's work is particularly elegant, as it retains the humanness of drawing with a compelling computer algorithm-like objectiveness. In many ways, this parallels the kind of info-expressiveness of da Vinci's Vitruvian Man. The work predates algorithm-generated arc-diagrams.

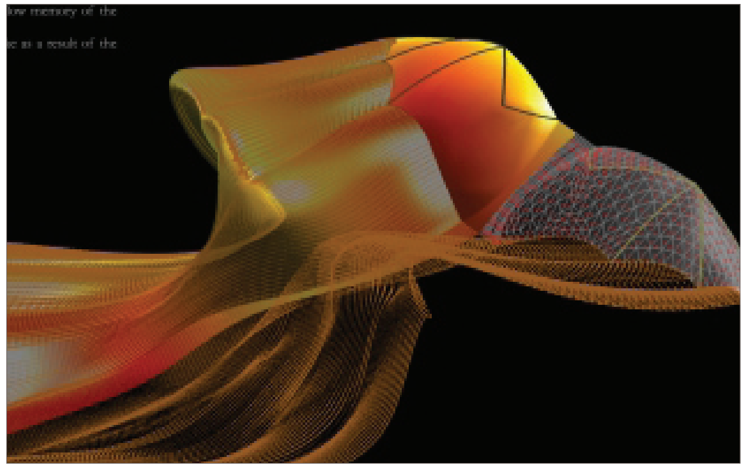
THE NEW SCHOOL

PARSONS INSTITUTE
FOR INFORMATION MAPPING

68 5th Avenue
Room 200
New York, NY 10011

T: 212 229 6825
F: 212 414 4031
piim.newschool.edu

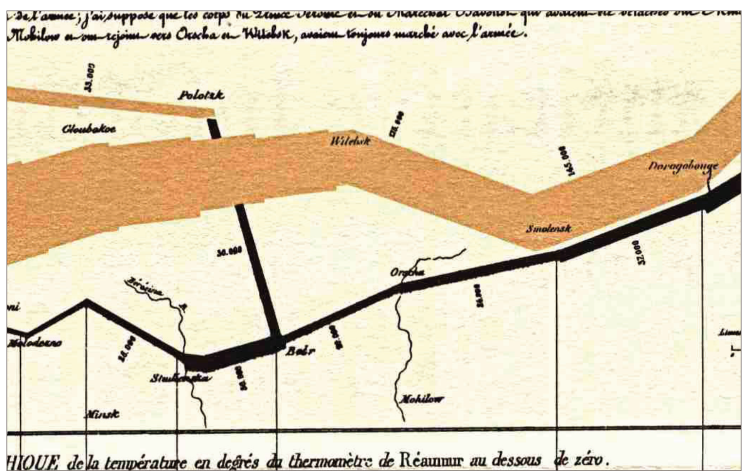
H-C-S PICTORIAL
>>: [CD] [AG] Q-COMPOSITE [PDS]



2007 BROWN UNIVERSITY, VISUALIZATION RESEARCH LAB, KENNETH S. BREUER, DAVID J. WILLIS, MYKHAYLO KOSTANDOV, DANIEL K. RISKIN, JAIME PERAIRE DAVID H. LAIDLAW, SHARON M. SWART MODELING THE FLIGHT OF A BAT

This is an example where complexity becomes simple. When quantitative values are projected correctly and precisely in three-dimensional space, they can become a similitude of reality. By applying a superfice to the numeric, the quantities become skinned in such a way that insights, formerly unseen, can be observed from the phenomena. Such is the case here, where the bat's flight is made visible. The icon schematic for this type of visual is simple as well, but it is rare (a pairwise device-set of pictorial/quantitative, both high-constraint).

H-C-S SYMBOLIC
>: Q-SCALED NETWORK [PDS]
+: L-C-S SYMBOLIC
>>: GEO-SCHEMATIC [PDS]
[ICW] >>: C-POSITIONED LINE GRAPH [PDS]



1865 CHARLES JOSEPH MINARD NAPOLEON'S MARCH TO MOSCOW, THE WAR OF 1812

In this celebrated informative image, made famous by Edward Tufte (The Visual Display of Quantitative Information), Charles Minard employs a fascinating schematic. Two basemaps are integrated through a side-by-side support of mostly quantitative values. One basemap appears to be an x-value, but it is actually a (very) low-constraint geographic reference, the other is a high-constraint quantitative. Napoleon's tragic campaign into Russia with the consequent loss of troops is displayed through composite of data informing on factors of location, temperature, and troop loss.