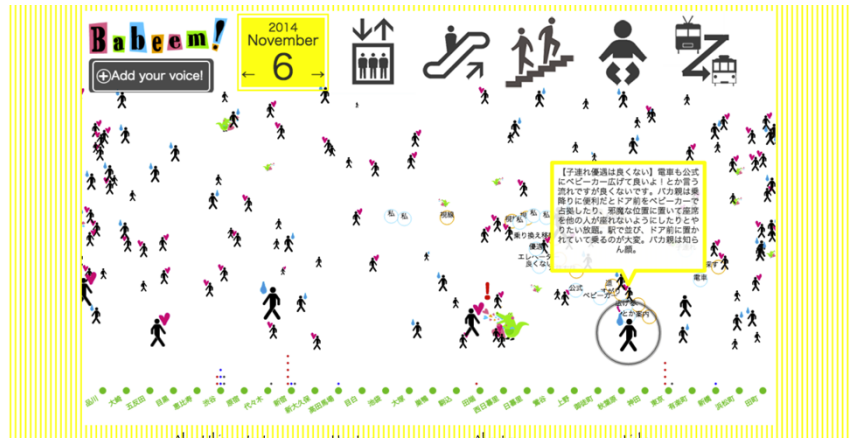


Makiko Hardada
Graduate School of
Tokyo Metropolitan University,
Japan Society for the Promotion of
Science Research Fellowship DC2
sumakokima@gmail.com

Yoshiaki Komatsu
XING.INC
yoshiaki.komatsu@xing.co.jp

Hidenori Watanave
Graduate School of
Tokyo Metropolitan University
hwtvn@sd.tmu.ac.jp

Visualization of Web Application for Archiving Views of Railway Stations' Experiences for Strollers



Abstract

Our study in this paper aims to show railway stations' experiences for strollers from the point of users' view. To approach this purpose, we propose a visualizing web application to archive the views of railway stations experiments between stroller users and other people. We create a system to collect the views from Twitter and our own contribution system. We apply language analysis to the views and extract users' sentiment and key phrases. In addition, we visualize these views to overview with sentiment and key phrases simultaneously. We consider that our work will give a better understanding of various inconveniences for stroller users, and propose guidelines of what kind of behavior and understanding are required for each other.

Keywords: Visualization, Social Network, Language Analysis, Strollers

1 Introduction

In Japan, it has been maintenance of barrier-free for passengers by legislation, such as barrier-free law [1]. A railway is the main means of transportation [2], and stroller users are increasing at stations. However, there are many difficulty scenes for strollers at railway stations [3][4][5]. These difficulties are caused by not only the physical scene, such as a structure of barrier-free, but also understanding for the environments for strollers. However, there are different views about strollers at railway stations between stroller users and other people, so that to understand each other is needed to use stations comfortably [7].

The guidelines to improve the railway stations' usability have been published at railway stations. It is encouraged people to have an attention to each other, and shows the appropriate actions in typical case. Although, there are many minor troubles that can see only an interested party, however such minor cases are not discussed in public space.

From the above, we should point out that it is needed to share views of strollers at stations between stroller users and other people. We consider that this will give a better understanding of various inconveniences for stroller users, and propose the guidelines of that what kind of behavior and understanding are required for each other. Our study in this paper aims to show railway stations' experiences for strollers from the point of users' view. To approach this purpose, we propose a visualizing web application to archive the views of railway stations experiments between stroller users and other people. We create a system to collect the views from Twitter and our own contribution system. We apply language analysis to the views and extract users' sentiment and key phrases of the context. In addition, we visualize these views to overview with the sentiment and the key phrases simultaneously.

2 Background and Purpose

2.1 Environments for strollers at railway stations

Idei et al. [3] describe that the more people use stroller, stations are more inconvenience. Matsubara's survey[4] reports that guidelines of strollers at public transport are not uniformed and it makes difficult to understand each position between stroller users and the other people. Furthermore, this report describes that to grasp the regular needs of people has not been performed. Tatewaki et al. [5] point out that the influence on stroller users by the station's structure. They suggest that the changing the structure takes time, but it can follow by showing user's experience. All of these papers describe the difficulty scenes for stroller users at railway stations by questionnaire survey for the stroller users, and report the importance of understanding strollers' environments. However, they resolve around railway operators and building contractors, so that we consider that they are not to be shared to the general public.

2.2 Approaches for strollers at railway stations

To follow physical inconveniences, station maps that contain information about barrier-free structures, such as elevators, escalators, stairs, and family bathrooms, are published at every station; however, they do not show the difficulty scene during the process of using barrier-free structures and such a minor trouble is not discussed in public space.

Japan's Ministry of Land, Infrastructure and Transport have published the rules to get well understanding for strollers. The ministry have also designated a priority mark for strollers to paste at barrier-free structures [6]. It is encouraged people to have an attention to each other, and shows the appropriate actions in typical case – namely, the actions is left to users, but the guideline for the minor troubles has not been regulated.

Okuyama and taniguchi [7] survey the dependency on measures of administration for strollers, and report that more younger people are, the dependency become higher. It means that there are the generation gaps about the views of strollers. However, the approaches to eliminate the distinction have not been done.

From above, it is concerned that resent approaches cannot follow to get smooth communications if there are different understandings between both.

2.3 The purpose of this study

From the above, we consider that it is needed to exchange the views of railway stations experiments for strollers between stroller users and the other people, so that the purpose of this study is to show railway stations' experiences for strollers from the point of users' view. We make an attempt to get the views from stroller users and the other people, and compare them. To approach this purpose, we create the web application to archive the views of strollers and visualize the results.

3 Recent researches and our visualization approach

3.1 Exchange of views about stroller on the web

Women's Park[8] is one of the most famous SNS(Social Network Service) to exchange information, conversation, and

discuss for mothers. In the content, there are many discussions about experiences with strollers at stations. However, only the membership (expectant and nursing mothers) can access it, so that it is impossible to share the views of stroller users to the other people. "Rakuraku odekake net"[9] is presented as the web service to search the station's barrier-free information. Everyone can access the information, but it doesn't show the users' view. On the other hand, "Mamaspert"[10] is characterized by stroller's usability for mothers and this content gives station's usability for strollers with message of users' experiences. However, the contribution is limited only mothers. [8][9][10] are seen to be of use to share the information related to strollers, but it is difficult to compare the views of strollers between the stroller users and the other people, so that they don't follow this study's purpose.

On the other hand, some topics [11] about strollers' experiments on the FAQ site are opened to everybody. They are of great value to show the environments of stroller, however it is needed to have an articulate context to post the message. We should point out that the vague messages should be focused on to understand strollers' environments. Furthermore, we consider the experiment for strollers are not always necessary for the answer.

Considering the recent approaches, we consider that there are experiments to discuss about strollers at railway stations, however the approach to compare the views of strollers at railway stations between stroller users and the other people have not been designed.

3.2 Collective intelligence and visualization

Collective intelligence is shared or group intelligence that emerges from the collaboration, collective efforts, and competition of many individuals and appears in consensus decision making. Tom and George [12] said that collective intelligence has an ability to form a reference for selecting the appropriate action. Due to the expansion of the Internet, it became possible for ordinary people to post their own opinion and Collective intelligence has been constructed on the web.

Especially, Twitter, which is one of the most popular SNS, has been gathering attention as to get the recent environment by user's experiences [13]. Yamanaka et al. [14] and Sasaki et al. [14] add tweets which includes geo location data on the map. Ree et al. [16] proposes a method to gather crowd behavioral vectors to derive latent classes of urban characteristics in terms of crowd behavioral patterns and relevant urban areas which are extracted using geo-tagged Tweets. It is appeared in above researches that geo location data link a context to address, so that it can propose the characteristic of each location. However about the tweets of stroller's views, users tend to tweet without it, and also we consider that to use the geo location data is not suitable for data about stroller because of protection of privacy. Thus, it is difficult to use it in this research. However, there are more tweets which include "station name" than with geo location data. Therefore, we will use station names instead of geo location data to show the characteristic of the place. On the other hand, Sawada et al. [17] visualize tweets with a network model. A network model is a database model conceived as a

flexible way of representing objects and their relationships. It is good at showing the schema, viewed as a graph in which object types are nodes and relationship types are arcs; however the minor element is settled at a low rank and it is worried that the minority view's accessibility become degraded. Our study aims to show the minor views, so that network model is not competent for this research. However, we should pay attention the construction network models method to divide the sentence into clause and show not the full context but the word. We consider that this method enables users to access the unexpected words which are tend to skip over while reading. "TwitInfo"[18] presents a system for visualizing and summarizing events on Twitter. This allows users to browse a large collection of tweets using a timeline-based display that highlights peaks of high tweet activity with positive and negative sentiment. We consider that using timeline is applied to showing the view's changing over the days in our archiving. Sentiment viz"[19], "Kazemiru"[20], and "Tweet beam"[21] are visualizing applications for the general public to show the large information with Twitter. All of them show the tweets at random, so that all tweets have equal accessibility. And they have an interactive proposing the context by mouse over the icons. The normal display does not show the context, and they required the users' operations. To hide the text from the display can design more friendly. We want to apply this approach. The other interested points of these researches to be able to apply for our study are extracting sentiment of the context in TwitInfo and Sentiment viz to show the emotion's background of using the search word. Kazemiru classify the Tweets according to the scene and icons are applied with the color, to discover groups of similar tendency of views.

3.3 This research's visualization approach

From above, we will summarize the visualization methods which our research can apply.

- Collect the views about strollers:
 - We will use Twitter data for getting users' views about stroller of stroller users and the other people.
- Language Analysis:
 - Divide sentence into clause and show the keywords to enables users to access the unexpected words which are tend to skip over while reading.
 - Extract the tweet's sentiment to show the emotion's background of using the word.
 - Classify the tweets according to the scene.
 - Extract the station name.
- Design of visualization
 - Set a calendar to show the view's changing over the days.
 - Map the tweets on each station name instead of using geo location data to show the characteristic of the place.
 - Present Tweets randomly to make higher accessibility for minor opinions.



Figure 1 Screenshot of our application

Table 1 The experiences of stroller users and the other people on Twitter

Stroller users	The other people
There are few opportunities to get help from others	I saw a mother with stroller at stairs, but I had no idea how to do is better. So couldn't do anything.
I had commuted with stroller, so that when I use a station without elevators or escalators I hold my stroller with one hand and my baby with one hand. I want to avoid rush, but working mothers cannot. I met people who helped me to carry my stroller in a cool face. Appreciated.	There was a mom who suddenly drift with a stroller in every change of direction at the station. When I saw the baby in the worry, his face was of the man who attack the pass.
Asakusa is not recommended to stroller users. I wish the station's usability is better at least.	I watched a man helped holding a stroller at stairs which looks hard to use for holding a baby mothers. Feel good.
Thanks for someone who helped me to lift my stroller on stairs at Nihonbashi and Ootemachi, It was really helpful.	I wonder people who are pushing the stroller do not feel yourself dodge at not limited to Disney, I thought that while waiting for a friend in the Sunday at a station.



Figure 2 The image of calendar

- Have an interaction system to show the context, and we design icons according to the classified categories.

The instructions at the next section tell you about our visualization design based on above list.

4 About our visualization design

Figure1 is the screenshot of our application.





Table 2 Example of Language Analysis1

Tag	Data
Content	I saw the woman who was trying holding her stroller at the stairs at Tokyo station, and it looks hard, so that I asked her “May I help you to carry your stroller with you?”. However, she shunned my kindness. After that I will talk only to the elderly.
Station Name	Tokyo
Latitude	35.611382
Longitude	139.766084
Emotion	Negative
Key Phrase	Tokyo, stroller, stairs, carry, with, hard, shunned, elderly, kindness, only, talk

Table 3 Example of Language Analysis2

Tag	Data
Content	A young man helped me to lift my stroller at the stairs at the station. He was naturally nice guy, but it looked so cool all the more! He was up to the stairs already, but down to us to help me! I greatly appreciate his kindness!
Station Name	null
Latitude	null
Longitude	null
Emotion	Positive
Key Phrase	young man, help, lift, stroller, stairs, nice, guy, cool, down, appreciate, kindness

Table 4 The icons

ID	Image	Meaning
a		The views of stroller users
b		The views of the other people
c		The positive sentiment
d		The negative sentiment

4.1 Collect the views of stroller

About views of people are able to be seen on SNS; “Twitter” which is one of SNS includes users’ views, which reflect their sentiments, lifestyles and environments from every walk of life. Many opinions about strollers at railway stations by the general public are opened. The tweets which include “station” and “stroller” are collected via Twitter Search API[22]. To collect the minor opinions, we set the result type as “mixed”; include both popular and real time results in the response. The collected views are classified as stroller users or the other people. It is judged by the users’ profile information. When the

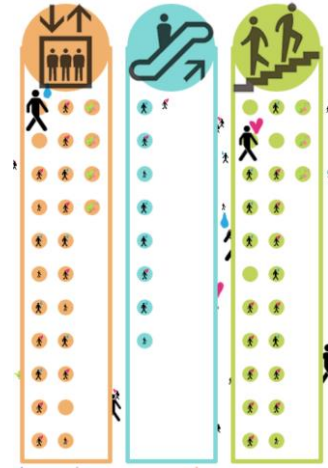


Figure 3 The result of categorization



Figure 4 The station list



Figure 5 The mouse over the station name

profile context includes the words like mother, childcare, baby, and nursing, the view is tagged as to stroller users, if not, it is tagged as the other people.

Furthermore, we constructed the contribution form in the application to collect the views of people who do not have an account for Twitter. Users have to insert 4 data in the form; users type (stroller user / others), date, views, and station name. There are required items except for a station name.

Table 1 presents some of collected views.

4.2 Language Analysis for views

Table 2 and Table 3 show the result of language Analysis for views. In this paragraph, we will introduce about our language analysis.

4.2.1 Sentiment and Key phrase

We extract the sentiment of “positive / negative” and key phrases from users’ views by language analysis [23]. The extracted key phrases are limited to a noun, a verb, and an adjective. These key phrases make users to understand the content easily and increase imagination.

4.2.2 Classify the tweets according to the scene

In this application, we classify the tweets according to the scenes which are described at barrier free map at stations, like



Figure 6 (Left) Appearing the context by mouse over
(Right) The collide event

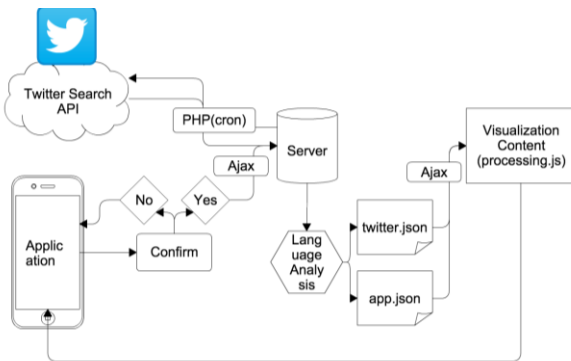


Figure 7 The Construction of systems

“elevator”, “escalator”, “stair”, and “family bathroom”. In addition, we add a category of “exchange the train”, which are mentioned in Matsubara’s report. If tweet includes above the word, it is classified.

4.2.3 Extract the Station name

To extract the station name, we prepare the dictionary of station list. This dictionary includes the station name of Yamanote Line, as the sample case, and the based information of each station. This information is got by Hatena Keyword API[24].

4.3 Design of visualization

4.3.1 The graphic design and structures

The views are visualized as web application written in processing.js. We design the two icons, the one means the views of stroller users (Table.4-a), and the other means the views of people who are not stroller user (Table.4-b). Each of icons has one view. If the included text’s sentiment is positive, the heart shape is added to the icon (Table.4-c). If its sentiment is negative, the shape of tears is added to the icon (Table.4-d). Our content contains 3 categories.

1. **Calendar (Figure 2)** : The calendar is located in the upper part of the display. It has the arrows and users can select the date by mouse click. The icon size is depended on the calendar. If the view is published in the calendar’s day, the icon size is magnified by 3 times. Furthermore it has the collide event (cf. 4.3.2).
2. **Clustering (Figure 3)**: The images of Elevator, Escalator,

Stair, Family bathroom, and Exchanging trains are located in the upper part of display. The box is appeared by mouse click the image. The icons related to the scene are listed in the box. The stroller user’s icons are listed from the right part of the box, and other’s views are listed from the left part of it.

3. **Station list (Figure 4)(Figure 5)**: The list of the station located at the bottom of display. The small circles above the name show the count of the views related to the station. The related icons will gather around of the name and station information is appeared by mouse over the station name.

4.3.2 Interaction and Movement

1. **Basically action**: The icons move around the canvas. The speed is between 1.0 and 2.0. Users can see the full text by mouse over the icon (Figure 6-Left). The movement of the icon is stopped and the scale is expanded while mouse over.

2. **Collide event**: When the icons collide each other, key phrase appears on the canvas (Figure 6-Right). To enhance the visibility of the text, three key phrases are appeared and this event is arise less than five at the same time. The displayed key phrases are selected at random on each occasion. The key phrases are shown like a bubble. When the bubble’s position-y is going out of display, there fade out. We consider that it helps users to get information unintentionally.

5 System

Figure.7 shows the structure of our visualization systems. The PHP code which gets the data from Twitter is run every day via cron. And language analysis is held at the same time. After that, the data is saved as json file. The visualization application gets these json files via ajax.

6 User reactions after public

We published this application on 18 November. We got the users comment about our approach. Here we present some of them.

- I thought that it helps the needs of our society at the point of feminine.
- Intuitive application depended on the needs.
- I sympathize this approach because to go out with baby was too hard.
- Such a sharing information is very important.
- I found the unexpected views! I studied, and want to practice.
- It can solve the urgent problems.
- To visualize the social difficulty is important by web service, however I wonder if there is a solutions which can solve in that time and place.

7. Conclusion

Our study in this paper aims to show railway stations’ experiences for strollers from the point of users’ view. To approach this purpose, we proposed a visualizing web application to archive the views of railway stations experiences between stroller users and other people. We created a system to collect the views from Twitter and our own

contribution system. We applied language analysis to the views and extract users' sentiment and key phrases of the context. In addition, we visualized these views to overview with the sentiment and the key phrases simultaneously.

We got the user comments after the publication. We regarded that our approach can present to consider the experiments of strollers at stations.

We considered that this will give a better understanding of various inconveniences for stroller users, and propose the guidelines of that what kind of behavior and understanding are required for each other.

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