

Location-based Image Viewing System Synchronized with Video Clips

Maho Nishizawa (Kwansei Gakuin University, Japan)

Yuanyuan Wang (Yamaguchi University, Japan)

Yukiko Kawai (Kyoto Sangyo University, Japan)

Kazutoshi Sumiya (Kwansei Gakuin University, Japan)

Background



- Various video clips, such as educational, drama, travel videos
 - want to know **more information about the area**
 - want to know **other areas which is related the area**

- SNS image sharing sites:  **Instagram** 

A huge number of location-based image data with hashtags

- location names are often used as hashtags

- Goal

Supporting and arousing user interests & user knowledge

Our Approach

- Supporting and arousing user knowledge & user interests
- Showing **deep** and **relevant** information for video clips by using location-based images and hashtags from Instagram



Deep information

- detail information based on location names in CC

Relevant information

- information based on location names not included in CC

INPUT (video clips)



OUTPUT (images from Instagram)



Deep and Relevant Information

Hyogo
Prefecture



Deep Information

Kobe City / The Mount of Rokko
Kobe City / Sannomiya
Kobe City / Sannomiya / Chinese town

Relevant Information

Kobe City = Port town in Japan
Kobe City / Yokohama City/
Nagasaki City

Nagasaki
City

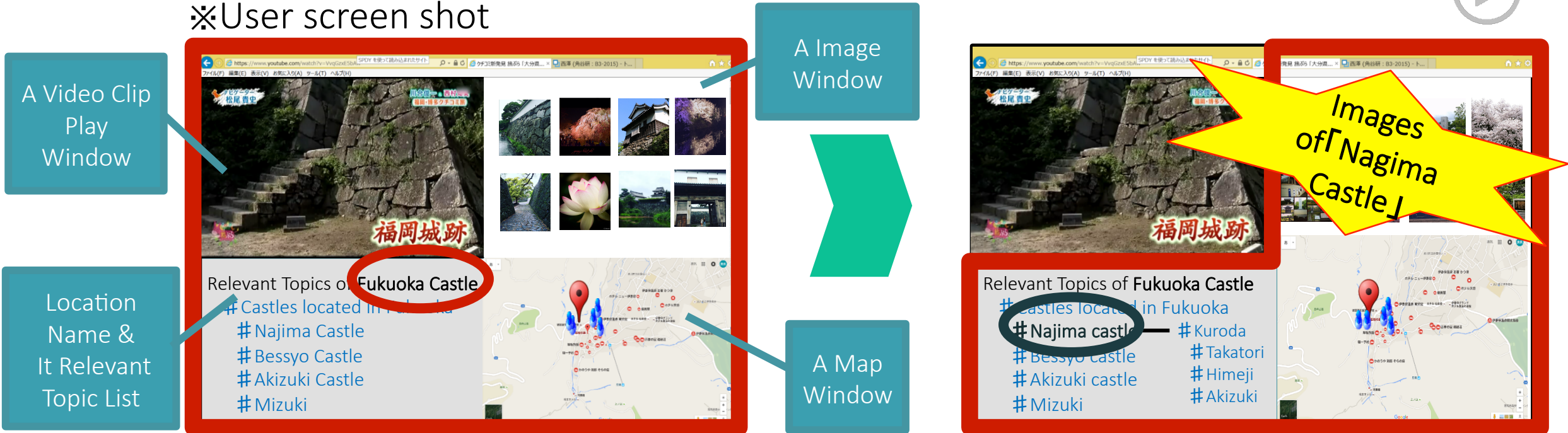
Kobe City

Yokohama
City

Image Viewing System with Video Clips

- Showing of **deep information** with images from Instagram about video clips
 - Showing of **relevant information** with relevant hashtags from Instagram about video clips
- If a user clicks a relevant hashtag, this system will show new relevant images and new relevant hashtags from Instagram

※User screen shot



System Overview

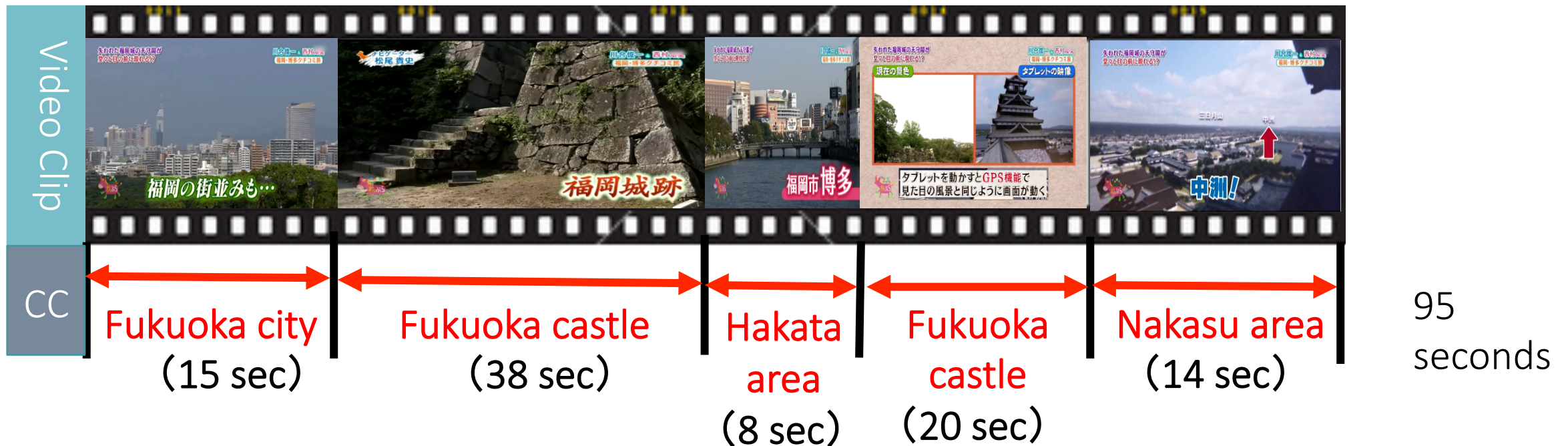
1. Detecting location information and scenes of video clips
2. Extracting images from Instagram by using location information
3. Extracting relevant hashtags from Instagram by matching relevant topics in the semantic structure from Wikipedia

System Overview

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1. Detecting Location Information and Scenes of Video Clips (1/2)

- Extracting location information (location names and spots) and their appearance time in **Closed Captions (CC)**
- Dividing scenes of each location information, if the next one appears in **CC**



1. Detecting Location Information and Scenes of Video Clips (2/2)

“New discovery! Wondering”* Caption Data

Time	Extracted location information from CC
0'05"	Fukuoka
0'20"	Fukuoka Castle
0'31"	
0'46"	
0'58"	Hakata
1'09"	Fukuoka
1'18"	Fukuoka Castle
2'14"	
2'28"	Nakasu
3'35"	Ganso Nagahamaya
3'45"	

“Good Place”** Caption Data

Time	Extracted location information from CC
0'14"	Lake Biwa
0'19"	
0'24"	Yogo Lake
1'15"	Nagahama

- If the same location information continuously appear in short time, they are determined in one scene
ex. “Fukuoka Castle”, “Lake Biwa”

- One scene is too short if the next location information appears within T seconds
this next location information will be eliminated ($T = 3\text{seconds}$)

23*1: <https://www.youtube.com/watch?v=jldUBH2SwDg&index=10&list=WL>

** : https://www.youtube.com/watch?v=7_QP2BaaBAG&index=18&list=WL

System Overview

1. Detecting location information and scenes of video clips
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2. Extracting Images from Instagram by Using Location Information

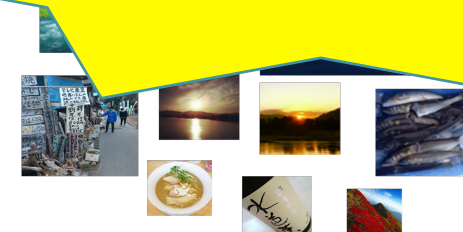
- Using extracted location information as **object hashtags**, and search for images from Instagram.



#Fukuoka Castle	Search
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Number of "Like"
Presenting top-P images



System Overview

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3. Extracting Relevant Hashtags from Instagram

- Constructing the **tree structure** of the video clip by using *Wikipedia* categories, and extracting relevant topics
- Extracting relevant hashtags from Instagram by matching the extracted relevant topics

<Problems>

1. A tree structure has a lot of nodes
2. Same location information may exist in different tree structures

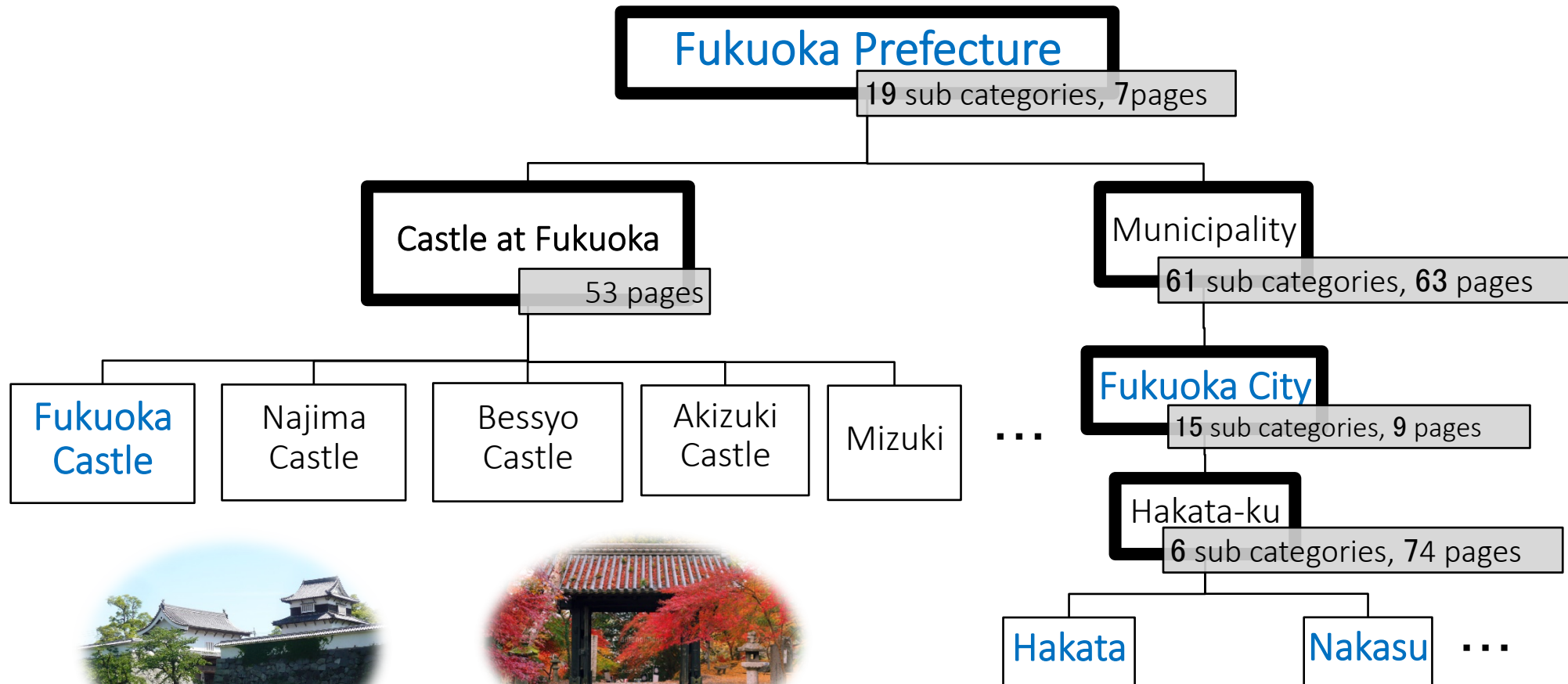
<Solutions>

1. Filtering nodes of a tree structure if the reference pages of each node more than N pages (N=5)
2. Selecting one tree structure of a location information by comparing the number of reference pages

Problem 1. A Tree Structure Has A Lot of Nodes

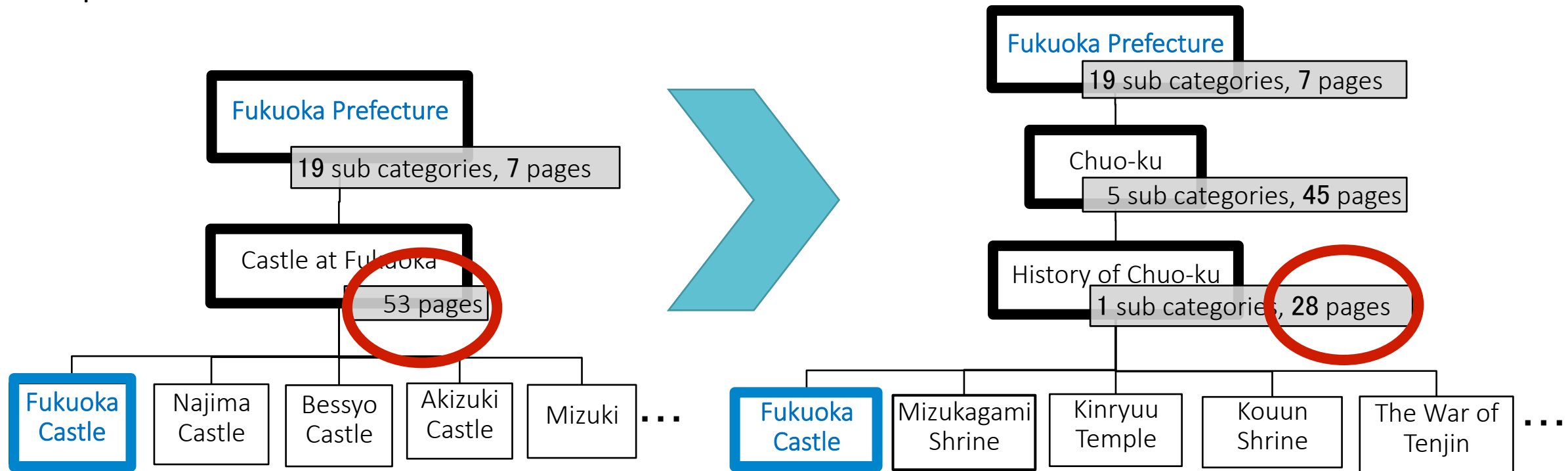
The tree structure of “New discovery! Wondering”*

※ blue text = location information



Problem 2. Same Location Information May Exist in Different Tree Structures

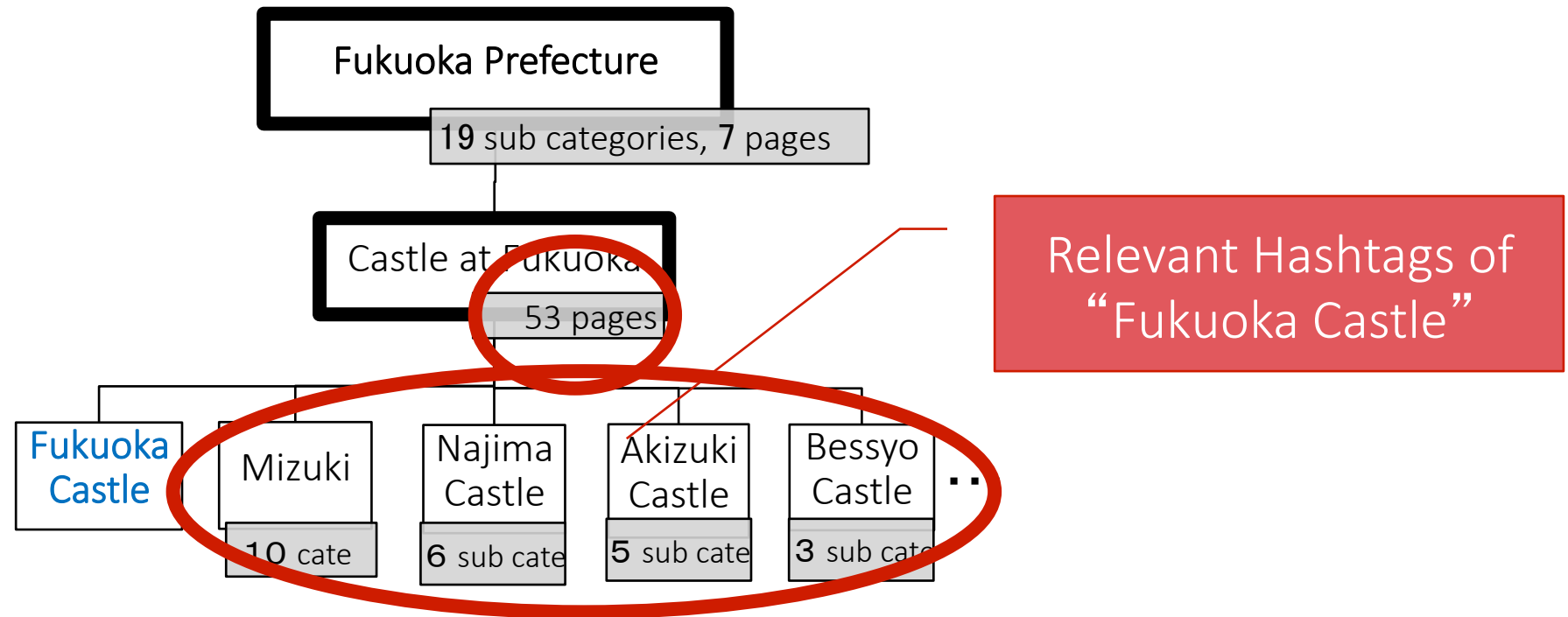
Two patterns of tree structure about “Fukuoka Castle”



The number of Reference Pages **53 pages (Castle) > 28 pages (History)**

3. Extracting Relevant Hashtags from Instagram

Recommending categories and pages which are **parallel relationships** with location information in the tree structure of the video clip



Presenting top-M pages, the Number of referred categories → Presenting as Relevant Hashtags

User Study

● Purpose

To evaluate the effectiveness of presenting **relevant hashtags and images (Deep information, Relevant information)** with video clips

● Subject

6 college students (have experience to live in Kansai, Shikoku area)

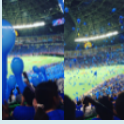









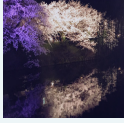







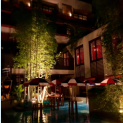










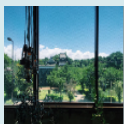




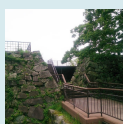


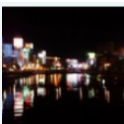




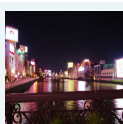
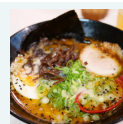
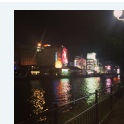







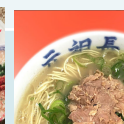
● Data (travel video ×2)

“New discovery! Wondering (Fukuoka Prefecture) ” * (2014.10.25 broadcast) **outside Domicile**

“Good place (Shiga Prefecture)”** (2015.2.20 broadcast) **Domicile**







- Estimating categories from the tree structure that have referred pages more than N (N=5)
- Presenting top-M referred pages (M=4)

“New discovery! Wondering (Fukuoka)”* (using part 0’00”~5’30”)

Time	Extracted location information from CC	Extracted relevant hashtags from Wikipedia	Extracted images from Instagram (Top-8)
0’05”	Fukuoka City	Kita-Kyushu City, Izuka City, Kurume City, Miyawaka City, Munakata City	       
0’20” 0’31” 0’46”	Fukuoka Castle	Najima Castle, Bessyo Castle, Akizuki Castle, Mizuki, Takatori Castle	       
0’58”	Hakata	Dazaifu, Munakata City, Neko Castle, Chikuzen-Kokubun temple, Genko	       
1’09”	Fukuoka City	Osaka City, Kobe City, Yokohama City, Saitama City	       
1’18” 2’14”	Fukuoka Castle	Kinryu temple, Koun Shrine, A War of Tenjin, Mizukagami Shrine, Nissan gallery	       
2’28”	Nakasu	Hakata river, Nakasu, Kinkuma, Higashi park, Mino Island	       
3’35” 3’45”	Ganso-Nagahamaya	Ichiran, Kaedama, Hakata Ippudo, Hakata Tenjin, Furyu	       

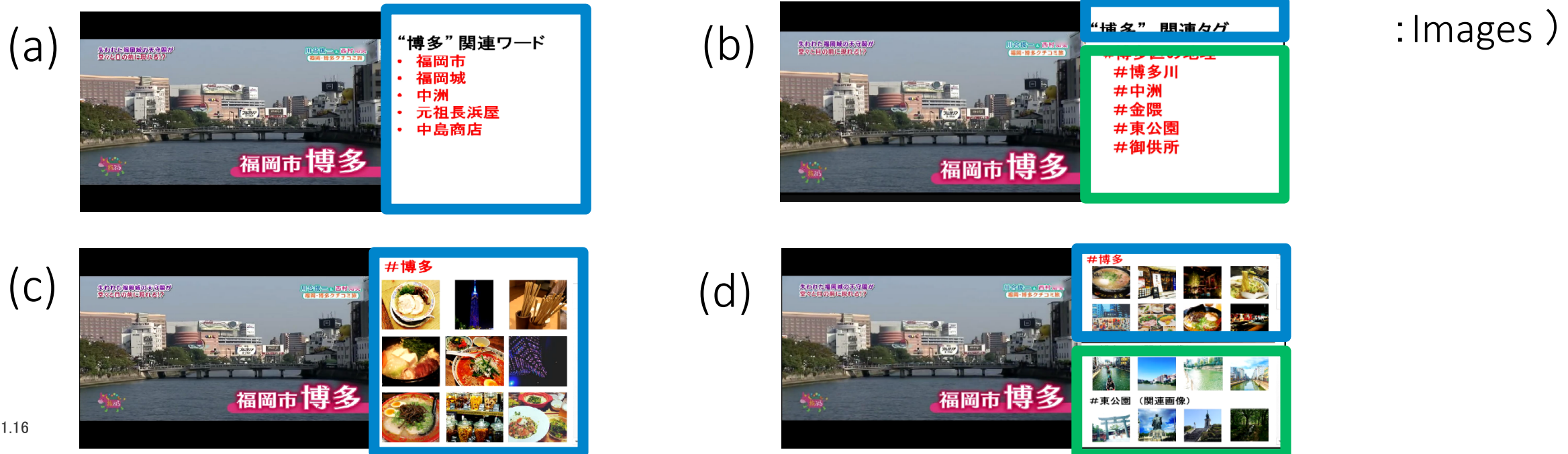
“Good place (Siga Prefecture)”**

(Using part 0'00" ~ 2'30")

Time	Extracted location information from CC	Extracted relevant hashtags from Wikipedia	Extracted images from Instagram (Top-8)
0'14" 0'19"	Lake Biwa	Yogo Lake, Konoe basin, Torimaru peninsula, Tankai Lake, Nishi pond	       
0'24"	Lake Yogo	Kinpun mountain, Sugaya hot-spring, Takeu Island, Nagahama port, Nagahama science park	       
1'15"	Nagahama City	Oichigo-chan, Kitakonoe-resort, Nagahama police office, Nagahama-Dora company, Nagahama-Kita Biwa Lake firework festival	       

Experiment

- (a) location information synchronized with scenes (Deep information: text)
- (b) Relevant hashtags synchronized with scenes (Deep + Relevant information: text)
- (c) Images of location information synchronized with scenes (Deep information: images)
- (d) Images of relevant hashtags synchronized with scenes (Deep + Relevant information: Images)



(a) location information synchronized with scenes
(Deep information: text)



Relevant words of
“Hakata”

- Fukuoka city
- Fukuoka castle
- Nakasu
- Ganso-Nagahamaya
- Nakajima shop

(b) Relevant hashtags synchronized with scenes
(Deep information + Relevant information: text)



Relevant hashyags of
“Hakata”

- # Hakata river
- # Nakasu
- # Kinkuma
- # Higashi park
- # Gokusho

(c) Images of location information synchronized with scenes
(Deep information: images)



#Hakata



(d) Images of relevant hashtags synchronized with scenes
 (Deep information + Relevant information: Images)



#Hakata



#Hakata river : relevant images



#East park : relevant images

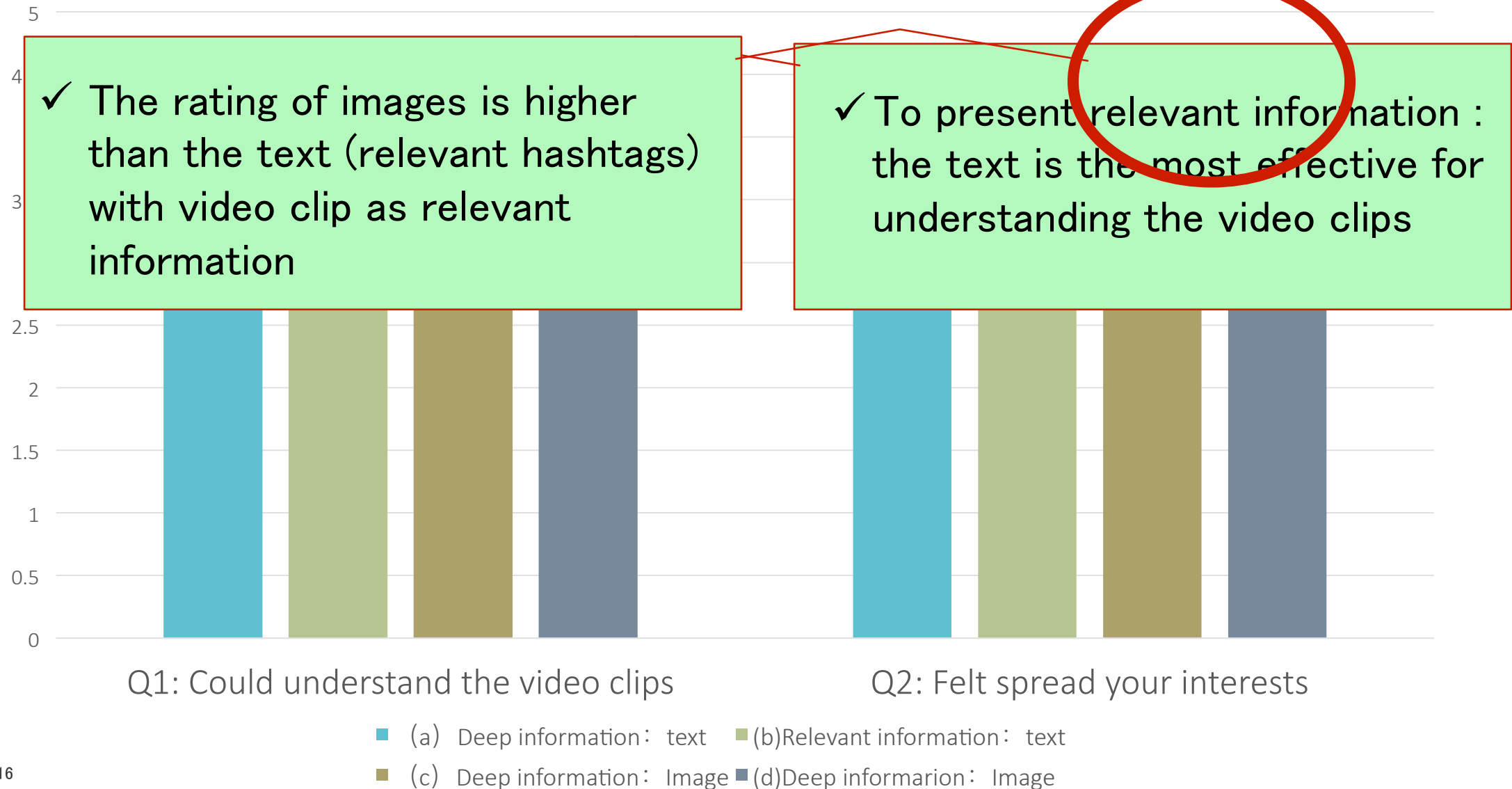


Questionnaire

- *Q1:* Could understand the video clips
- *Q2:* Felt spread your interests
- *Q3:* Write down relevant hashtags and images that are not related to the video clips
- *Q4:* Write down relevant hashtags and images that you are interested in

Experiment Result

Result



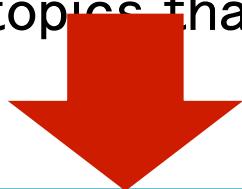
Q3

- ✓ Subjects felt several unknown topics are not related to the video clips
- ✓ General images about people, flower, or sky

Images that are not related to the




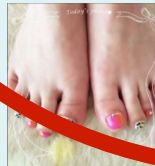
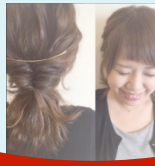

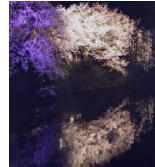

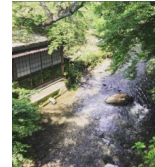


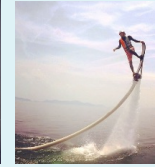
- ✓ These images and relevant topics are not related to locations in the video clips

Relevant topics that they have interest



Q4

- ✓ Need to present the relevance of locations in the video clips and their relevant hashtags

Wondering	Nissan gallery, Gasnso Nagahamaya, Nakajima Shoten
Good place	Nagahama police office, Nagaham, Oichigo-chan
Wondering	  
Good place	  
Wondering	Neko Castle, Ichiran, Ganso Nagahamaya, Mizuki
Good place	Sugaya hot spring, Oichigochan, Nagahama science park
Wondering	  
Good place	  

Conclusions and Future Work

- ◆ Proposed an image viewing system synchronized with video clips
 - Supporting **Deep information** and **Relevant information** for video clips
 - deep information: detail information based on location names in CC
 - relevant information: information based on location names except CC
 - User Study using travel videos (Wondering: 7scenes / Good place: 3scenes)
 - ✓ Good point : Presenting of images and relevant topics is good for understanding the video clips and spreading interests about the video clips.
 - ✓ Bad point : Some images and relevant topics are not related to locations in the video clips
- ◆ Future work
 - To extract relevant hashtags of semantic structures in Instagram
 - To extend the system with other media : geographic map, web page, street view, etc...

THANK YOU FOR LISTENING