卒業論文

即時性の伴うイベントを
可視化・共有するWebサービス群

Web Services Enabling Real-time Visualization and Sharing of Information from Real-World Events

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概要

Twitterに代表されるマイクロブログの広まりやスマートフォンの普及により，ソーシャルメディアに人々の自発的で自然な反応が多く含まれていることが可能になった．本研究においても，リアルタイムの個別ユーザからの実世界のイベントに関する反応を入手し，トレンド分析やイベントの整理，共有などを行う様々なサービスを最新のサーバ技術を用いて構築した．リアルタイムな情報共有に注目し，複数のアプリケーションの作成を通し共通基盤を構築したことについて述べる．

キーワード:

ブラウザネットワーキング，マイクロブログ，人流

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Web Services Enabling Real-time Visualization and Sharing of Information from Real-World Events

Abstract

It is possible that contain many spontaneous and natural reaction of people in social media with spread of microblogging represented by Twitter and smartphones. In the present study, to obtain a reaction related to real-world events from the real-time of the individual user, organizing of trend analysis and events, was constructed using the latest server technology a variety of services to perform the share such. In this paper, focuses on real-time information sharing, we describe that was constructed a common infrastructure through the creation of multiple applications.

Keyword:

Browser Networking,Microblogging,People Flow

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Chapter 1

Introduction

In this chapter, the background of this study and the purpose and describes the contents of the configuration of the present paper.

1.1 Background

Against the background of the spread and smartphones spread of micro-blog, which is represented by Twitter, it is as spontaneous and natural reaction of people is contained in a large amount in social media, has become easily able to acquire it.

1.2 Purpose

In the present study, to obtain a reaction related to real-world events from the real-time of the individual user, organization of trend analysis and events, to construct a variety of services to carry out, such as shared by using the latest server technology. Focusing on real-time information sharing, we describe that it has built a common infrastructure through the creation of more than one application.

The following configuration of the present paper is organized as follows.Chapter 2 describes the detection and visualization of routes and events using a micro blog.Chapter 3 describes the proposed system of improvised browser communication.Chapter 4, describes the extraction of local trend on Twitter.In Chapter 5, describes the construction of a mobile terminal sensing server API.In Chapter 6, we describe the GPS route noise removal technique.Finally, we describe the conclusion of this paper in Chapter 8.

Chapter 2

Route event detection and visualization by the location information with Tweets analysis

This chapter focuses on tweets marked with location information, describes the visualization technique based on Web applications of human movement path that is expected to event participants.

2.1 System summary

In this study, creation of visualization and application of human movement path of user expected to event participants, with location information. In addition, we describe a Web application that was created for the purpose of detection and visualization of clustering to events from the location information and tweet content.

2.1.1 Moving path visualization

Was visualization of the collected moving path a tweet from the sample as 2014 October 18, Fujisawa Enoshima fireworks [4] that have been made in days of study(fig 1). Data was collected, and defined as follows event participants Fireworks on the day.

- Tweeted in within a radius of 10km.
- Made the tweets including the "fireworks" or "Fujisawa" or main station name.

2.1.2 Event detection

Sample of a study collected tweets, was posted May 9 to May 12, 2015, in the circumference of the time when a system has been developed. Visualization to tweets keyword and latitude, on the map and color-coded for each cluster performs a clustering longitude parameters. Also created a Web application that allows to manage and map view of clustering results(fig 2).

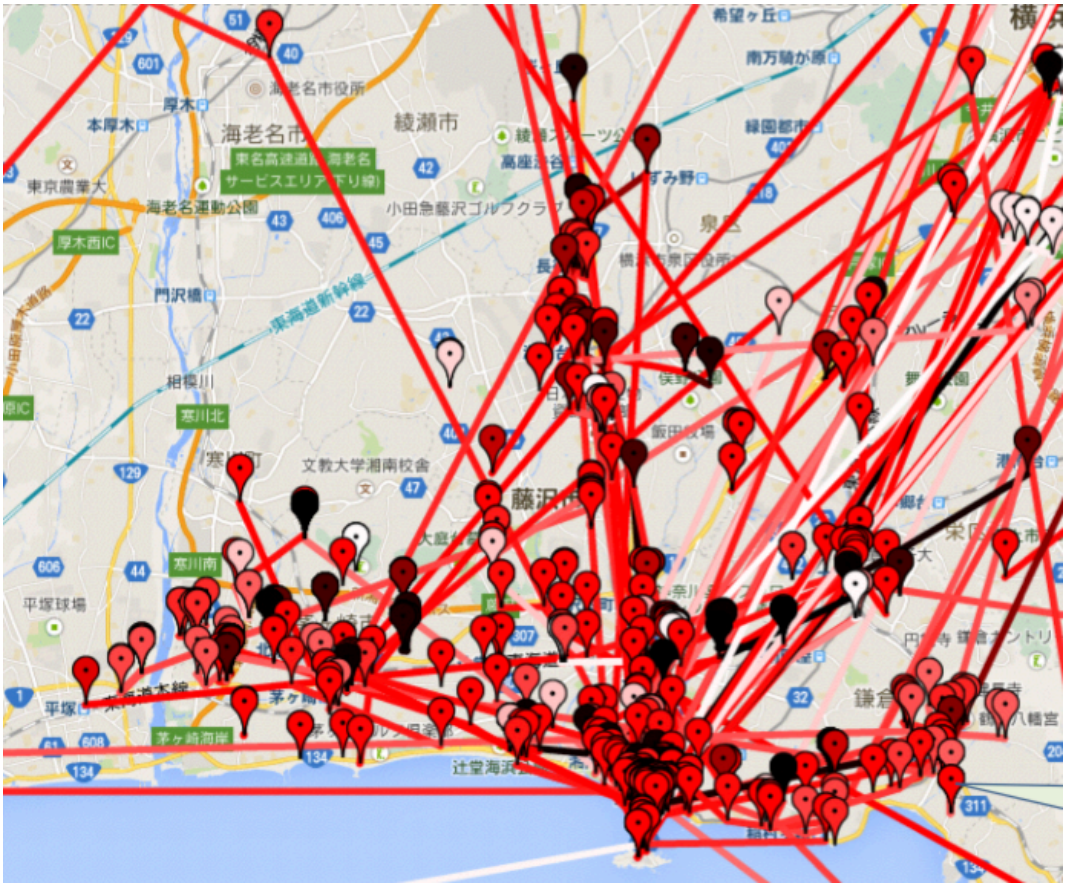

Fig. 1: Application Screen

2.2 System stracture

2.2.1 Abount Twitter API

The tweet collection of the present study was using the Twitter API. Mainly use the `https://api.twitter.com/1.1/search/tweets.json` and `https://stream.twitter.com/1.1/statuses/filter.json` was collected tweets. search/tweets API is a possible acquisition of the past tweets range specified in the past tweets search and latitude and longitude and a radius of a keyword specified as the filtering of the tweet. In addition, the past tweets by

Fig. 2: Event detection application screen

"search/tweets" there is a limit of up to a week ago.

2.2.2 Moving path visualization

To analyze the procedure in the following (fig 3).

Acquisition of sample

Were acquired focused around 10km distance from the fireworks launch point of Fujisawa Enoshima fireworks. Fireworks launch point is W35°18′25″ E139°28′43″. Furthermore collect the tweet, posted by acquired tweet's owner, of the day from 17 to 19 days(table 1)

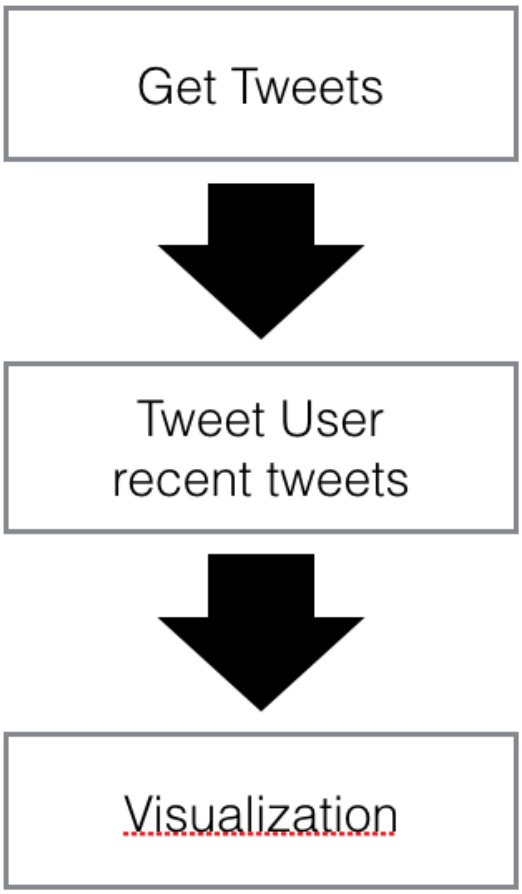

Fig. 3: Flow of fireworks Tweets analysis

Visualization Web application

The visualization was using the Google Maps API [5]. To display the marker in each tweet point, the same user displays signed before and after the tweet and the line use a polyline, is a straight line was attempted visualization of the route. The color of the marker to change the brightness with time, and the display in a dark red from bright red through the night from morning(fig 4).

Date	Number of sample
Oct. 17	5052
Oct. 18	26723
Oct. 19	20227

Table. 1: Fireworks - Sample tweet number

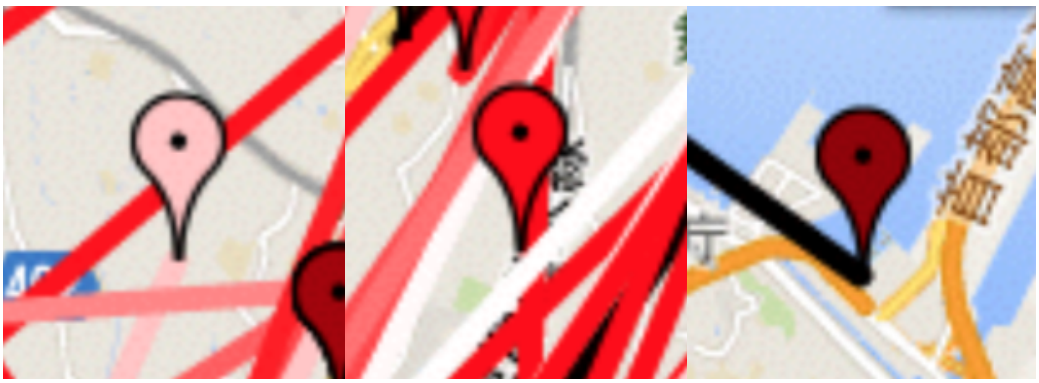

Fig. 4: From left to right, marker of the morning, noon, night, time zone

2.2.3 Event detection

To analyze the procedure in the following (fig 5).

Tweets collection

Discover were obtained similarly to the visualization of the movement path. This time, as a sample of the Tokyo metropolitan area of the tweet. Tokyo downtown, 100km within the from E35°40′24″ W139°42′37″, collection date and time was 4 days of May 9 to May 12th.

Clustering

Were clustered using K-means the keyword latitude and longitude to the shaft. A result, was able to classify the number of cluster (table 2) for each

date. Further, it is necessary to examine techniques since the result desired result of attempting K-means could not be obtained, including the time zone.

Date	Number of Culster
May. 09	10
May. 10	12
May. 11	7
May. 12	7

Table. 2: Event detection - the number of clusters

Visualization Web application

Using GoogleMap like the path visualization. It has changed the color of the marker in each cluster. Pick up because the good results in the result of the visualization results 10 days were obtained. 10 days clusters became list, such as follows (fig 6).

Keyword	Number of Tweets
imacoconow	264
kawaguchi	76
神田祭	65
photo	43
横浜	41
週末限定	38
神田明神	35
東京	30
天気	28

Table. 3: Event detection - May 10

Events that could be discovered by visualization

It is on 10 May shrine of Kanda Festival of events that had been understood from the previous experiment Miyairi has been carried out throughout the day. It was actually able to detect the tweets around events [6]. In addition, has also been events that did not run in advance on the same day "野外音楽フェスティバル 人間交差点 2015 [7]", it can be said that here also could be detected as tweets around events.

2.2.4 Geo Tweet collection client

We have created a Web application that collects in bulk tweets with location information as a tool to collect the Tweet in this study by using the API (fig 9). In applications to get a recent tweet, it is expected to take advantage in future research.

2.3 Conclusion of this chapter

As a result, although it is such speculation stations that are key to use from the visualization, the moving source and the human flow of only the information obtained in the collection to join each user it could not be predicted only roughly.

As a related study, information adding approach to Discover no location information have been proposed[3], the analysis can be expected with respect to the increase and the user information by utilizing.

Because the current is not able to attribute pickled user, I want to try or not find any significance in the visualization in the future and the additional information. Clustering, including the time axis is also considered to be involved in the detection accuracy of the event. Visualize using the animation is also believed to have spread the possibility of representation.

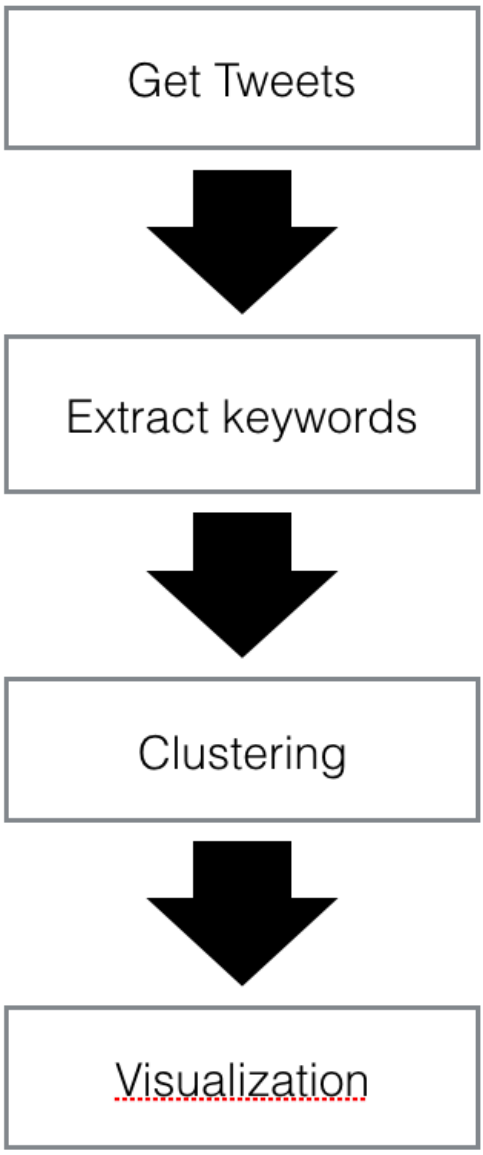

Fig. 5: Flow of event detection and visualization

Fig. 6: Plot the results May 10

Fig. 7: Plot of Kandasai Tweets

Fig. 8: Plot of nkfes Tweets

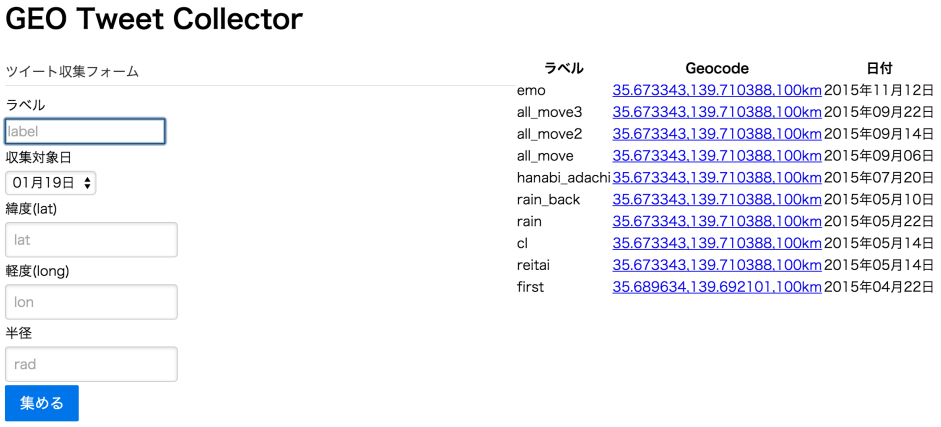

Fig. 9: Tweet collection application UI

Chapter 3

A instant browser networking game platform supporting multiple players

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In this chapter, we describe a browser capable of networking game is improvised multiplayer play that was created.

3.1 Background and summary

In recent years, real-time communication technology has been attracting attention by WebSocket [13]. There is a need to work efficiently use the communication tool in many of the technical positions. It to the background, the study of real-time synchronization WebGL technique suggestions [8] and Web desktop sharing of using WebSocket [**?**] is being carried out in joint research. Moreover, against the background of the widespread use of smart phones [11], take advantage of the QR code [12] has also penetrated, recognition rate of QR code reader is a more than 90%, finding that use experience rate is about 70% are out [10].

We focused on immediate establishment of a connection where the smartphone with the controller. And by the creation of immediate participation capable browser application, describes the proposed information sharing method based on smart phone using the QR code and WebSocket[25].

3.2 System summary

As an example with the creation of the game platform, it was the creation of a multiplayer-enabled browser shooter. QR code as the (fig 1) is displayed when you start the server to access from the monitor terminal to the game page in a browser. Players who play in the same screen can participate in the play can be accessed by the QR code read by smartphone terminal to the URL for the controller.

Controller is a horizontal possession smartphones, shake (shake the smartphone) was placed in the game as the input also like behavior (fig 2). Immediate participation in the smartphone by using a socket communication [17] can be a real-time operation of the player can be.

3.2.1 Game system

The content of the game will be explained.

Fig. 1: Authentication QR code

The game was to create a plane of the shooting game. Section, consisting of the wall can be moved on the stage is the player (fig 3) object can not pass through (fig 4). Players have an HP (Hit Point), MP (Hit Point), consume MP to shot attack, it consumed MP is MP and get scattered to the map was added to the rules of the feature of recovery.

Action of the player can be done, but three of the move and shot attack and dash. Shot in the controller right, shot in the controller left attack, dash can be in the shake.

It was consideration of the processing speed for the number of players. It was performed regression analysis taking the connection number and FPS about creating the game (fig 5). Some display was the state are heavy in seven of 28.28fps at the time of connection

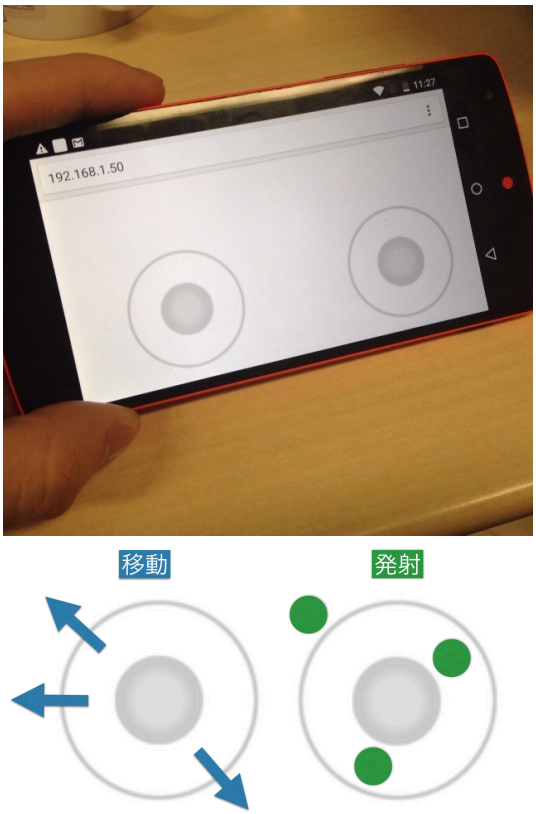

Fig. 2: Controller, controller of the description

3.3 System structure

3.3.1 Diagram

The configuration of the system will assume the two, and the configuration shown in (fig 6) move and operate the online server, the configuration shown in (fig 7) like can play only in the local network by to make a server on the PC.

3.3.2 Flow of network communication

To establish a connection in the flow (fig 8), such as:

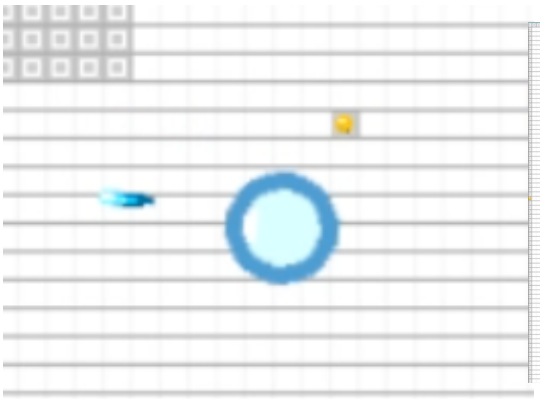

Fig. 3: Player, Shot

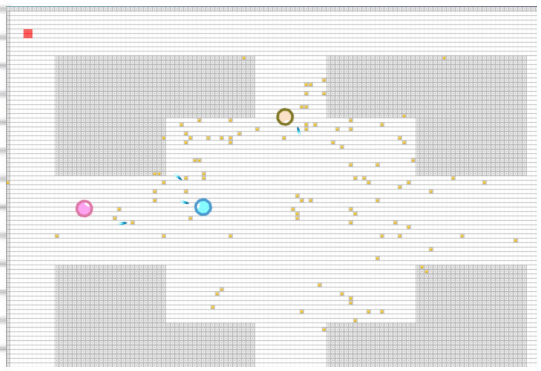

Fig. 4: Game screen

- To access the main page from the terminal as the display. (1, 2)
- To establish a socket connection at the time of the response. (3, 4)

It is to play until the preparation of the game screen do the following such communication (fig 9).

- Clients access to the team selection page (/con). (1, 2)
- To access the team to the selected completion page (con/team=), to establish a connection of the socket. (3, 4, 5, 6.)
- To send additional information to the display terminal or other users. (7).

Game-time communication is sent to the client that opened the main page through socket for input of a controller as shown (fig **??**)nodegame), it is synchronized with the player's actions.

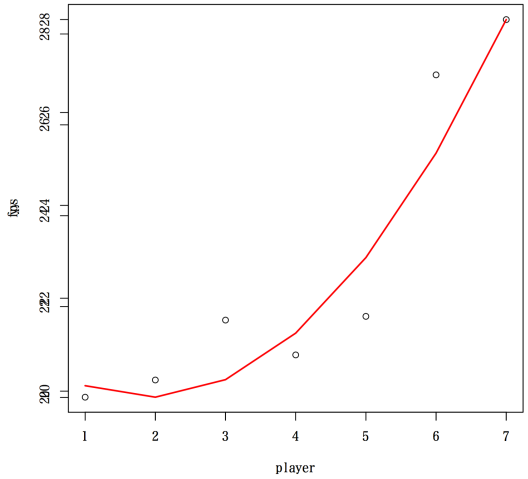

Fig. 5: FPS Graph

3.4 Conclusion of this chapter

Figure how you are playing the game To me it shows (fig 11). Game freeze occurs this time made the game is about once in 20 seconds in connection with four people, was seen constantly Kaku with that's connected in eight. If the data to be handled in the socket is simple is believed that can improve the performance of.

The system made a demo and poster sessions presented at the University of the open campus and academic. Although many of the participants were able to participate in its own smart phone, the case of QR code reader app is not in the terminal occurs in one percent or less. Considered and evaluation of packaging and network load as the starting point and the game framework for future development.

The application of this system, a general purpose of the server-side, a library can be expected. It seems to spread the possibility of communication to the mobile terminal in such there is no network environment affected areas by blowing the Wifi if it is possible to perform also porting to RaspberryPI.

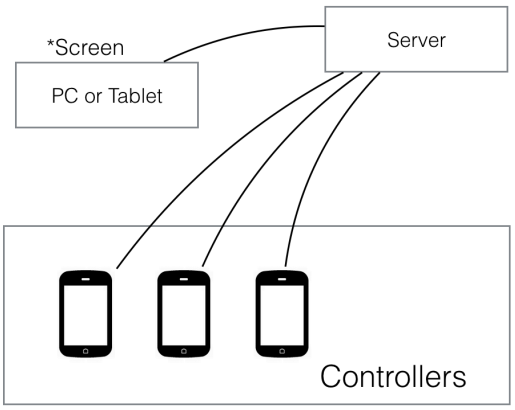

Fig. 6: System configuration

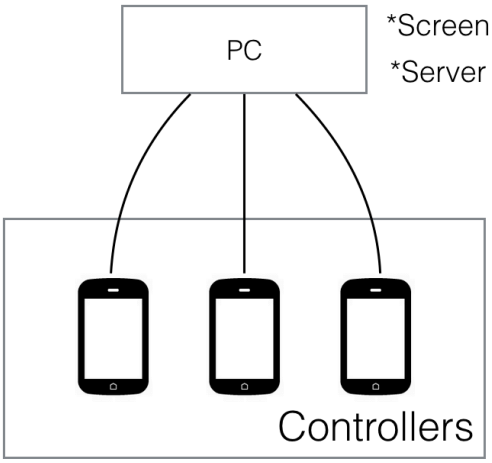

Fig. 7: System configuration2

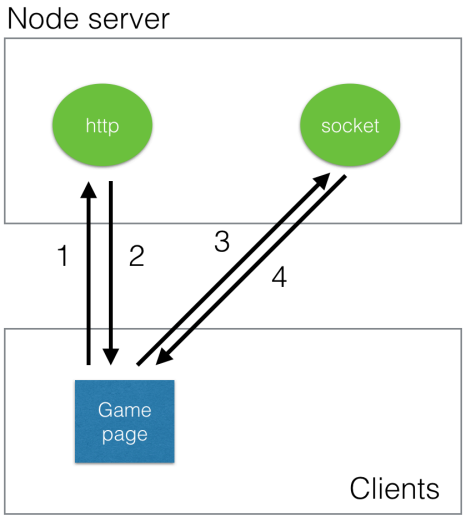

Fig. 8: Communication at the time of the main page connection

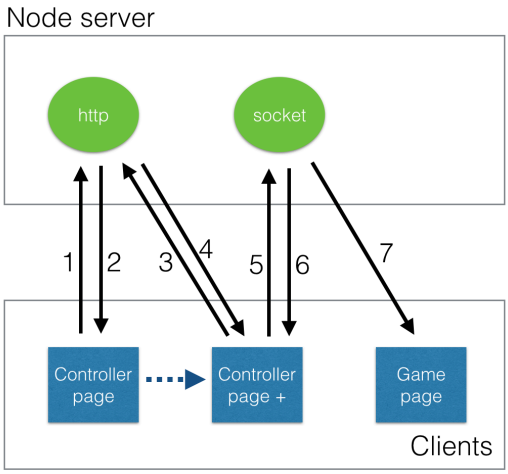

Fig. 9: Communication at the time of the controller connection

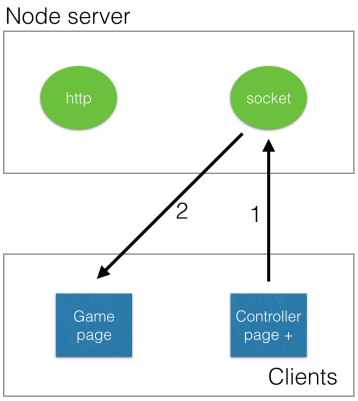

Fig. 10: Synchronization control query at the time of the game

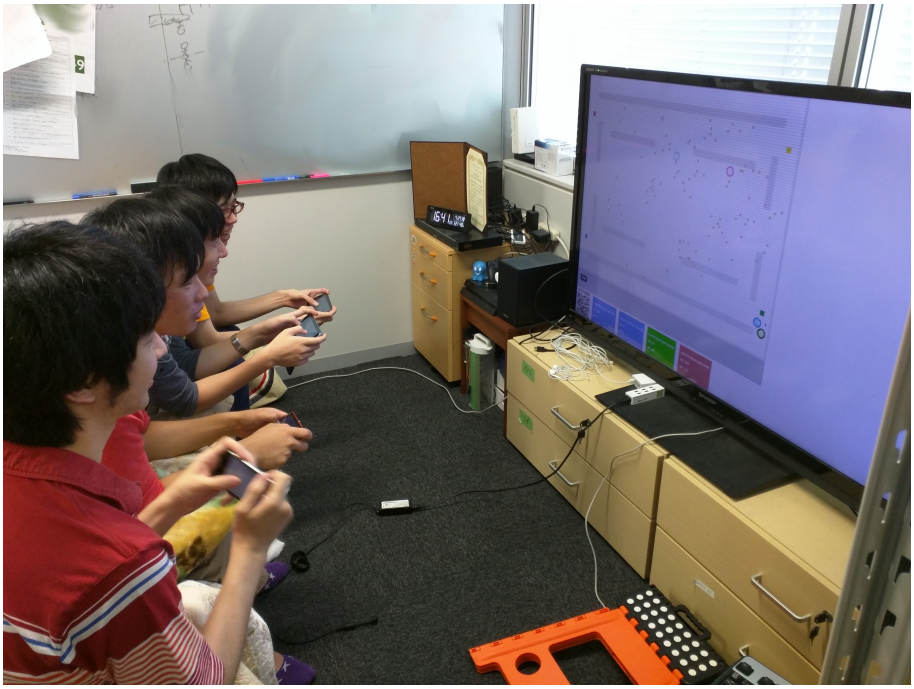

Fig. 11: State of play

Chapter 4

Extraction of the local trend of Twitter

It describes the study of the real-time trend analysis techniques within a particular cluster in this chapter

4.1 Background and related research

The society has a variety of organizations and groups, there is a news and trends in the interior. In addition, Twitter has been actively used as a tool for the event acquisition of real-time information and progress. As related research, proposals and of the events of the congestion situation grasp by tweet analysis [19], have any other suggestions of the analysis method of forecasting and will trigger things trend [20]. We tried to extraction of the local trend keyword by the analysis of this time Tweets by university students.

4.2 System summary

As a sample, was registered at the user has been self-application and manual, the aggregate to target university students of Twitter user a total of about 600 users of the tweet, the extraction of keywords that are prevalent in the immediate vicinity of the time zone application the implemented. To do the statistics every hour, to the post from Twitter of bot [1] the top keywords as a trend(fig 1) [21].

Fig. 1: Twitter bot account that you created in the experiment

[1] Twitter account that is running as an Internet bot

4.3 Algorithm

The evaluation of the trend using the proprietary algorithm as shown in (fig 2). Simply calculate the frequency of occurrence of the keyword First, the adjustment of the point by the number of users, carry out the removal of the noise the point of the words you accumulated and recorded trend of recent one day as a negative evaluation. A result the upper six stars of the tweet, the point is keep a record in the database is divided into the log and cumulative for the next evaluation.

And mounting a plurality of the following functions also discussed delivery of as a trend content of.

- The 1st and the delivery of one week of trend
- Additional features of the keyword dictionary by reply
- Display of trend-filled in a continuous

4.4 Conclusion of this chapter

As a result of experiments with extracts of trends in this technique, it was possible to extract the information in the news on Twitter sporadic occur in actual campus, as shown in figreftrendsample0. A result of the overlap in words that are posted as a trend in Twitter official was also seen many (fig 4). In addition, less likely to be such a special proper nouns from the sweetness of the space between words accuracy of sentences informal extraction, keyword of hash tags that are extracted reliably in opposite is the improvement tend to point is biased high.

For the delivery of at bot to be limited representation, it was also carried out implementation of the web site, as shown in (fig 5) [22]. The introduction of the evaluation to put the emphasis on local characteristic keywords not only in the cluster, statistics by the evaluation of emotion, is considered the development of such a result display on the Web site.

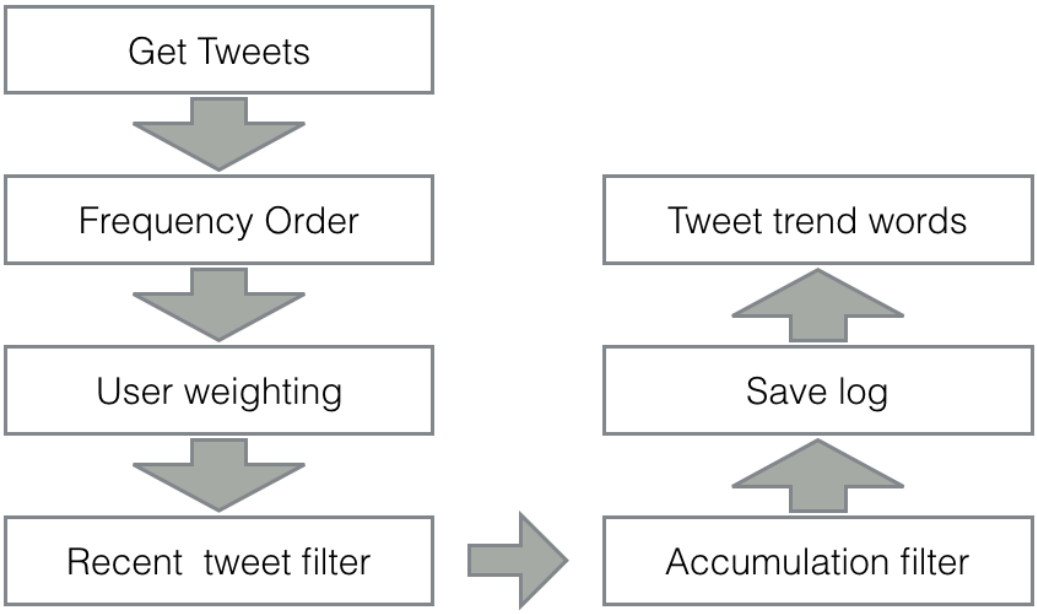

Fig. 2: Flow of analysis of trends

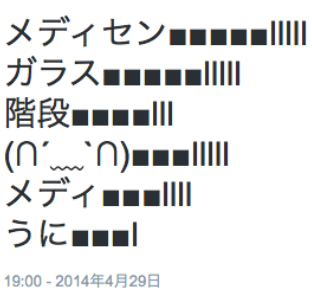

Fig. 3: Examples including sudden information that occurred on campus

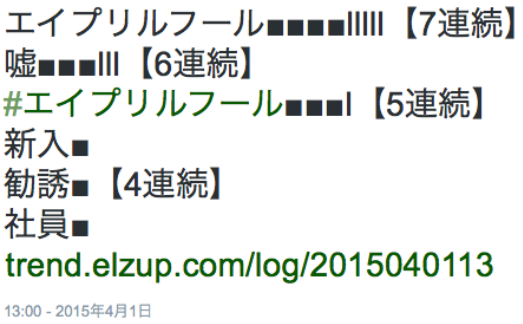

Fig. 4: Example of the overlap with the Twitter official trend

Fig. 5: Trend aggregation Web page

Chapter 5

Mobile terminal sensing server API

This chapter describes the creation of the server application for managing the log of data collected by a sensor attached to the mobile terminal

5.1 Background and related research

Against the background of the widespread use of smart phone that comes with a variety of sensors, the realization of sensing using a general user of the smartphone has been expected [24]. This time, the purpose of the sensor information management through the use and multiple users on multiple studies and projects, have created a need to achieve a user participatory sensing server application, a management application in the creation and Web screen of the Web API.

5.2 System summary

Defining the data structure to be stored on the server as shown in (fig 1). This is for the purpose of Project specific administration, Project and User was one-to-many. The mobile terminal of the client application, it is possible to create a simple sensing applications to use two to perform "issued Create User Project" and "Additional sensor information of the user". Management screen is a simple UI, was to allow the data export in the per-user or per-project basis from the management screen (fig 2) (fig 3). Implementation of the export function in CSV and KML format for analysis of the collected data. KML is effective for the analysis have been supported by the Google Earth and Google Maps (fig 4). And as an output using the Google Earth shows the displaying the altitude information (fig 5).

Fig. 1: Data structure to be handled by the server

Fig. 2: Management screen of the project list

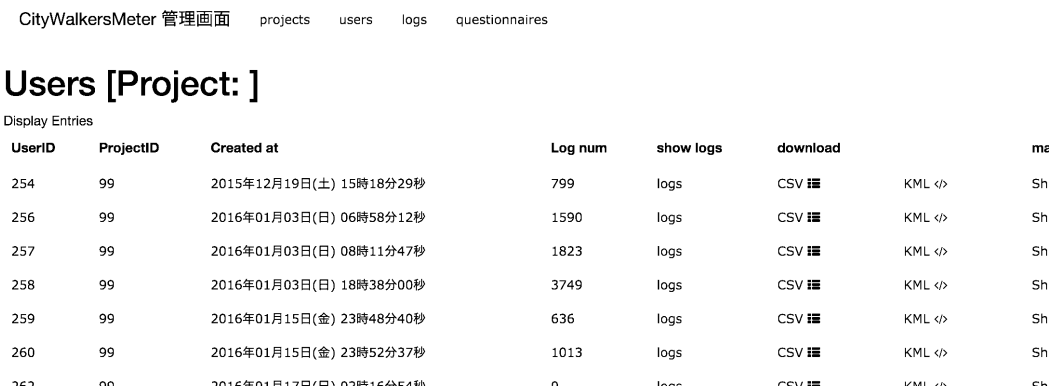

Fig. 3: User management screen that can perform such as downloading of data

Fig. 4: Visualization by Google Earth and analysis

Fig. 5: Visualization of the altitude information

Chapter 6

GPS route noise removal

This chapter describes the proposal of the noise filtering technique in the log of the GPS data

6.1 Background and related research

GGPS technology is a technology that enables highly precise positioning of real-time, are utilized in various fields. On the other hand it is widely known is also a problem for the positioning error by the GPS in[23].

6.2 Sample data

Long moving distance in the experiment, using the recording data on skiings for a special motion as the sample(fig 1). Of Skiing data for 3 days, day 2 data was seen particularly noisy. 5-second intervals using GPS data 1963 pieces of which were recorded in the log. From the sample data et GPS noise like (fig 2) was observed.

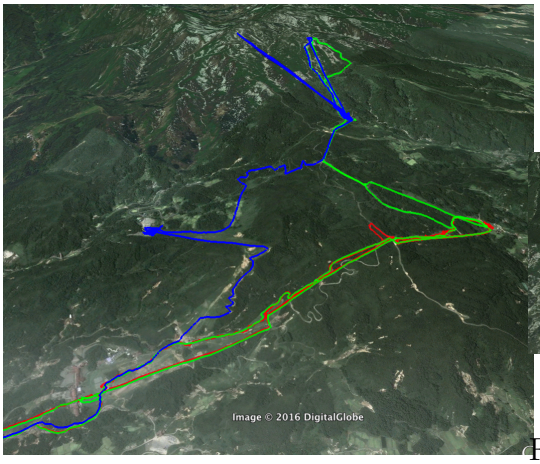

Fig. 1: Ski of acquired data Red: the first day, blue: the second day, green: the third day

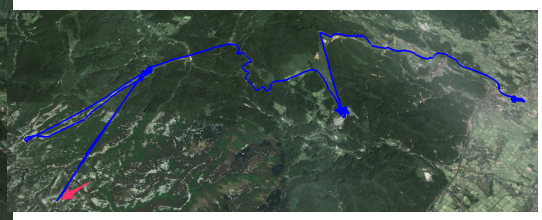

Fig. 2: GPS noise, the arrow portion of the sample data

6.3 Algorithm

Since the data are recorded at regular intervals, the speed is determined from the size of the distance between two points of consecutive data. And delete data that are considered to have moved in the apparently unnatural speed. Procedure is carried out as shown in (fig 3) shown below. In addition, using the Hyubeny formula the distance calculation. The ratio of upper and plotted on the map as a threshold in descending order of distance between two points, and evaluated

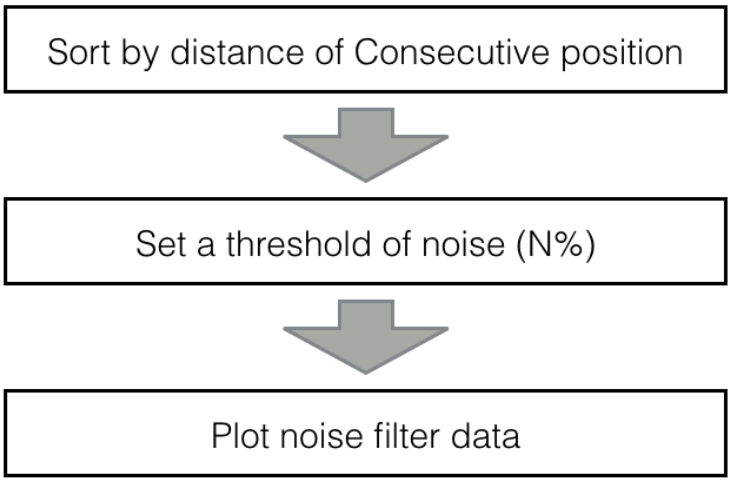

Fig. 3: Proposed filtering procedure

6.4 Result

The result of filtering as the ratio of error data 30% and 10% and 2% shown in (fig 4) and filteredfiltered2. In particular, removal of large erroneous detection data was able to do. However, the error of the GPS logs indoors as shown in (fig 6) could not be covered.

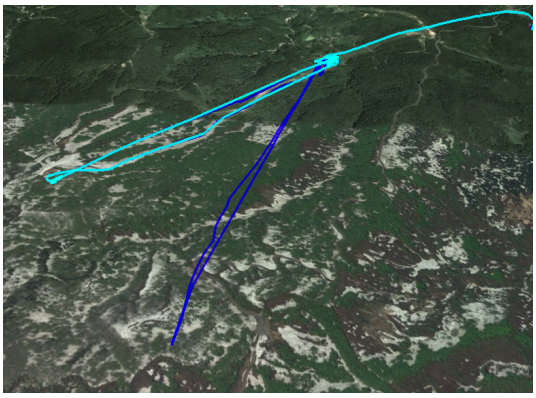

Fig. 4: Data after the filter, blue: pre-filter, light blue: After filter

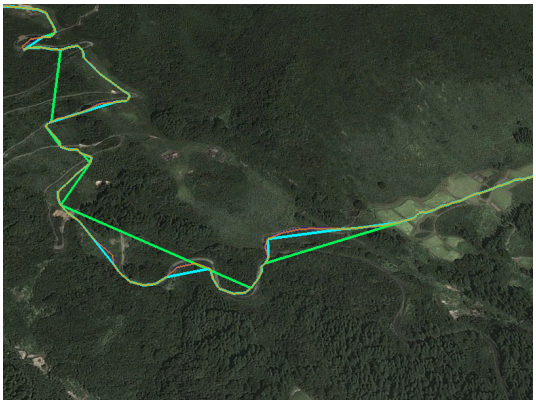

Fig. 5: Data 2 after the filter, yellow-green: 30%, light blue: 10%, red: 2%

6.5 Conclusion of this chapter

It proposed a filtering method using it for determining the threshold as a percentage of the noise data. Altitude to the GPS information, and since the accuracy of the information is added and improved techniques in light of it conceivable. In addition, the number of data of the sample by the filtering process is thus reduced is improvement, it is necessary to devise also data cleansing process.

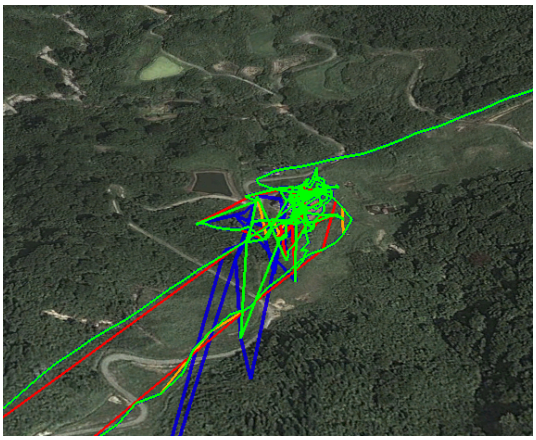

Fig. 6: Data filter results in the indoor, blue: pre-filter, red: 30%, yellow-green: 10%

Chapter 7

Conclusion

7.1 Conclusion Summary

With the spread of the spread and smartphones of micro-blog, which is represented by Twitter, it is to them continue to improve the Kaeyori convenience to people's lives as the infrastructure is essential server-side technology. In the present study, to obtain a reaction related to real-world events from the real-time of the individual user, organization of trend analysis and events, to construct a variety of services to carry out, such as shared by using the latest server technology.

7.2 In addition

We have introduced in this paper, will spread immediately smartphone participation application, trend delivery bot, such as through more open source the latest information visualization shared foundation of Web services group such as through extending the participatory sensing server API production and user evaluation.

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Hiroto Takahashi

Off-campus Conference presentation

1. 髙橋洸人, 岩井 将行, ”即興的な多人数チームプレイが可能なブラウザネットワーキングゲーム基盤”, 情報処理学会 エンタテインメントコンピューティング研究会 (SIG-EC)．2015 年 10 月．
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