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学 位 論 文 内 容 の 要 旨

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Public Open Space Design based on People' s Perception using Social Media in Winter Cities
(ソーシャルメディアによる空間認識に基づく北方都市のオープンスペースデザイン)

Winter cities can take an active role in becoming more livable and appealing, primarily through greater use of the public open spaces, attempting to counter 'indoor-living' in winter. The enhanced activity on public open spaces can assist in rehabilitation of the negative perception of winter. As a tool to enhance outdoor activity, temporary design as festivals presents a great opportunity by improving perception of winter. However, temporary design is considered as additional to permanent or traditional design and not implemented in the urban design process. To empathize the role of the temporary design in designing public open spaces in winter cities, we analyze the impact of the temporary design on people' s behavior and perception in relationship to permanent design. While spatial behavior analysis became widely used in urban design, evaluating perception of urban environment remains a challenging task, that reflect in collecting a lot of data from scratch. However, due to the rapid growing number of social media users and produced by them data on a daily basis, it becomes possible to fill that gap. Most of urban studies using social media focus on spatial use of cities, however few examines people' s perception. Thus, the primary aim is to develop new urban design approach for comprehensive analysis of people's perception based on the social media, which is in line with the research purpose of exploring temporary design and its role in public open space design in winter cities.

The thesis consists of 7 chapters as following:

Chapter 1 defined winter cities as regions where the average temperature is below freezing with precipitation in the form of snow during a few months. Not only those factors are the main causes of reduction in outdoor activity in winter cities, but also negative perception of winter. The important role of the public open spaces as triggers for outdoor activity is emphasized in the chapter. Three major research topics in urban studies, focusing on the understanding of a greater use of public open spaces are defined in this chapter as follows: the impact of the environment on urban design (micro-climate), the relationship between urban design and people' s behavior, and the relationship between urban design and people' s perception. Considering academic studies in winter cities, after the first mentions of winter city concept by Pressman in 1987 the idea received little attention until around 2005, when it re-emerged as an object of academic attention, focusing on the development of the public open space design based on the impacts of environmental conditions. A few studies in winter explored the people's behavior and comfort and less considered perception. Moreover, despite that the temporary design as winter festivals was always proposed in winter cities to enhance necessary outdoor activity, there are still few studies that consider this design approach.

Chapter 2 defined that preserved in Russia Soviet-era public open spaces present great value for temporary design interventions, due to the intended temporary use of those public open spaces, with distinctive design approach from Western countries. The vision of the public open space in Western countries intends to serve individuals' comfort and social inclusion, while Soviet-era design aim to serve masses with different scenarios events. Great scale, central position in the city, attached wide venues for transportation, where central area is flat and empty of any kind of objects are the main physical features of soviet public open spaces. These features have a value for implementation of the variety of different temporary design strategies. Lenin Square in winter city Khabarovsk is well-preserved soviet public open space, while design of Kita 3-jo plaza in city Sapporo with similar climate introduces Western design approach in the chapter. In social media analysis the 'Illumination Festival' on Sapporo Station South Square and 'Ice Town' on Lenin Square were described in the chapter as the cases that can assist in understanding the impact of the different temporary design interventions on the people' s perception and empathize the role of illumination in winter cities.

Chapter 3 described methods of examining relationship between environmental conditions, urban design, and people' s behavior, based on the field survey. Exploring relationship between urban design and people' s perception is proposed in the chapter, using social media. Field survey in extreme cold climate at day and night on Lenin Square is described, including two situations 'event' and 'no

event' that can assist in understanding of the relationship between temporary design and permanent design. The 'event' situation was defined in a chapter as period of festival 'Ice Town' on Lenin Square, that include such items as ice and snow sculptures, event illumination, and Main Tree. The 'no event' refers to those objects designed for everyday use, including flowerbeds, street furniture and light. Those situations were also proposed in social media analysis on the examples of the 'Ice Town' in Khabarovsk and 'Illumination Festival' in Sapporo. Photos shared in social media using geolocation can define the people's impression of the place, while captions attached to those photos – positivity or negativity of the impressions. The two kind of photo content analysis using Deep Learning were proposed in the chapter to faster overall process capable of scaling to the global scope of data. Deep Learning also was suggested in sentiment analysis of captions.

Chapter 4 explains the relationship between environmental conditions and people's behavior on Kita 3-jo plaza in Sapporo. It reveals the clear reduction in number of pedestrians' activities with lowering the air temperature in cooling period. The sitting time decreased with increasing of the wind speed. No sitting behavior was observed on public open space below 5 Celsius degrees. However, sunlight on public open space enhanced sitting behavior. Therefore, it is important to control the microclimates of the outdoor public open spaces and to create desirable outdoor environments to promote outdoor activity in cooling, especially, cold periods.

Chapter 5 revealed the relationship of the urban design and people's behavior based on the field survey on Lenin Square in winter. Temporary design interventions on public open space significantly enhances people's behavior even at extreme temperatures at night. Despite that some people used shortcut on the square, the rest 70% walked around the square, slid the slopes, took pictures and played with snow and ice. During permanent design only 10% of pedestrians engaged in activities, while the rest simply passed through. The comparison of field surveys on Kita 3-jo plaza in cooling period and Lenin Square in winter month revealed similarities in spatial use of permanent design that reflect in a few outdoor activities on public open spaces. In cold climate people tend to use a public open space as a transit, a few people stop for a talk or playing with snow. The results defined that temporary design and permanent design should be considered as complementary to each other and each serves specific role for winter cities. Permanent design is described as an enduring and basic design for regular needs, with high accessibility, convenient routes through public open spaces with flat and vacant area in the center. It does not impose regular behavior but provides a basic framework and tools for it in the form of street furniture and shortcuts. Temporary design complements permanent design with enhancing supplementary activities as taking pictures, sliding, playing, and complexity of walking routes maintained by variety of urban items.

Chapter 6 revealed the relationship of the urban design and people's perception on the example of 'Ice Town' on Lenin Square and 'Illumination Festival' on Sapporo Station South Square. The results empathized that temporary design significantly improved people's perception of public open spaces in winter. Without temporary design pedestrians had a little impression of public open spaces and their attention draws to a few urban items. Noted, that during festivals the temporary items as well as permanent items draw people's attention at day and night, however, the well-lit urban items at night had a greatest impact on the people's impression, comparing two case studies. The people's impressions of urban items were analyzed mostly as a positive experience of two case studies. A few negative experiences were related to cold weather conditions. Temporary design items that enhanced people's perception the most are listed in the chapter.

Chapter 7 proposed comprehensive urban design approach for public open spaces in winter cities from 5 aspects as following: (a) The consideration of the environmental characteristic in urban design in winter cities is the first step in preventing the negative impacts of winter. (b) The features of permanent design as scale, accessibility, location, landscape, street furniture must be considered when planning the temporary design. (c) Temporary design is an effective tool to enhance supplementary physical and social activities in winter cities even in severe cold climates. (d) Temporary design is trigger that initiate interaction with the urban environment and improves the perception of the public open space. (e) The understanding of people's perception of different temporary and permanent items using social media is effective tool to develop temporary design guidelines for public open spaces.

The new urban design approach was developed to enhance activity on public open spaces in winter cities by temporary design interventions.