

Study on improvement of excursion and attraction in Kanazawa by visualizing historical landscape resources with 360-degree videos

Keiko Dochi (Department of Architecture, National Institute of Technology, Ishikawa College, k.dochi@ishikawa-nct.ac.jp)

Makoto Koshino (Department of Electronics and Information Engineering, National Institute of Technology, Ishikawa College, koshino@ishikawa-nct.ac.jp)

Abstract

By creating content that visualizes the historical landscape resources of Kanazawa City, it has become possible to visually grasp the changes in the historical landscape. Besides, by visualizing the hidden historical resources and communicating those in an easy-to-understand manner, tourists and residents can learn more about the history of Kanazawa, and it will be an opportunity to enhance the appeal of Kanazawa and excursion to the city. We developed a sightseeing application which was approved and successfully released on March 20, 2020, for the App Store so that we could gather and verify opinions at workshops, etc., and make improvements for public access.

Keywords

visualization, historical landscape resources, 360-degree video, excursion and attraction, town management

1. Introduction

In Kanazawa City, the increase of tourists in the city center has been rising since the operation of the Hokuriku Shinkansen line in 2015. However, tourists tend to visit only famous tourist spots. Kanazawa City is the first designated historical city promoting the development and restoration of historical resources. However, they are hardly known to tourists and even citizens. In addition, as Kanazawa City did not suffer the fires of war or major disasters, land division of the feudal era still remains here. However, the castle cannot be seen from the city because of modern city planning.

This paper focuses on a project for two years to increase the attractiveness of the city center through cooperation among industry, government, academia, and the local community. The project aims to improve excursion and attraction in Kanazawa City by creating new sightseeing routes and visualized historical landscape resources with 360-degree videos. The contents reproduce the old cityscape while overlaying old maps. The goal is to make a more complete application to be open to the public on App Store.

2. The present conditions and issues of Kanazawa tourism

Kanazawa tourism has four main issues as follows: “crowded with tourists”, “increase of walking on foot”, “congestion of famous tourist spots”, and “information on the historic landscape resources”.

2.1 Increase of tourists (crowded with tourists)

Kanazawa City has carefully preserved its history, tradition, and culture, and has enhanced its uniqueness. Town management has been evaluated highly from home and abroad.

Since the Hokuriku Shinkansen line opening of 2015, the number of tourists staying in Kanazawa has been increasing (see Table 1). The number of foreign tourists staying in Kanazawa

Table 1: Changes in the number of people staying in Kanazawa

Year	# of people to stay
2014	2,749,577
2015	2,905,204
2016	3,084,854
2017	3,193,504
2018	3,305,090

Source: Kanazawa sightseeing survey report 2018, pp. 95.

Table 2: Changes in the number of foreign people staying in Kanazawa

Year	# of foreign people to stay
2014	200,580
2015	256,092
2016	396,173
2017	448,267
2018	522,343

Source: Kanazawa sightseeing survey report 2018, pp. 100.

awa City is also increasing (see Table 2).

2.2 Increase of walking on foot

As the number of tourists to Kanazawa City increased, services such as bicycle rental, “Machinori”, and kimono rental were enhanced. As a result, walking on foot to enjoy exploring the city also increased. Tourists visit not only major tourist spots that have been introduced in the existing tourist routes but also many tourists can be seen in the alleys recently.

2.3 Congestion of famous tourist spots

The tourists tend to visit only famous tourist spots. These spots in the city are very crowded and limited to famous sightseeing spots such as Kanazawa Castle, Kenrokuen Garden, Higashi Chaya District, and Omicho Market (see Table 3). There-

Table 3: The number of tourists at each tourist spot

Sightseeing Spots	%
Kanazawa Castle, Kenrokuen	88.7
Chaya District	73.9
Omicho Market	68.9
21st-Century Museum	48.7
Nagamachi Samurai House Ruins	26.1
Temple Area	5.4
Others	4.9

Source: Kanazawa sightseeing survey report 2018, pp. 22.

fore, it is necessary to introduce unknown spots and create new sightseeing routes to eliminate congestion in the city.

2.4 Information on the historic landscape resources

Kanazawa City is the first designated historical city in the Historical Town Development Act enacted and enforced in 2008. Since Kanazawa City issued the “Kanazawa City Historical Scenic Maintenance Improvement Project”, they have been making efforts for the maintenance and improvement of historical scenic beauty. Specific improvements include the restoration of historic sites such as castle facilities and historical canals. They are hidden and hardly known to tourists and even citizens. However, restoration and maintenance of the “Sougamae” (soil fence around the castle) (see Figure 1), built as a defensive facility in the castle town, is the most curious and complicated one. Also, only a small part has been restored (see Figure 2). Despite the rare example of “Sougamae” remains restoration in Japan, it is difficult to imagine the whole picture of “Sougamae”.

Also, as Kanazawa City did not suffer the fires of war or major disasters, land division of the feudal era and the taste of a castle town remains here. In the feudal era, many of the streets in the samurai area were designed to overlook Kanazawa Cas-

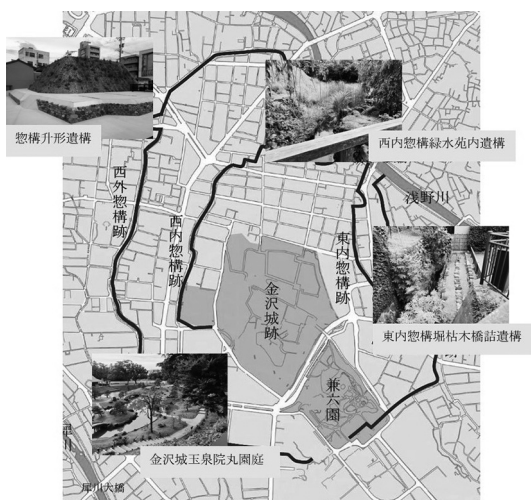


Figure 1: Restoration and maintenance spots of the “Sougamae” remains



Figure 2: Restoration and maintenance of a small part of the “Sougamae” remains

tle. It seems that the dignity of the castle owner was shown to vassals and the citizens. However, the main castle tower was burned down a few years after its construction and was not rebuilt. Currently, the castle cannot be seen from the city because of modern city planning (see Figure 3).

To solve these issues, a new tourism application was developed by visualized historical landscape resources with 360-degree videos and old maps and verified in this study to improve excursion and attraction in Kanazawa City.

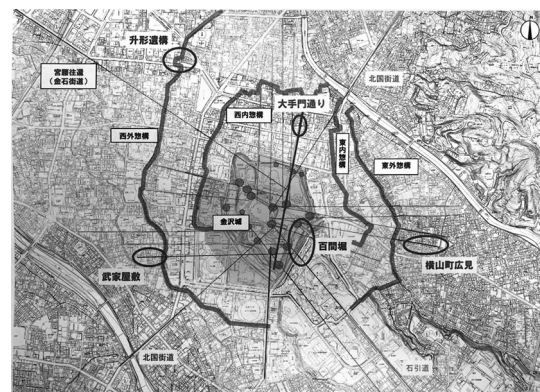


Figure 3: The streets in the samurai area are designed to overlook the castle

Source: Tsuba, T., Kanazawa College of Art.

3. Creating contents

Creating content involves 360-degree videos by a drone and creating new sightseeing routes around hidden historical landscape resources to improve excursion and attraction in Kanazawa City. This method has not been seen yet in existing contents such as “Kanazawa Castle AR App” and “Kokon Kanazawa”. Moreover, since it reproduces the scenery of Kanazawa Castle as seen from the city center, it makes a realistic experience.

In addition, we held a workshop twice to verify the contents and to collect opinions in a questionnaire survey. From those results, we made many improvements. The final goal is to make a more complete application to be open to the public on App Store.

3.1 Selecting the points and content overview

The following four points, near the famous tourist spots where many tourists visit, were selected for visualized historical landscape resources.

3.1.1 Sougamae (soil fence around the castle) Remains

First, “Sougamae Remains”, which inspired this study was selected. Despite being on the main street that leads to Omicho Market from Kanazawa Station, its meaning is not well known (see Figure 6). “Sougamae Remains” are visualized with 360-degree videos. And then, the content reproduces the old cityscape while overlaying old maps.

From the sky, it explains the position of Kanazawa Castle and makes an image of the whole picture of “Sougamae”. And also, users can imagine a sense of the size of the “soil fence” and “moat” at eye level.

3.1.2 Hokkoku Kaido (street) and Asanogawa Ohashi (bridge)

Next are streets that exist near the “Sougamae” or Kanazawa Castle and were designed to overlook Kanazawa Castle in the past. One of them is the “Hokkoku Kaido” and also a bridge named “Asanogawa Ohashi”. It is a point of entrance and place where vassals seemed to enter the castle while looking up at Kanazawa Castle during the feudal era. There is a famous tourist spot called Higashi Chaya area nearby and there are many tourists on the streets. By showing Kanazawa Castle from the sky above the entrance, you can imagine the scenery of the feudal era.

3.1.3 Nagamachi Samurai House Ruins (area and street)

The third are also streets that exist near the “Sougamae” or Kanazawa Castle and were designed to overlook Kanazawa Castle in the past. However, few people know about it. The area retains the taste of a castle town and a clay wall of the old samurai residence remains. As mentioned in 3.1.2 above, by showing Kanazawa Castle from the sky above the street, we can imagine the scenery of the feudal era.

3.1.4 Hyaken-Bori and Ishikawa Bashi (moat and bridge)

The fourth is the largest moat between Kenrokuen Garden

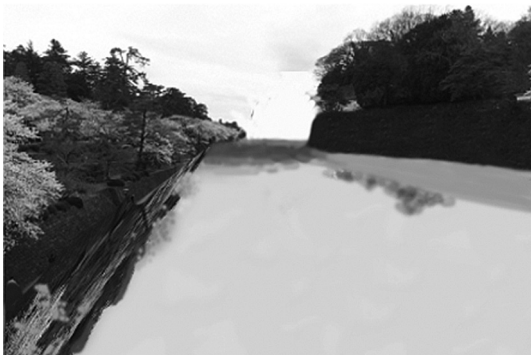


Figure 4: Description of Hyaken-Bori and Ishikawa Bashi (moat and bridge)

and Kanazawa Castle. At present, it is the main road and there are no features of an old appearance. We introduce the moat filled with water in the picture and make an image with a sense of its size (see Figure 4).

3.2 Creating new sightseeing routes

Creating a new route was based on the “Kanazawa famous place tour 1-day course” in “Kanazawa Travel Story” and includes stops at the above four points selected for content creation. This 1-day course is attractive to tourists because it takes them to some of the most famous sights in Kanazawa. However, this 1-day course is based on walking along the main street. Our creation of a new route is based on walking along the “Sougamae” to enjoy the historic streets of Kanazawa with this application to further improve an excursion (see Figure 5).

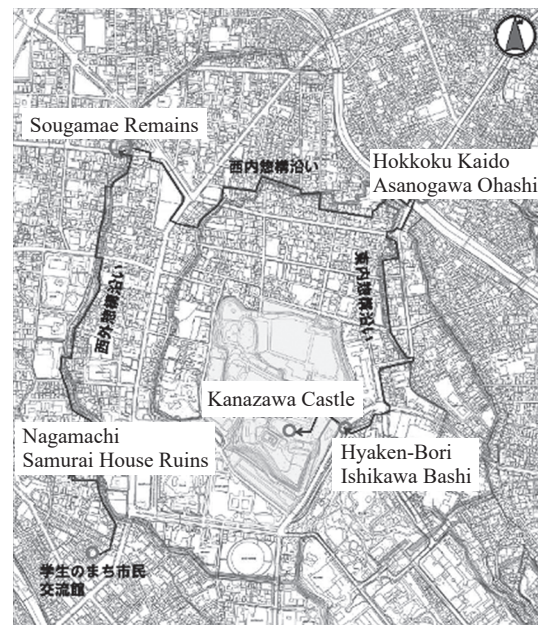


Figure 5: The new route with four points along the “Sougamae”
Source: Masuta, T., Kanazawa Institute of Technology.

3.3 Shooting 360-degree videos with a drone

We shot the 360-degree videos from above using a drone to produce the four-spot area mentioned above. This study uses DJI Phantom 3 (called a drone) and RICOH THETA V to capture 4K 360-degree videos.

On August 9, 2018, we had a meeting with the company that commissioned the shooting with the drone and decided the shooting date and time. The shooting was carried out on September 13 and 14 for two days. After that, we created the content for four points using the video. Those contents were verified at a workshop on December 9, 2018. As a result of the workshop, the following three points: “Sougamae Remains”, “Nagamachi Samurai House Ruins”, and “Hokkoku Kaido and Asanogawa Ohashi” were reshot with a drone because of the poor image quality and image shaking on September 9, 2019 (see Figure 6).



Figure 6: Drone photography at “Nagamachi Samurai House Ruins”



Figure 9: Title screen before improvement (2018)

3.4 Creating 360-degree video content

In 2018, we mainly examined the structure of how to show 360-degree videos at each spot. On the title screen, the walking route was projected, and the 360-degree video point was shown there (Figure 7). When a filled circle is selected, the name of the point is displayed. When a jump button is selected, a 360-degree video of that point is displayed and starts to move. One of the explanation screens is shown in Figure 8. The title screen is shown in Figure 9.

In response to the verification results of the workshop in

2018, many contents that had been created were re-created in 2019 to attempt to improve the realistic experience. The blur of the 360-degree videos was removed by stabilizing with video editing software.

On the point selection screen before the improvement (Figure 7), it is difficult to see which point is corresponding to the filled circle. The names of each point and the main points under Kanazawa Castle are shown (see Figure 10). The explanation screen was added with more details as shown in Figure 11. The information of the title screen was increased as shown in Figure 12. The operation explanation was also added to. (see Figure 13)

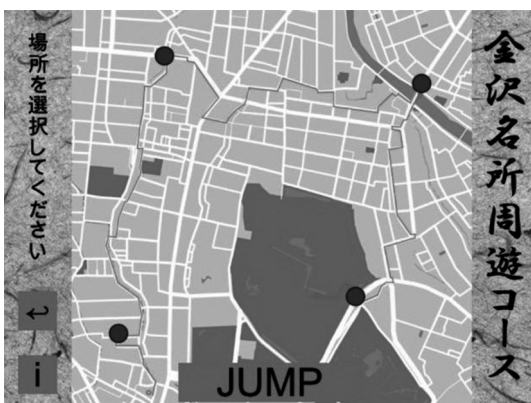


Figure 7: New sightseeing route including the four points before improvement (2018)



Figure 10: New sightseeing route including the four points after improvement (2019)

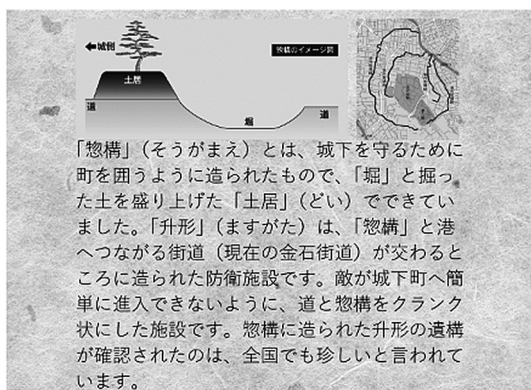


Figure 8: Explanation screen before improvement (2018)



Figure 11: Explanation screen after improvement (2019)



Figure 12: Title screen after improvement (2019)



Figure 13: Additional operating instructions (2019)

3.5 Target hardware

In developing the tourist information application, an iPad was used to provide a 360-degree video. A smartphone was not used because the screen size is too small. We used an iPad (3rd generation) in 2018. We used an iPad (6th generation) in 2019. In 2019, the performance of the device improved, and the 360-degree video is easier to follow. Furthermore, it contributed to improving the quality of the user's experience as a whole because it was able to cope with high-load operations. We used the game engine Unity to develop the application.

4. Discussion

4.1 Workshops for verification

The first workshop was held on December 9, 2018, to verify the contents. 17 participants used the application, and opinions and questions were asked in a questionnaire format regarding the feeling of use and how to show the content at each point. Due to bad weather, on-site surveys were conducted at two locations: "Nagamachi Samurai House Ruins" and "Sougamae Remains".

Following the verification results of the first workshop, three points: "Sougamae Remains", "Nagamachi Samurai House Ruins", and "Hokkoku Kaido and Asanogawa Ohashi" were reshot with a drone and the contents were improved. Then, the second workshop was held on December 14, 2019, and a questionnaire was given to a total of 20 participants, including six who participated the previous year (see Figure 14).

4.2 Discussion contents from the questionnaire results

According to the results of the first workshop, it is necessary to indicate a description of the streets designed to overlook



Figure 14: Workshops in 2018 (left) and 2019 (right)

Kanazawa Castle on the explanation screen at two points: "Hokkoku Kaido and Asanogawa Ohashi" and "Nagamachi Samurai House Ruins". And also, it is clear that many improvements are needed for the other two spots. For the "Sougamae Remains", it is necessary to improve the resolution of the drone video. In addition, it is necessary to improve the drawing of "Hyaken-Bori and Ishikawa-Bashi". For example, the drawing of the water surface should be more realistic, and it is necessary to add surrounding buildings, etc. Moreover, it became clear that a description had to be added. From a result of the workshop, the following three points: "Sougamae Remains", "Nagamachi Samurai House Ruins", and "Hokkoku Kaido and Asanogawa Ohashi" were reshot with a drone with better performance on September 9, 2019. The contents were further improved using those images. Regarding "Hyaken-Bori and Ishikawa-Bashi", the content was recreated from additional materials.

The results of the questionnaire from the two workshops are shown below and will be discussed. "Nagamachi Samurai House Ruins" and "Hokkoku-Kaido and Asanogawa-Ohashi" cannot be compared simply because the content was significantly changed between the first and second workshops. Tables 4 and 5 show the results of the second workshop.

Table 4: Questionnaire result about the content of "Nagamachi Samurai House Ruins" (second workshop)

Description	%
The ability to overlap current Kanazawa with old Kanazawa	75
A place where you can see the direction of Kanazawa Castle from the sky	70
Knowing the directions of major places in Kanazawa city	35
Other	10

Table 5: Questionnaire result about the content of "Hokkoku Kaido and Asanogawa Ohashi" (second workshop)

Description	%
The ability to overlap current Kanazawa with old Kanazawa	90
A place where you can see the direction of Kanazawa Castle from the sky	60
Knowing the directions of major places in Kanazawa city	50
Seeing the image of Sougame Masugata at the time of construction	70
Other	5

From the results of each questionnaire, there are items that more than half of the people could not understand. Therefore, further improvement is considered necessary. However, participants in last year's workshop commented that the following improved: "It became possible to compare it with the surrounding buildings by re-taking the 360-degree video", and "map operation was easier to understand".

As for the "Sougamae Remains", the first and second surveys were compared, as shown in Table 6 and 7. 32 % indicated "The current Kanazawa and the old Kanazawa can be overlapped", 13 % for "Kanazawa Castle can be seen from the sky", and 29 % "The place where the image of "Sougamae" at that time can be seen". Therefore, it was found that more and more people felt "good". From the results of the questionnaire, the improvement of the content made it easier to understand "Sougamae Remains".

The questionnaire was open-ended and asked for opinions about "Hyaken-Bori and Ishikawa-Bashi". There were many opinions of need for improvement as follows: "I didn't know when the water was flowing, the image of the river is difficult to understand", "If there is the sky on the river, it is easier to image", "I want you to draw the castle tower reflected on the water surface", etc. From these points of view, it was confirmed that there were many points to improve.

Table 6: Questionnaire result about the content of "Sougamae Remains" (second workshop)

Description	%
The ability to overlap current Kanazawa with old Kanazawa	90
A place where you can see the direction of Kanazawa Castle from the sky	55
Knowing the directions of major places in Kanazawa city	45
Other	5

Table 7: Comparison of 2018 and 2019 questionnaire results about the content of "Sougamae Remains"

Description	2018 (%)	2019 (%)
The ability to overlap current Kanazawa with old Kanazawa	58	90
A place where you can see the direction of Kanazawa Castle from the sky	47	60
Seeing the image of Sougame Masugata at the time of construction	41	70

5. Conclusion

From the results of the two workshops, we obtained a variety of useful opinions to improve each content. Based on the results, we further improved the application and submitted the completed application to the App Store. The application was approved and successfully released on March 20, 2020 (<https://apps.apple.com/us/app/金澤まち歩き/id1503179543>).

Future developments and proposals for this application are possible as below: to tell about the hidden history of Kanazawa to residents, to make it an educational application that can be

used in school classes, to overlay and display information about restaurants, and to display evacuation space in an emergency such as a disaster prevention map, etc. We believe that this application can further improve the excursion and attraction in Kanazawa City.

Acknowledgments

We are grateful to participants who allowed to be interviewed and partners for this study. And also, we would like to acknowledge Kanazawa City for sponsoring the project in 2018 and the University Consortium of Ishikawa for sponsoring the project in 2019.

References

- Dochi, K. and Uesaka, T. (2019). Study on improvement of excursion and attraction in Kanazawa by visualizing historical landscape resources with 360-degree videos, Japan Urban design Institute, Kanto block Research presentation program, and lectures Collection, Vol. 5, 21-25. (in Japanese)
- History of Asanogawa Ohashi. Kanazawa River National Highway Office. http://www.hrr.mlit.go.jp/kanazawa/mb2_jigyo/bunkazai/asanogawa/history.html. (in Japanese)
- Kanazawa Castle AR App. Board of Education, Kanazawa Castle Research Institute. <http://www.pref.ishikawa.lg.jp/kyoiku/bunkazai/kanazawazyo/arkanazawazyo/arkanazawazyo.html>. (in Japanese)
- Kanazawa Castle Sougamae Remains. Kanazawa City Cultural Property Protection Division. <https://www4.city.kanazawa.lg.jp/11104/bunkazaimain/torikumi/sougamaechousa.html>. (in Japanese)
- Kanazawa Historical City Promotion Division. Nagamachi Samurai Residence Onosho Canal. <https://www4.city.kanazawa.lg.jp/11107/keikan/yousui/guid203.html>. (in Japanese)
- Kanazawa Sightseeing Survey Report 2018. <https://www4.city.kanazawa.lg.jp/data/open/cnt/3/14897/1/kankou-chousa2018-syuusei.pdf>. (in Japanese)
- Kanazawa Travel Story: Kanazawa famous place tour 1-day course. <https://www.kanazawa-kankouyukai.or.jp/>. (in Japanese)
- Kokon Kanazawa. Able Computer. <http://ablecomputer.co.jp/Product/KanazawaOldMap/>. (in Japanese)
- Murata, A. (2020). Improvement of excursion and attraction in Kanazawa by visualizing historical landscape resources with 360-degree videos. *National Institute of Technology, Ishikawa College Summary of Graduation Thesis*. (in Japanese)
- Sakai, R., Dochi, K., and Koshino, M. (2019). Study on improvement of excursion and attraction by visualizing historical landscape resources in Kanazawa. *Architectural Institute of Japan Hokuriku Branch Research Report*, Vol. 62, 439-442. (in Japanese)
- Sakai, R. (2019). Study on improvement of excursion and attraction by visualizing historical landscape resources in Kanazawa. *National Institute of Technology, Ishikawa College Summary of Graduation Thesis*. (in Japanese)

(Received March 23, 2020; accepted April 13, 2020)