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A Survey of the Visual Design of Cartographic and other Elements of Illustrated Tourist Maps

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Abstract—The use of tourist maps has become an important part of many people’s travel experiences. Design of tourist maps is far from being a straightforward task—requiring the knowledge of cartography, visual design, and visualization. This is particularly true for *illustrated tourist maps*, which are supposed to be easier to understand and use by travelers from different backgrounds due to their use of illustrations for communicating map information. Most such maps, however, are designed for better visual aesthetics than necessarily for more accurate cartographic information. This paper presents a survey of illustrated tourist maps, with the aim of identifying and categorizing their common cartographic and other illustrated elements, as well as the visual styles used to represent those elements, and the functions they provide.

Keywords—Illustrated tourist maps, tourist maps, map visualizations, map elements, cartography, visual design.

I. INTRODUCTION

Maps are perhaps the most widely used forms of visualization, particularly by ordinary people. Indeed some of the best known visualizations are maps—including Minard’s map of the march of Napoleon’s army to Russia in 1812, Snow’s 1845 map of the cholera epidemic in the Soho district of London, and Beck’s 1931 map of the London Underground [1]. Geographical maps are particularly useful, mainly because they support users in forming cognitive spatial representations [2] of locations and distances in a 2D space, which can in some cases be as accurate as cognitive maps resulting from real-life experiences of actual travel between physical locations [3].

The first widespread use of *tourist maps* [4] started with their inclusion in travel guides published in 1830s for wealthy travelers of the Grand Tour of Europe [5]. While all modern tourist maps are obviously designed for “tourists”, it is rather difficult to define who a typical tourist might be. Depending on their primary needs, tourists might be traveling for leisure, sightseeing, business, or a host of other reasons [4].

Furthermore, due to the large amount of information which tourist maps need to include, their design is highly complex. In addition to the main cartographic complexity of deciding on the information content, generalization, and symbolization [6], tourist maps also need to resolve several

conflicts with these cartographic complexities [6]. Foremost amongst these conflicts is the challenge of designing, creating, and producing tourist maps using a discrete set of symbols which can be easily interpreted by tourists from different cultural, language, or educational backgrounds [6]—not to mention with varying primary tourist needs.

Many designers of tourist maps attempt to overcome some of these challenges related to the diversity of tourists, and their cartographic capabilities, through the use of illustrations. We refer to such maps here as *illustrated tourist maps*, by which we mean tourist maps that contain visual elements, implemented through different means of illustration. However, even when designed by professional illustrators, graphic designers, or other visual designers, illustrated tourist maps often seem to aim at providing better visual aesthetics rather than good cartographic design.

In this paper, we present a survey of a set of illustrated tourist maps, which we have carried out to analyze the visual design of their cartographic and other illustrated elements. The aim has been to identify and categorize the most common elements used in such maps, and provide a classification of the visual design styles used to represent those elements, and the map functions they attempt to serve.

II. ILLUSTRATED TOURIST MAPS

While no definition of maps can fully describe all the different kinds of maps that are created, in the context of our work, we consider maps as visualizations of geospatial data [7]. Harley and Woodward, on the other hand, define maps more broadly as “graphic representations that facilitate a spatial understanding of things, concepts, conditions, processes, or events in the human world” [8].

There are a lot of things and phenomena that might be difficult to fully understand without the possibility of placing them on a map [9]. Maps allow people to “link places in the world to other kinds of things” [9], and convey information about certain things in specific locations, at some particular moment in time [10]. What is common to all maps, is that they generalize and simplify the things they represent—sometimes severely compromising the reality, or parts of it. In many cases, maps distort the reality on purpose, and in

fact, maps function most likely because they show the reality with just a sufficient level of accuracy for each situation, instead of even trying to represent the world as it truly is [11]. Of course, maps that aim to represent things closer to the way they are, usually achieve their goals better than those that do not resemble the reality at all [10].

Tourist maps have the added value of linking their users' own experiences to different geographical places they contain. They are generally used for both planning various tourist activities to be undertaken, as well as their implementation. Tourist maps visualize representations of places they depict, and often link specific information and spatial aspects of the locations they contain [12]. As such, tourist maps are a significant part of the modern travel culture. They are created by organizations and companies that promote tourism and travel, and they evolve and live on through the interactions between the tourists and the local people [12].

Tourist maps are also rather different from other types of maps because of their specific characteristics. For instance, they are used by people with different language or other abilities, they must convey a large amount of information, and they must satisfy a variety of tourists' needs [6].

Tourist maps are even produced differently than other cartographic maps. In many respects, the starting point for producing tourist maps is often more similar to producing advertisement material. This is because tourist maps strive to guide travelers' behavior in a way that is beneficial to the tourism industry. At the same time, however, tourist maps are also produced to simply help travelers navigate and learn about the historical and cultural environments, and activities of their represented locations [12]. Tourist maps do not usually tend to focus on geographical information or the physical environment itself, but rather, they focus on guiding tourists to those locations that have a potential to fulfill tourists' expectations regarding their journey [12].

Illustrated tourist maps move even further in the direction of visual representation of local identities, in an attempt to create greater links between tourists and the local people and their cities. By incorporating elements of artistic visual expression and map design, illustrated tourist maps operate at the intersection of art, visual design and cartography. As such, creating useful illustrated tourist maps requires a range of multidisciplinary skills and knowledge. It is not, therefore, surprising that many illustrated tourist maps are often less than perfect, due to the lack of skills required for creating visually appealing and functional cartographic maps.

III. DESIGNING CARTOGRAPHIC MAPS

Cartographic map design is a complex task which has evolved considerably over the past few hundred years. Before attempting to analyze illustrated tourist maps, it is important to understand some of the main characteristics of cartographic maps in general, the elements they contain, and the way they are designed.

A. Characteristics of Cartographic Maps

To create meaningful and functional cartographic maps, designers need to consider a number of important map characteristics. Barber [11] identifies and defines these characteristics as the following:

- *Scale* of a map represents the relationship between the size of the real world environment and its size on the map. Scale may not always be relevant in terms of functionality of a map, but it is important for the kind of things depicted on it, and their level of accuracy.
- *Selection* refers to the choices of what is presented on a map. To create a map that makes sense, only a limited amount of detail can be depicted on it. As such, all maps are to some extent selective and biased.
- *Generalization* is about modifying features of a map so that they can be understood more efficiently, in terms of legibility and clarity. Maps can only be accurate up to a certain point, simply because the full spectrum of reality can never be presented on a single map.
- *Signs* on a map are inseparably connected to its other main characteristics. Maps are full of signs, and a map itself is also a sign—since it is a model of something else (i.e., reality). There are two kinds of signs on maps: iconic and arbitrary. Iconic signs resemble, more or less, the things they represent, whereas arbitrary signs are based on more random understanding that may exist between the map designer and the map users.
- *Authority and power* that maps have is not always recognized. A map user should always ponder why the map has been made in the first place, and by whom, so that its accuracy and reliability can be established.

B. Cartographic Design Process and Principles

Slocum et al. [13] point out that the cartographic design is not just about creating the actual map, or about its appearance. The aim of cartographic design is to produce maps that can be effortlessly used to obtain the needed information. As part of this design process, a map is first conceptualized and then visualized, with two specific objectives in mind: 1) the map must serve the needs of its users, and 2) it must convey its information as simply and clearly as possible [13].

Cartographic design has largely been influenced by scientific map design research. While it is important to understand these scientific aspects of cartography, maps must also be considered from their artistic perspective. However, it is not so easy to predict how the users of a map will experience its artistic aspects, which are usually determined by its designer's intuition rather than scientific experimentation. All in all, maps which are created by taking into account the artistic aspects, instead of merely following just the cartographic principles, are better likely to convey their contained information more effectively [13].

Cartography is also closely related to visual design, as it relies on the use of visual means to convey information.

As such, cartographic design relies on the Gestalt theory of visual perception—which aims to explain how different components of a visual composition are combined into a consistent whole, and are perceived by a human mind. In fact these days a large percentage of maps, especially those that are printed or published online, are created by visual designers.

One of the main Gestalt principles that maps need to follow is that of visual hierarchy—the principle of representing different map elements according to how significant they are in relation to each other in the context of a particular map. Visual hierarchy allows map users to detect the most important information or elements before the less important ones, and therefore, it makes a map easier to interpret.

Visual *contrast* is a means of creating visual hierarchy, which creates an effect called visual weight—the amount of attention that a particular feature or element attracts. Contrast helps map users separate different map features from each other, and when properly implemented, it has the potential to make the map more interesting. One or more visual variables such as shape, size, orientation, or color can be modified to create visual contrast.

Another essential cartographic design principle is known as *figure-ground* relationship—the impression of certain map objects appearing closer to the viewer than others. There are a couple of simple guidelines that work relatively well in achieving figure-ground relationship. For example, when certain points or lines need to be emphasized, they should be made darker than the area on which they are placed.

Yet another cartographic design principle, which is important to all forms of visual design, is *balance*. When the different map elements are properly implemented on a map, they produce visual harmony. To create such balance, a map designer always needs to pay attention to the space that is available for the map elements, and implement the elements so that they do not conflict with each other [13].

C. Cartographic Map Elements

There are a number of cartographic elements that most maps include. These elements are used for communicating spatial, geographic, and other information represented on maps. By making appropriate decisions about what elements to include on a map, and how, map designers try to make sure that the map contains as little “map noise” as possible.

Slocum et al. [13] identify the following list of the most commonly used map elements—ordered according to their visual importance. They also recommend that the first element on the list should take up the largest amount of space when shown on a map, and the last one should be incorporated as an element that requires the smallest amount of space.

- 1) *Frame line and neat line* are used to arrange all the other elements on a map. They determine the total space reserved for all the contents of a map.

- 2) *Mapped area* is the space that the map represents. It often includes the base information that forms a geographic frame for the map.
- 3) *Inset* is a map displayed in the immediate presence of another, often bigger, map.
- 4) *Title and subtitle* are used to declare the theme, topic or the area that the map represents.
- 5) *Legend* of a map displays and explains the symbols that are placed on the map.
- 6) *Data source* informs the map user where the data, that the map is based on, originates from.
- 7) *Scale* allows the map user to understand the size reduction ratio of the map. It can also be used to examine distances on the mapped area.
- 8) *Orientation* of the map shows the direction of its north.

Since *type* (i.e., visual characteristics of text) is a part of many of these map elements, it can be classified in itself as a map element. As such, properly designed type elements have the potential to make a map more appealing and functional.

IV. SURVEY OF ILLUSTRATED TOURIST MAPS

As mentioned, we have carried out a survey of a set of illustrated tourist maps to a) identify and categorize their most common cartographic and other illustrated elements, b) classify the various visual styles used to represent them, and c) show the map functions those element try to provide.

A. Survey Methodology

For our survey we used a set of illustrated tourist maps provided by *USE-IT*¹. We chose these maps because—besides being free and non-commercial, and not serving any businesses—they are made specifically for young travelers, and as such, make extensive use of illustrations. Furthermore, all the maps are designed and created by local people of each respective city, and therefore, tend to include a greater level of local knowledge, as well as more cultural and local visual design styles.

Although *USE-IT* maps are required to be created by professional visual designers, it is not a particular requirement that these designers need to have professional training in cartography. Also, while *USE-IT* provides mobile map apps as well, all the maps are designed to be printed. Furthermore, even though the maps do not have to follow a fixed visual layout, they have a similar format to the conventional printed folded tourist maps.

For our survey, we downloaded a total of 35 city maps² from the *USE-IT* website in 2018. Figure 1 shows a representative example of the downloaded maps—in this case,

¹<https://www.use-it.travel>

²The maps for: Antwerp, Augsburg, Belgrade, Bordeaux, Brno, Bruges, Brussels, České Budějovice, Charleroi, Cordoba, Ferrara, Funchal, Ghent, Graz, Guimaraes, Leeuwarden, Leuven, Ljubljana, Magdeburg, Mechelen, Nantes, Nicosia, Nijmegen, Olomouc, Oslo, Ostrava, Oulu, Porto, Prague, Prato, Rouen, Timisoara, Utrecht, Zagreb, Zlin.



Figure 1. An example of a *USE-IT* map, for the city of Bruges.



Figure 2. A detailed view of part of the *USE-IT* map of Bruges.

showing part of the map for the city of Bruges in Belgium—with some of its illustrations shown in detail in Figure 2.

We analyzed each map, following an iterative process, consisting of these four stages:

- 1) Identifying and classifying cartographic and other illustrated elements.

Table I
ILLUSTRATIONS AS PART OF CARTOGRAPHIC ELEMENTS.

Elements	Styles
a. frame line and neat line	i. expressive or decorative style
b. mapped area	ii. with illustration figures
c. inset	iii. both of the above
d. title and subtitle	
e. legend	Functions
f. scale	1— information about geography
g. orientation	3— navigation or orientation
h. type	4— branding or marketing
	5— aesthetic or decorative

Table II
ILLUSTRATIONS REPRESENTING GEOGRAPHIC OR ARTIFICIAL GEOGRAPHIC FEATURES.

Features	Styles
a. water area	i. using a texture or pattern
b. forest area	ii. using expressive color
c. park area	iii. using individual illustrated objects
d. sports field	
e. graveyard	Functions
f. other land area	1— information about geography
g. mountain	2— information about services
h. nature object	4— branding or marketing
	5— aesthetic or decorative

- 2) Identifying and classifying visual design styles used to represent those elements.
- 3) Identifying and classifying the functions that those elements aim to provide.
- 4) Identifying any problematic issues related to the visual design of those elements.

B. Survey Findings

In the first stage of our survey, we identified a large number of cartographic and other illustrated elements in the maps we analyzed. We then categorized these elements into five different groups:

- 1) Illustrations as part of cartographic elements (Table I).
- 2) Illustrations representing geographic or artificial geographic features (Table II).
- 3) Illustrations representing built environment elements (Table III).
- 4) Illustrations as part of icons (Table IV).
- 5) Illustrations representing other miscellaneous objects (Table V).

The list of all the identified elements are given in the left-hand column of each of the referenced tables I–V.

In the second stage of our survey, we identified and categorized all the different visual styles used to illustrate the identified map elements. While there was a wide range of visual styles used for this purpose, illustrations of some of the map element categories were more diverse than others. The styles used for each category of elements are shown in the right-hand column (top) of tables I–V.

From this analysis it is clear that due to their importance in city maps, built environments are illustrated in a greater

Table III
ILLUSTRATIONS REPRESENTING BUILT ENVIRONMENT ELEMENTS.

Elements	Styles
a. accessible building b. statue c. fountain	i. colors used 1. <i>black and white</i> 2. <i>monotone</i> 3. <i>multicolored</i> ii. illustration style 1. <i>3D model (scaled model like)</i> 2. <i>other 3D</i> 3. <i>stencil like or silhouette</i> 4. <i>line icon</i> 5. <i>line drawing</i> 6. <i>flat design</i> 7. <i>hand-drawn</i> iii. type of expression iv. impression of reality 1. <i>realistic</i> 2. <i>semi-realistic</i> 3. <i>non-realistic</i> v. amount of detail 1. <i>detailed</i> 2. <i>semi-detailed</i> 3. <i>simplified</i> 4. <i>highly simplified</i>
	Functions
	2— information about services 3— navigation or orientation 4— branding or marketing 5— aesthetic or decorative

variety of visual styles than most other map elements—even though the range of different elements in this category is rather small (only 3). The other category with a wide range of visual styles is that of illustrations as part of icons. In this case, however, the number of elements is also very large (over 35) in comparison to other categories. The use of illustrations as part of icons seems to be very popular, because it allows adding a more unique visual style to each map.

In the third stage of our survey, we identified and categorized the potential functions the use of illustrations aimed to provide the map users. Based on our analysis, we categorized these functions into five groups:

- 1) Conveying information about geography.
- 2) Conveying information about services.
- 3) Conveying information that support navigation or orientation functions.
- 4) Conveying information related to branding or marketing functions.
- 5) Serving aesthetic or decorative functions.

Not all the categories of potential functions were provided by each of the categories of map elements, and some served more functions than others. The functions served by each category of elements are shown in the right-hand column (bottom) of tables I–V. As can be seen, once again, the use of illustrations as part of icons seems to be very popular as a means of serving different functions in illustrated tourist maps.

Table IV
ILLUSTRATIONS AS PART OF ICONS.

Icons	Styles
a. tourist information b. meeting point c. ATM and exchange d. WiFi e. accommodation f. camping g. laundry h. postal services i. health services j. police station k. public transport l. market and grocery m. open market n. food and restaurant o. local food p. cafe q. bakery r. bar and pub s. drinking fountain t. sightseeing and attraction u. going out v. shopping w. chilling x. historical attraction y. arts and culture z. park, water, urban area aa. view ab. romantic spot ac. sports and hobbies ad. bike rental ae. boat rental af. toilets (WC) ag. bathing area ah. accessible area ai. lockers	i. colors used 1. <i>black, white, gray</i> 2. <i>white plus color</i> 3. <i>black plus color</i> 4. <i>single color</i> 5. <i>multicolored</i> ii. illustration style 1. <i>stencil like or silhouette</i> 2. <i>line icon</i> 3. <i>line drawing</i> 4. <i>flat design</i> 5. <i>hand-drawn</i> iii. amount of detail 1. <i>detailed</i> 2. <i>semi-detailed</i> 3. <i>simplified</i>
	Functions
	1— information about geography 2— information about services 3— navigation or orientation 4— branding or marketing 5— aesthetic or decorative

Table V
ILLUSTRATIONS REPRESENTING OTHER MISCELLANEOUS OBJECTS.

Objects	Styles
a. human related b. animal related c. transportation related	— <i>a range of variations</i>
	Functions
	1— information about geography 2— information about services 3— navigation or orientation 4— branding or marketing 5— aesthetic or decorative

In the final stage of our survey, we analyzed all the maps to identify any potential problematic issues caused by the visual design of the illustrated map elements. We found a range of issues which we will discuss in the next section.

C. Issue Related to Visual Design

Table VI provides a summary of the potential problematic issues which are caused by the visual design of the illustrated elements in the maps we have surveyed. We have grouped these issues into eight categories. The first three categories are related to specific cartographic and other illustrated map

elements, while the remaining five categories apply more generally to the overall style of our surveyed maps.

Regardless of the categories formed, a considerable number of the problematic issues discovered are related to the visual weight of different map elements. In many cases, different artistic or expressive design styles excessively directed viewer's attention away from the actual information contents of the map. In some cases, however, the problem was entirely the opposite, in that certain elements did not sufficiently stand out from the other map elements, but instead blended into the background—often because of the poor choices made regarding the use of colors, or the chosen illustration style.

Another major issue we identified in several different categories is related to the amount of visual detail in certain map elements. In many cases, the relatively small-sized map elements either included too many, or too few details, causing difficulties for the map reader in interpreting the information that the element had presumably been designed to convey. In turn, some of the map elements resembled each other too much—especially in small size—mostly due to a lack of distinguishing details.

As with most visual designs, colors play an important role in map design. As such, one of the most fundamental categories of problematic design issues we identified is related to the use of colors. First of all, many of the maps included colors and colored areas that were used without any kind of explanation to assist readers in interpreting their information meaning. In many cases, the magnitude of the problem was increased even more due to the use of a particularly expressive or otherwise distinguishable colors—causing difficulties for the map reader in making a distinction between the important and less important contents of the map. In addition to using colors without explaining their meaning, many of the colors used were also not only not self-explanatory enough, but in some cases, misleading as well. Similar problems related to the use of different patterns and textures were also identified in our surveyed maps. These kinds of design choices, regardless of their visual appeal, drastically undermine the ultimate function of illustrated tourist maps in attempting to be easier to interpret.

Several maps also suffered from the misuse of, or the lack of, some important cartographic elements. In addition to excessive emphasis on some cartographic elements, certain elements, such as the indicator of scale, were found to be hard to interpret on certain maps—as they seemed obviously inaccurate and misleading. Generally speaking, different cartographic elements were in many cases inappropriately treated as mere opportunities to display artistic expression, instead of using them as clarifying elements that would help the map reader understand the contents of the map more easily. Such misuse of the fundamental map elements is likely to cause a distrust in the accuracy of the map in

Table VI
A SUMMARY OF THE POTENTIAL PROBLEMATIC ISSUES CAUSED BY THE VISUAL DESIGN OF THE ILLUSTRATED MAP ELEMENTS.

Categories	Issues
Cartographic element	<ul style="list-style-type: none"> – scale indicator is hard to interpret – scale indicator seems inaccurate – there is no scale indicator – type draws too much attention – frame line draws too much attention – legend draws too much attention – street data draws too much attention
Built environment	<ul style="list-style-type: none"> – illustration orientations are confusing – illustrations are hard to identify due to their style – illustrations do not stand out from the background – illustration details are hard to identify due to their small size – illustrations are highly out of proportion
Icon	<ul style="list-style-type: none"> – icons are hard to recognize in small size due to the style used – details of the icons are not distinguishable – icons are hard to separate from each other – too many details produce map noise
Color	<ul style="list-style-type: none"> – colors draw too much attention – not all the colors are self-explanatory – some colors mix up with other colors used – not all the colors used are explained – too many transparent color layers on top of each other – illogical use of color – too many colors are used – problematic color combinations
Pattern or texture	<ul style="list-style-type: none"> – patterns draw too much attention – not all the patterns are self-explanatory – not all the patterns used are explained – unnecessary use of patterns
Visual style	<ul style="list-style-type: none"> – expressive or decorative appearance draws too much attention – expressive or decorative appearance produces map noise
Additional illustration	<ul style="list-style-type: none"> – illustrations block information on the mapped area – illustrations draw too much attention
Other design issues	<ul style="list-style-type: none"> – lack of contrast between map elements resulting in monotonous design – lack of details is resulting in impression of poor quality

general—not to mention the difficulties that it might cause for the functionality of the map.

Problematic issues were also found with different additional illustration elements on the maps. On several maps, additional illustration elements placed on the mapped area took up relatively too much space, and in many cases, they even blocked other more important elements on the map—preventing the map reader from accessing all the potential information on the map.

V. CONCLUSIONS

In this paper, we have presented a survey of a set of illustrated tourist maps, in which we have identified and categorized their most commonly illustrated elements, and the functions they aim to serve. We have also provided a

classification of all the different visual design styles used to represent these elements. While our survey has been based on a selection of *USE-IT* maps, we consider this selection to be a good representative of professionally designed illustrated tourist maps, which contain a wide variety of different types of illustrations used in such maps.

We have identified a range of visual design problems from which our surveyed maps suffer. These problems are likely to exist in other illustrated tourist maps, and as such, bringing them to the attention of designers would hopefully reduce the likelihood of their occurrences in future maps.

Despite these visual design problems, our survey has demonstrated that it is possible to create illustrated tourist maps, which are not only designed visually in a personal and stylized way, but also effectively support their map functions through their illustrated elements. In order to achieve this effectiveness, however, the choices that are made regarding the style of the illustrated elements must be carefully considered. Generally speaking, it is often better to make style-related and artistic choices moderately expressive, and use them only when dealing with map elements which primarily have a clear representative function.

Finally, while our focus here has been on printed illustrated tourist maps, many of our finding also apply to online maps. One major difference there though is that when online maps are made interactive, there are other tools such as layering and zooming which can be used to provide alternative options for creating illustrated map elements. However, interactive online maps also have their own design issues, such as transparency levels and readability [14], which need to be considered carefully.

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Maps reviewed in our survey were provided for free by *USE-IT* (<https://www.use-it.travel>). We would like to thank *USE-IT* and the creators of the maps we have used. It is important to note that the city maps we have surveyed may have been changed since we downloaded them in 2018.

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