# Design Research on Urban Public Space Share Interactive Mode Under the Background of Internet Plus

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**Abstract.** In terms of travel, social networking, consumer and other aspects, internet changes human behavior and urban public space. Location Big Data, Socially Aware Computing and PSPL Survey provide a basis for research and guidelines for the city's public spaces design of Internet plus. From the perspective of the Internet plus, combined with the location of Location Big Data, Socially Aware Computing and PSPL Survey, this article explains the interactive behavior between people, the innovative behavior between people and the environment, the interactions behavior between people and the objects, discusses the integration of "Urban Public Space Design" and "interaction design" in the future, explore the vitality, networking, dynamic, sharing, of urban public spaces. This article aims to construct a design patterns in sharing interactive of urban public space from Internet plus interactive for urban residents, to provide a spatial form of more experienced, participatory and dynamic, so as to enrich the innovative ideas of human urban design under the back ground of internet new context.

**Keywords:** Urban public spaces · Internet plus · Interactivity · Interactive mode · Design research · Location big data · Socially aware computing · PSPL survey

## 1 Introduction

Internet is a vast network waved by various networks through a set of common protocol, single and international logically [1]. "Internet plus" represents a new economic form [2], which means relying on the Internet information technology to realize the combination of the Internet and traditional industries, so as to to optimize the production factors, update the business system, and reconstruct business model to complete the economic transformation and upgrade. "Internet plus" program aims to give full play to the advantages of the Internet, make an in-depth integration of the Internet and traditional industries, to promotion economic productivity by industrial upgrading, and finally realize the increase of social wealth [3]. "Internet plus" is a new format of development of China in the situation of Innovation 2.0, new format of economic and social development in term of evolution and drive of Internet form pushed by Knowledge-based society and Innovation 2.0. Internet plus is a further practical achievement of Internet


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thinking, representing an advanced production power, promoting continuous evolution in economic form and further leading to vitality of social economic entity, providing a broad network platform for reform, innovation and development [4].

Urban public space refers to open space volume existing between building entities in a city or groups of cities, open places for urban residents to carry out public communication activities, serving most people; meanwhile, it is also important places for human and nature in material communication, energy exchanges and exchange of information, playing a significant role of reflecting the city's image. It is also called living room' and 'show window' of a city [5].

Urban public space is an important part of urban space with physical attribute of the built environment and social attribute on the background of politics, economy and culture while the later is the determinant of the former and the former carrier and presentation of the later. Only physical attribute is focused initially rather than social attribute in the definition of public space which is regarded same with that of open space and external space, etc. Carr (1992) defined public space in Urban space—public space as, "public places where people carry out functional activities or ceremony activities no matter in daily life or seasonal festivals, making people make up society." Physically public space and socially public space are an integral whole according to development of social history.

## 2 Support of Research on Urban Public Space Form Relevant Technical Method

With development of times, multi-side dialogue between various fields has been a new tendency of innovation and the alternative relationship between disciplines is increased year after year gradually, in addition, crossover design method has been a new design strategy in the current design field. Urban design is of integration, the connotations of which is gradually developed and redefined under the background of Internet. Kevin Linch set vitality as primary index for evaluating the quality of space form in book The Good City Form. He defined vitality in this way: the support degree of inhabitation mode for vital functions, ecological requirements and human capacity. With development of technology, Internet changes human behaviors in aspects of travel, social communication, consumption and housing and so on, making increasingly strong and dynamic subject consciousness in the creative process of urban public space design. Design disciplines are undergoing social turns as objects of design research change from forms to behaviors in interpersonal communication while the focus is gradually changed into human social demands [6]. Technology in social computation such as location big data and socially aware computing provides the studying foundation for urban public space design under the background of Internet plus while PSPL Survey is used as the main one in guiding urban public space design.

### 2.1 Location Big Data

Big data refers to polymerization of large and complex data sets. Scale and complexity of these data sets are often beyond the ability of the current database management software and data processing techniques in obtaining, management, retrieval, analysis, excavation and visualization within acceptable time. Location big data, LBD is an important part of big data. One key point for smart cities is to establish a ubiquitous urban computing system, which involves three major aspects of ubiquitous mapping, location big data analysis and service providing. Therefore, analytic processing and assistant decision of big data have become the key issues in smart cities implementation and urban geographic situation analysis [7].

### 2.2 Social Perception Computation and Design Research

Socially aware computing is aimed at carrying out real-time awareness and identification of social individual behaviors, analyzing, mining characteristics and rules of social interaction, assisting individual social behaviors and supporting the interaction, communication and cooperation of the community by large scale multi-type sensor devices increasingly deployed in human living space [8].

Social aware computing focused on using advanced computer science and technology to be aware of individual behaviors and group interaction in reality, understand the activity patterns of human society and provide intelligent assistant and support for individual and group interaction. Social internet analysis, machine learning, data mining and other methods are adopted to analyze group social interaction; socially aware computing is applied in aspects of urban social interwork, intelligent transport management, urban planning and development and so on.

### 2.3 Assessment Guidelines – PSPL

"Public Space - Public Life" survey method (PSPL Survey) is the main one adopted by Jan Gehl in his research on "the relationship between public space and public life" and later guidance in design. The method is aimed at providing basis for design and transformation of public space and further creating public space with high quality, meeting the demands of citizens in their developing public life by effectively understanding and grasping human activities and characteristics of their behaviors in public space based on results of analysis combining the quantitative and the qualitative [9].

As an assessment method of quality and citizens' living conditions in term of urban public space, this method is popular and easy to understand, evaluating public space quality and public living conditions to great extent. People are studied in their daily public life and usage of public space to discover the relationship between public space and life while data collection, processing and analysis are carried out for final usage through observation, interview and record of people in their activities and state of activity. This method is adopted in public space transformation project in New York and nine planning countermeasures and suggestions are proposed after research and

analysis with a result of twofold increment in bicycle path and significant contribution in environmental protection of New York.

## 3 Research on Sharing Interactive Mode of Urban Public Space

### 3.1 The Design Framework of the Sharing Interactive Patterns of Urban Public Space

Design research on urban public space focuses on the interactive form of human experiences and participation by modern tech means under the background of information society and Internet plus. It is of characteristics of interactivity, participatory, science and technology. It is necessary to carry out deep researches on some core conceptions and theories from perspective of urban design, architectural planning theory, sociology, computer science and psychology and so on.

From the perspective of design research, analysis is made of interactive relationship between human, human and environment, human and objects in urban public space design based on direct support from such computer science as location big data and social perception, basis for implementation of usage of public space. PSPL Survey is an assessment method mainly for public life and public space, putting the space to good use and meeting the relevant demands of citizens in better harmony with the people-oriented design conception. The design framework of sharing interactive modes of urban public space and its content are as follows in Table 1.

**Table 1.** The design framework of interactive patterns in sharing urban public space and its content.

| Conception | Interactive behavior | Innovative behavior | Inter-behavior |
|---|---|---|---|
| Relationship | Between human | Between human and environment | Between human and machine |
| Characteristic | Energetic | No-linear | Interactivity |
| Location big data | Data and information gathering, sharing, analysis and feedback | Platform for information sharing, exchange and gathering | Implementation of carrier, operation and application |
| Social perception | Human's participation and cooperation are necessary | Public space situation | Interactive pattern and information feedback |
| PSPL survey | Evaluating the space life | Evaluating space life and quality | Evaluating the space life |

Detailed description and illustration of public space application will be carried out in the following from perspective of interactive behaviors, innovative behaviors and inter-behavior in the following based on the above research framework after practice, verification and improvement through specific projects.

### 3.2 Public Space Application Based on Interactive Behaviors

The value of public space is realized in people's participation and interaction and urban public space design under the background of Internet plus is design of people's lifestyle in the information age in fact. In term of interaction between people, urban public space design focuses on generation of information content, collection, share and feedback of data, in which people's participation and cooperation are necessary. At present, more and more design research begins to focus on mobile internet and the new way it provides for urban public space design. According to the current research, that obtaining the public's interaction and feedback as well as the way of applying the public data effectively is to be addressed urgently.

For example, I Love Beijing—online map and mobile app, it is used by urban maintenance personnel to cover such urban problems as road depression and lamp breakage, etc. Beijing Chengguan create I Love Beijing, city administration map public service platform based on theory of Innovation 2.0 and People's city, people manage while my territory, I control. At present, I Love Beijing has four functions: firstly, tip-offs, complaints, counsels, suggestions can be carried out directly through our website, city administration map as well as telephones, mail multi-channel accesses. Secondly, services of combination between dredging and blocking. The one proposed is convenience vegetable markets as more than 600 vegetable markets in Beijing are covered on the app. These markets are irregular and it is hard for the municipal government to trace their market hours, vegetable varieties and other information. Beijing residents are able to make scores and comments on market, correct error contents and add new ones, for example, information on market hours, through I Love Beijing. Thirdly, government affair maintenance and compilation system, through which the public are able to carry out compilations of the policies we upload, including giving policy suggestions. Fourthly, open data. We upload such data online as information on vegetable market to it and the data involved is original. Figure 1 is "I Love Beijing" for Smart City Administration: Cloud – Terminal Supporting Platform. Figure 2 is "I Love Beijing" for iPhone and Android: Mobile Public Service APP.

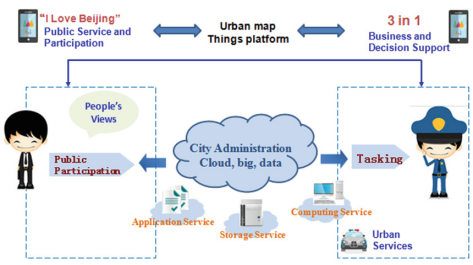


**Fig. 1.** "I Love Beijing" for smart city administration: cloud – terminal supporting platform.

**Fig. 2.** "I Love Beijing" for iPhone and Android: mobile public service APP.

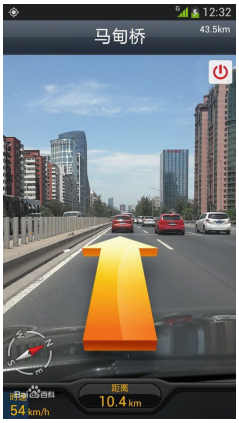


**Fig. 3.** AR living navigation


**Fig. 4.** Function interface

### 3.3 Public Space Application Based on Innovative Behaviors

Urban public space design must be fully people oriented, combine with environment to learn people's behavior pattern and mental tendency on one hand, and realize environment's guidance of people on the other hand. With rapid improvement of big data analysis ability and development of social media based on geographic information coding, new method and data make the effective measurement of urban street design and its attractively touchable. Innovative behaviors are requirement of city's humanization more as well as shaping experience city and dynamic city.

Such as based on geographical position and social function of application - Gaode navigation, it is an offline mobile navigation software for car-owners with distinguishing features of safety, easy to use and efficiency. Gaode map has created the best "living map" by using advanced technology for the users. That is, the design concept of human nature, rich interface reminder, clear voice guidance, beautiful interface and good navigation experience. Various depth POI points are more than 26,000,000, such as food, hotels, shopping malls and so on, and other all-round vast life information available for the search query, like clothing, living, transportation, entertainment, etc. Displaying the real road scene on the mobile phone screen by the camera, AR living navigation overlays road signs on the screen by using the navigation system, so that the users are able to experience the real scene navigation. Figure 3 is AR living navigation. Figure 4 is Function interface of Gaode.

### 3.4 Public Space Application Based on Inter-behavior

Inter-behavior focuses on characters and objects where the later refers to products and tangible substances in reality associated with Internet, meeting the requirements of interactive relationship establishment and building a bridge for interactions between urban spaces.

Recently, the air quality in Beijing can be described with words "bad and terrible". The hazy weather impresses people and people begin gradually to realize that air dust is harmful to their body. Therefore, people pay more and more attention to PM2.5 as these fine particles are more harmful to human body and air quality, beyond imagination.

In such a situation, mobile apps for providing officially air quality indexes appear naturally, very popular among the citizens. Some students and designers also participate in research and development of low-cost sensor devices which are available for citizens to measure air quality. Air.Air! is a convenient air quality monitor access to smartphone with display of regions with poor air quality and it will give a warning through smartphone. Pecking design students develop a air pollution monitor, the color of which changes gradually according to the degree of air pollution, making technical information more visual [10]. FLOAT smart kite designed by a designer in Beijing can measure the air quality over the city and make air quality map [11]. Figures 5 and 6 is about Air.Air!

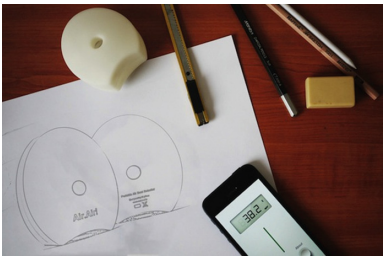

**Fig. 5.** Air.Air! design model

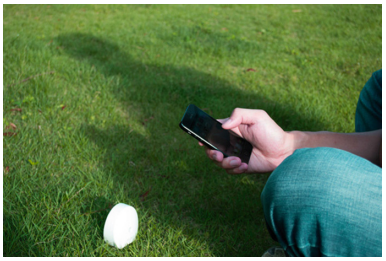

**Fig. 6.** Air.Air! scenarios

## 4 Questions and Discussions

Location big data and socially aware computing technology applied in the sharing interactive mode of public space enable urban space design to be with more science and technology, interactivity, vitality and share, etc. In term of urban public space sustainable design, it is also necessary to focus and consider the virtual space shape and humanization. With rise of Internet plus, more and more designers and urban planners as well as audience begin to link mobile network with traditional industries in social life, active the public space design mode, enriching the audience's participation modes in public space and promoting communication between the designer and the audience. Audience's participation and feedback are required in public space under the background of internet in order to implement effectively sustainable operation of urban public space sharing interaction.

### 4.1 Improve Public Space Experience Based on Socially Aware Computing and PSPL Survey

The users' requirements of public space are changeable and dynamic. With internet's entrance in life, people's living habits are changed and it becomes hard for traditional

public space design to meet the demands of its users. Research on public space design provides evaluations of various activities in public space and proposes design and reconstruction basis based on combination of rational cognition, perceptual experience and empirical analysis according to relevant users, group behaviors, data information and survey and analysis by combing with PSPL survey. However, it is unclear about how to establish public space quality standard and experience effects. It will be helpful to learn and analyze users, groups' behaviors and feelings, understand social activity modes of users and groups, providing intelligent auxiliary and supports and the information feedback help designers' optimization of spatial experience based on social perception computation. From perspective of design method, means of design are updated gradually and traditional means of design are sufficient to meet the demands of the current newly emerging design strategies. Urban design of integrity and establishment of platform for the sharing interactive mode of public space and solutions under the background of internet meets the demands of people in their interaction and application in spatial activities to greater extent. In addition, the design method combining social awareness and PSPL survey together is helpful for improving public spatial experience design.

### 4.2 Improve Public Space Innovation Based on Technology Means

Modern society has developed informational, omnidirectionally with digitization and intellectualization, marked by 'numbers' and 'net'. American scholar Negroponte always said, "the community consisting of internet users will be the tendency in daily life, the population structure will also become more and more similar with that of the world itself" [12]. It is can imaged that urban residents in future will complete their daily life through internet and changes in production and lifestyle of cities will lead to urban morphology—structure's fundamental transformation. With development of big data, transparent computation and VR technology and application of computer technology, new technology will redefine digital public space and bring unlimited space for future public space design as well and virtual space will be closer to our daily life in the future. Object images of urban space gives people subject image through their senses, that is, cities in their minds [13]. Human subject image plays significantly important role in urban public space creative design. Use new technical means to excavate psychological perception, put social perception technology to big use and promote the audience's participation in public space by catering to the audience with new interactive mode.

## 5 Conclusion

Research on public space design under the background of internet plus is cross-discipline involving urban design, construction planning, design research and computer science, etc. With continuous development of new technology's connotation and application, human participation will be required in future spatial structure to greater extent and the public will be the audience of space as well as participants in space design. Public space design is widened in breadth and depth based on location big data, social awareness and

PSPL Survey. The quality of public spatial from will be further improved if the technology, means and thinking of internet are integrated into traditional urban public space design. Interpretation of artificial space and space's shaping people and reflection of share interactive space applications with characteristics of participation and immersion by combining factors of technology and humanization will be another topic for public space design.

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