
Visual Highlighting of Information for Public Transport Information Systems

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Abstract

In urban space, public displays are primarily used to present information concerning public transport: tram or bus lines, timetables or departure times. They are mostly located at stops to provide information to people who are waiting for their bus or passing pedestrians. Highlighting relevant information on public displays seems to be a suitable approach to find specific information more quickly. In this paper, we present a general set of visual highlighting methods, which can be used to support users in finding relevant information. The presented highlightings form the basis to select the most appropriate approach for visualizing passenger information in the public transport domain more easily.

Author Keywords

Visualization; highlighting; public transport.

ACM Classification Keywords

H.5.2. Information interfaces and presentation (e.g., HCI): User Interfaces. *Graphical user interfaces (GUI)*.

Public Transport Information Systems

The number of public displays in public transportation rises because of decreasing manufacturing costs, which is accompanied by new application possibilities. Finding relevant information can sometimes be difficult due to

the size of a display and the wealth of information. Especially in case of homogenous types of media or information, for example, a lot of text or numbers it can take a while to find the required information. Fisher et al. [3] already investigated blocked highlighting and its usefulness to the test participants in order to find relevant information faster and more easily. Wickens et al. [9] describe how information on maps on small size displays (16") can be highlighted. As one result, they stated that a combination of high- and lowlighting helps viewers to find relevant information more quickly. Ostkamp et al. [6] did research on visual highlighting for public displays. The authors involve additional technologies such as mobile devices to select information and visualize them. In contrast to their work, we set our focus on general visualizations, which can be used in the application area of public transportation to highlight information on public displays. The results of the aforementioned authors [3], [6], [9] serve as a basis for our further investigations.

In public transport, the most important and common kinds of information for passengers include timetables with dependencies between number and text, a list of departures, network maps, tickets and fares, changes and the passenger's location [4] as presented in Figure 1. Especially for tourists or business travelers in unfamiliar environments, it is necessary to support them in finding helpful and relevant information. Highlighting these kinds of information seems to be an appropriate solution to support passengers.

Visual Highlighting of Information

We identified different visualizations and distinguish two types of highlighting: single and combined highlighting. This differentiation is necessary when considering different levels of complexity of information as well as different users at the same time.

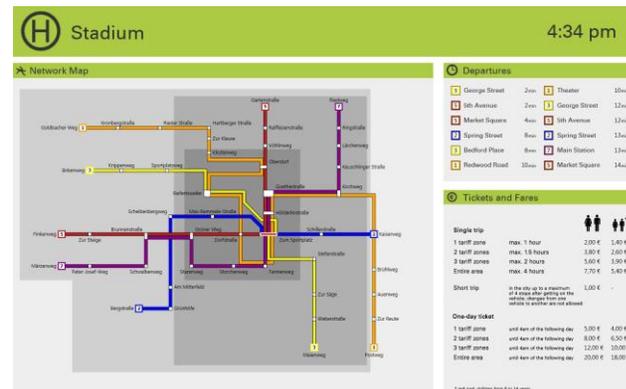
Single highlighting methods

We identified some single highlighting methods (see Table 1), which can be used to point out the relevant information in public transport. The highlighting methods can be applied not only to location, start or end points, but also to a specific line on a network map.

Combined highlighting methods

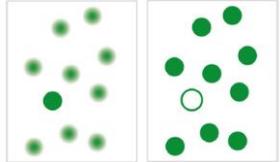
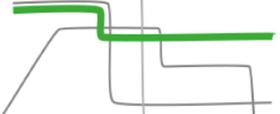
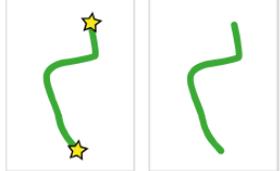
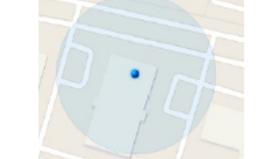
Combining different single highlighting methods represents further visualization options. Different combinations of two or three single highlighting methods are presented in Table 2. They can be used to highlight more complex information, e.g. start and end points combined with information about departure or arrival time or a specific line.

Figure 1: Public transport related information presented on a public display without highlighting



Highlighting	Effect	Visual example	Usage in public transport
Color/ Saturation	Objects with high saturation and/or color attract more attention than without. [5]		To highlight single points, e.g. start or end points on a map, locations, information in a set of homogenous information.
Blurring	Blurred elements take a back seat; defined elements come to the fore. [8]		To focus on a specific information in a set of homogenous or heterogenous information, e.g. a departure.
Size/Line width	Bigger objects are in the focus of interest, e.g. the biggest of several similar objects will be focused. [8]		For single points or lines on a map.
Movement/ Flashing	Moving or flashing elements attract attention.		To visualize the route from the start to the end point on a map.
Addition	Adding different shapes to an object to differentiate more easily between objects. [8]		E.g. to differentiate more easily between a list of ticket rates or departures.
Symbols	Symbols give meaning to an element, e.g. a special label. Independent from language. [2], [7]		To describe a single point better, e.g. marking a current location or an end point with a flag.
Text	Offer additional information to an object or symbol; differentiation of similar objects, e.g. Points of Interest. [5]		To describe a specific point, e.g. the name of a current location.

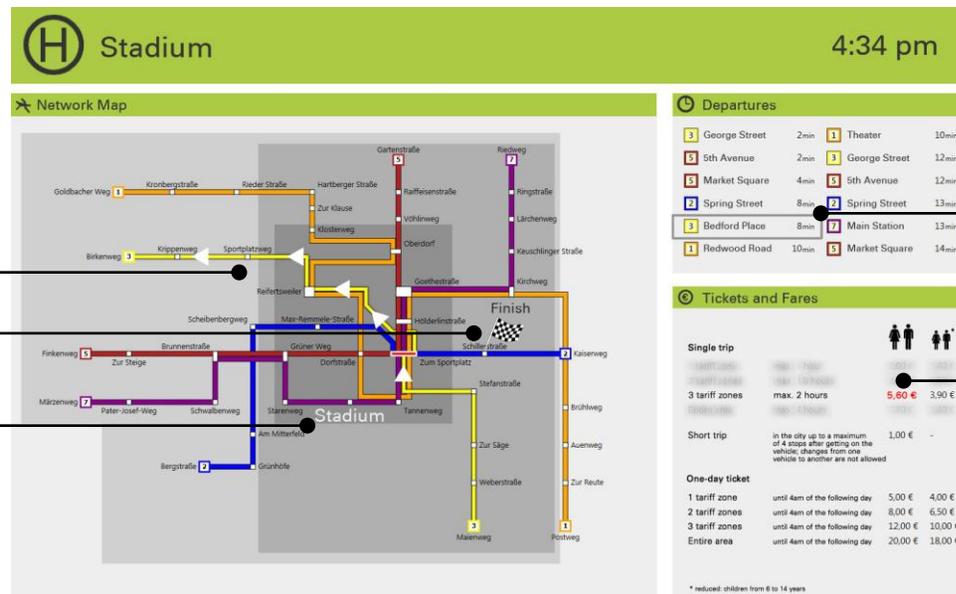
Table 1: Single highlighting methods

Highlighting	Effect	Visual example	Usage in public transport
Blurring & Flashing	Continued flashing and blurring of unimportant information simultaneously focus on flashing element.		To highlight information on a map or in a list, e.g. specific departure or a starting point.
Color & Blurring	Focused object has a different color than the blurred background.		Focus on a specific information, e.g. a single point on a map.
Size & Color	Focused object is bigger and has a different color than the surrounding objects, e.g. different bus lines.		To highlight, e.g. one specific line on a map.
Movement & Color	Colored moving objects attract attention.		To highlight a route on a map from a starting point to the passenger's destination.
Symbol & Flashing	Flashing symbols attract attention, e.g. start and finish of a given route.		To highlight a given route including the start and end point.
Addition & Movement /Flashing	An added flashing object, e.g. a bigger circle frames a smaller object.		To focus on a specific point, e.g. starting point on map with other surrounding points.

Flashing & Symbol & Movement	Movements or a flashing element attract attention, an additional symbol specifies the element. [2], [5], [1]		To focus on a specific information with the help of flashing and moving elements, to describe the information more detailed by a symbol.
Text & Symbol & Flashing	A short text describes symbols more detailed; flashing attracts attention.		Clearly describes a single point, language-independent, e.g. end point of a route.

Table 2: Combined highlighting methods

Figure 2: Public transport related information with highlighted content



Movement: One specific line is highlighted by moving arrows.

Symbol & Text: The end point is highlighted by a flag and additional text.

Color & Size: The current location is highlighted by a larger font size and a different color.

Addition: A specific stop is highlighted with a rectangle.

Blurring & Color: The relevant ticket and fare is highlighted by a striking color and by blurring of all other options.

The usage of different kinds of highlighting, e.g. blurring & color, addition, color & size, symbol & text as well as movement is illustrated in Figure 2.

Conclusion and Future Work

This paper presented a set of visual highlighting methods on public displays in the field of public transport and will be integrated in our future work. We plan to evaluate the different kinds of highlighting in a real-world setting. For this, the test users will have to perform different tasks in a given time including the correctness of the solved tasks. As a result of this evaluation, we expect to find the most efficient visualization for representing highlighted information in public transport. Furthermore, we want to establish a basis to give recommendations to (local) public transportation services, which type of highlighting of specific information suits best for passengers in public transport.

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