Spatial 'Complexity': Analysis of the Evolution of Beijing's Movement Network and its Effects on Urban Functions

Qiang Sheng

Introduction: why focus on movement network?

It is almost a cliché to talk about the rapid economical development in China and its effect on big cities like Beijing in recent decades. Under this market-driven process, many historical districts have been demolished and replaced by large urban projects or modern apartments. Parallel with numerous and increasing appeals for the preservation of the physical environment of the old town, recently scholars have also criticised the loss of street life and sense of place in Beijing. However, most of these discourses focus either on social and economical aspects, or too much on the architectural aspect (i.e. talking about the aesthetics of traditional elements or the effects of the street section, height of buildings, etc.). With regard to the first school, the use of public space and the vitality of street life are undoubtedly connected with the economic and social aspect, but the role of urban space is neglected when one understands shops and other public functions emerging as an economy based on movement.[1] As for the second school, there is obviously a limitation to their understanding of space as architectural, Cartesian space. Of course the aesthetic aspect matters, but more for the tourist camera, and less for the everyday life of people. Practically, this kind of formalist approach leads to a twofold mistake: sometimes it will overestimate the roll of urban images, and sometimes it will underestimate the regenerating power of urban places which look boring and uninteresting (from a designer's point of view) but are still full of public activities.

As mentioned before, one may look at urban place or the use of public space as an emerging effect based on the configuration of movement networks as the technological construction enabling and framing movement. Thus the stability and changes of urban functions like shops and other public activities should be studied through the way in which these technologies, and the ways they frame movement, change how people move on inter- and intra-city networks. In the following paragraphs I will describe, firstly, how I look at Beijing's traditional urban fabric as a clearly defined hierarchical space, both on the local scale as well as on the regional and city scale, and then show how it changes towards a city with a modern movement-network constructed by ringroads and highways. Finally, I will focus on a number of cases in detail to illustrate the effects of these changes.

An ideal city: isomorphic structure and spatial hierarchy

Beijing is a good example of a capital city well planned according to the ancient Chinese planning codes, as a combination of technical requirements and social hierarchy.[2] According to ancient Chinese philosophy, things have to be placed in the right position to obey the natural order, and this order can be defined in various scales. By way of a simple introduction to how this effects architecture and urbanism, I simply emphasise that there is an 'isomorphic structure'[3] from the micro-scale, such as the sitting arrangement around the dinner table (parents to the north, the elder son and his

wife to the east, the younger son and his wife to the west, and the children to the south), to the layout of buildings around a courtyard (the main building, where the parents live, located again to the north, the elder son to the east, the younger to the west, and the servants to the south, nearby the entrance to the courtyard), and finally the design of the city. In Beijing, in the area known as the 'inner city' (the north part of the old city) lived the royal family, as well as the high officials and noble families; most poor people lived to the south in the 'outer city'. Another interesting concept that needs emphasis is 'spatial depth', when considering how individuals move in this 'isomorphic structure' of different scales. For instance, a courtyard house may consist of many courtyards: the one connecting directly with the street (the shallowest) is a waiting area for guests, the central living courtyards are located in the middle, with the unmarried daughters live in the deepest courtyard. The number of courtyards also reflects the social status of a family: the more they have the higher their status is. A similar ordering from private to public applies when one goes from the courtyard house to the city. The first type of street one encounters is called *hutong* or *tiao*, (some poor families might even open their gate onto a small alley connecting to the *hutong* or *tiao*). A high-ranking officer could build something like a wall across from the entrance and even a gate-structure at the junction where the *hutong* meets the outside street to mark his territory, although in principle everyone could pass through the *hutong*. The next spatial depth would be the *xiang* or *jie* (street), the difference being that a *xiang* is normally more local than a *jie*. Considering the fact that the traditional courtyard house has a strong preference to face south, most *hutong* and *tiao* are east-west in orientation, while *xiang* and *jie* are normally oriented in a north-south direction.

Not surprisingly, most urban functions would locate themselves on *jie* and *xiang* space. Although commercial activity was strictly controlled in old Beijing (i.e. before 1911), presumably these regulations disappeared with the old empire. An important difference between *jie* and *xiang* is that the former are not only normally much longer, but they are also connected to the city gates. In 1934, and although the old empire had already collapsed, Beijing's spatial structure and the city' urban fabric remained almost untouched.

The inner city (in the north) and outer city (in the south) seemed to function as two separate cities connected by only three gates. For the inner city, considering the location of the Forbidden City in its middle as a huge barrier, the city scale movement assembled itself into a 'doughnut' like structure. Its east and west wings (*dongsidajie* and *xisidajie*, respectively) are both city-scale movement-carriers, as they are both very long streets in the urban fabric (*dajie* means 'great street'), and as mentioned before directly connect the inner and outer cities by two gates (Chongwenmen and Xuanwumen). Since historically the inner city was inhabited by nobles, its urban fabric appeared very regular and ordered. For the outer city, Guangan Street (as it is called today) and Qianmendajie (the north end of Qianmendajie not only connects to the inner city, but also to where the old train station is located, which further intensified its regional role) function as both regional- and city-scale networks, forming a 'crossroads' structure. Since the outer city was historically inhabited by poor people, its local fabric appeared less ordered, sometimes even chaotic. To be more precise, when there is no *jie* (normally it is planned) to regulate the street pattern, the urban fabric only reveals a local order, which no longer adheres to the normal orientations. Combining these, one can see that Beijing's movement structure of 1934, where some regional roads coming from the gateways of the city hit the city-scale network in the middle of the city, functions similarly to today's ringroads. The form of the tramlines at that time also justified this model somewhat. The Dongsidajie, Xisidajie and Qianmen areas were all important commercial

areas for Beijing at that period, and they were all obligatory points of passage for people travelling between the inner and outer cities. Qianmen, as it was the gateway for most people coming from a larger region (the train station being located at the northern end of the street) was the busiest of these three streets.

Towards a grid city: construction of city-scale grids, ringroads and highways

In this part of the paper I will focus on the development of Beijing from the 1950s to the present. After deciding to build a new capital based on the old city, Beijing's city wall was demolished. To facilitate the new housing district constructed to the west of the old city, Changan Street was expanded, and became a representative street for the new communist country, since most of the important new public buildings were built on that street. In 1958, a masterplan was made by the central government. Beijing's spatial structure was based on several circles of ringroads and a number of highways connecting with small towns nearby, forming a spider's web regional in scale. However, due to the influence of the Korean War (1950-53) and the Cultural Revolution (1966-69), the implementation of this plan reveals different speeds for the regional and the city scale.

On the one hand, on the regional scale most highways and ringroads were constructed after 1980. For instance, the Second Ringroad[4] was still far from being completed in 1968, while three-quarters of the Third Ringroad had already been built. After the 1990s, there was a sudden increase in the number of ringroads, from the completion of the Second Ringroad to the Sixth Ringroad, and now even a Seventh Ringroad is already under construction. Many highways built after 1987 have started to function as 'hyperlinks' between Beijing and other big cities, like Tianjing, Shijiazhuang, Kailuan and even Shenyang. In most cases they just intensified the existing links between those cities; sometimes they created new links, and a previous one was by-passed. For instance, there is an increasing demand for a rapid link between Beijing and the port city of Tianjing in the south-east. After the Jingjintang Highway and another city train (almost finished) will be completed, Tongzhou's role as an important regional node could be slightly weakened. While this intervention opens up new potentials in the south-east corner of Beijing, I shall not go into the details now, since it is the task of the next paragraph to illustrate the effects of changing movement networks.

On the other hand, compared to the late development on a regional scale, it seems that nothing could delay Beijing's process of transforming into a modern grid city on the city scale. Parallel with Changan Street, mentioned earlier, several interventions were made to strengthen the east-west link. Consequentially, a regularly formed city-scale grid became more and more dominant. The construction and formation of this city-scale grid was supposed to meet the urgent needs of car traffic and the bus system, both of which play vital roles in people's intra-city movement.

As a conclusion to this part, I must emphasise that my central concern here is not so much with the change in transportation modes from pedestrian- and bike-based to bus- and private-car-based modes, but more with changing patterns relating to different scales of movement. Specific technical systems, such as buses, the metro or highways, and even the walls and gates of old Beijing are all agencies or indicators for us to sort the movement networks at different scales. Fig. 1 illustrates the morphology of these movement networks based on the regional and city scale in 1934, 1968, 1987 and 2006 respectively. From this model one can clearly see the expansion of the regional network. With this expansion some streets previously used by people travelling at the regional scale are now used for movement within the city only. As I mentioned at

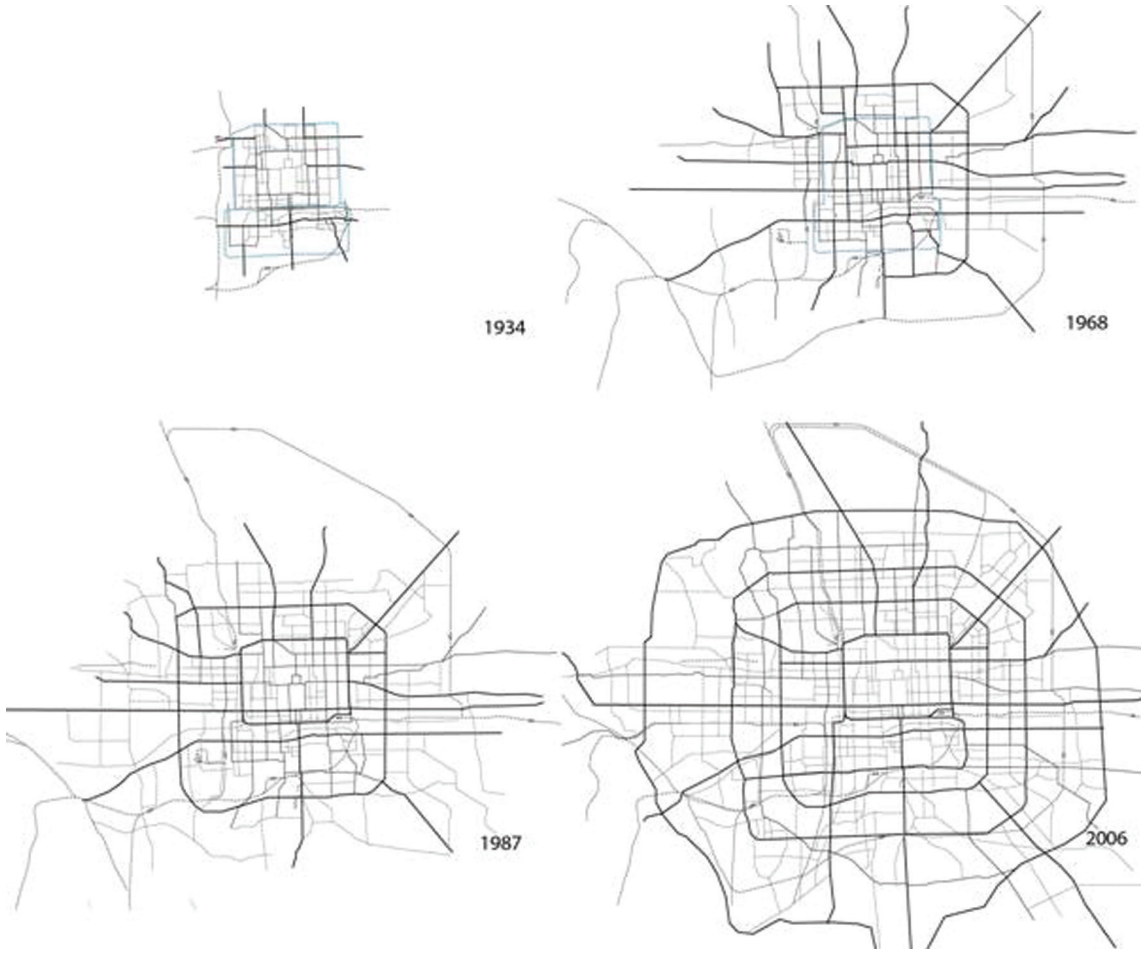

Fig. 1: Layered movement network model of Beijing in different periods.

the beginning of this paper, I believe that the transformation of the movement network is essential for urban functions and the activities emerging from it. In the following paragraph I will analyse this movement-based logic by focusing on the distribution of different scale shops in 1987 and 2006. In addition, a comparative case study will further illustrate the variations inside each scale of network and also represent how local everyday life appropriates the contemporary urban space of Beijing.

Changing centralities as effects of movement networks' rescaling

In this part of the paper, I will start with an analysis of the changing pattern of regional/metropolitan scale urban functions relating to the regional scale movement network in 1987 and 2006. From this analysis I will extract some general principles which will be used for a detailed case study. In the end this will not be a study restricted to economy and space, but also include social aspects in terms of intimate small-scale social activities. Again, a general pattern will be extracted to compare how these activities are located in old Beijing's urban fabric. Then one can see what this transformation in the regional- and city-scale structures means for local life, and what is the specificity of this superimposition of modern and old spatial structures in Beijing.

Let me start with the regional movement network and examine its influence on an agglomeration of metropolitan functions. Fig. 2 depicts networks that afforded regional movement in 1987 and 2006. From left to right their capacities are indicated by thickness of line; for instance, in 2006 the newly built highways appear as the thickest lines. As the map shows, one crucial difference in movement network is the shifting regional role from the old Second Ringroad to the Third Ringroad. Consequently, many 'new' shopping areas emerged near the Third Ringroad, especially close to where the new 'hyperlink' was made, or the original regional movement network was intensified. For example, Huangsi near G1, Maliandao near G3, the antique markets near G6 and G10. It is a pity that I do not have the data for the area near the Jingkai Highway (G4 on the map), but many new developments are taking place there as well. Some old metropolitan functions near the Second Ringroad disappeared or were downgraded to serve customers from the city or local scale. For example, Deshengmen Market near G1, Guangan-men market near G3, Yongdingmen market near G5. Another phenomenon clearly illustrated on the map is the east-west links that have been built or intensified. With the intensification of Changan Street (by the new extension of Metro No.1) and the construction of Pingan Street (by cutting through several housing blocks), the role of Chaofu Street as one important regional route for through traffic in Beijing's inner city has been weakened. A famous case related to this process is the downgrading of Longfusi shopping area in recent decades. On the other hand, the intensification of Changan Street helped to consolidate the existing shopping street in Xisi and Dongsi (Wangfujing), while the construction of Pingan Street opened up opportunities for Nanluoguxiang as a newly emerging fashion street with bars for international tourists.

I need to emphasise two points here: firstly, the fact that Xisi and Dongsi were historically shopping streets should not be treated as a given. It should be remembered that they also formed two of the three links between the outer and inner cities and therefore were part of the regional network. Their function as metropolitan-scale shopping areas could be sustained because Changan Street, which became increasingly important for regional through traffic, directly crossed them. Secondly, as has been mentioned, a *xiang* is normally a well-used local street comparing with a *jie*, and that was exactly the case for Nanluoguxiang. It was only after the construction of Pingan Street that is was made easily accessible and visible for regional flow. Summing up, one can already see some simple and clear spatial logics emerging from the changing

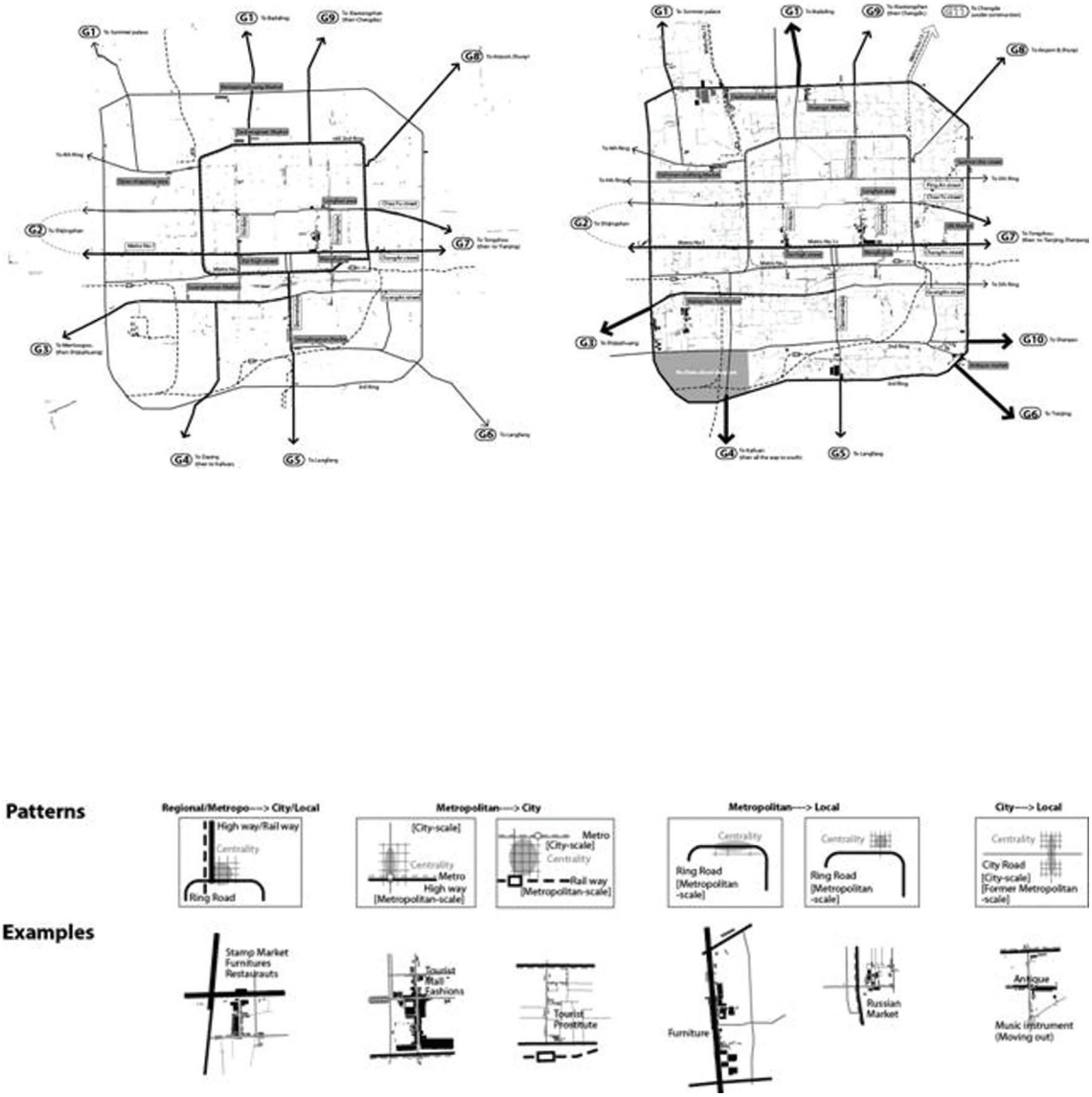

Fig. 2: Changing regional-movement network and related urban functions in 1987 and 2006 Black lines with different thicknesses indicate scale: the thicker, the larger. Black rectangles are metropolitan-scale functions, such as shopping malls or markets; spatial patterns for the location of metropolitan scale functions listed at the bottom.

metropolitan functions during these two years. That is, metropolitan urban functions tend to emerge on the regional network or in proximity to where the regional meets the city-scale network (especially city-scale networks which previously had a certain amount of regional importance as well, as used in the local sense). In most cases in Beijing, these functions form a seepage-like structure towards the lower scale. In the next part of this paper I will use a case study to illustrate the detail variations and transformations of urban functions, as well as other small-scale social activities related to movement networks in certain areas.

Two cases have been selected inside the Third Ringroad for a comparative study. [fig. 3] Case A (the Qianmen-Hufangqiao area) and Case B (the Yongdingmen-Muxiyuan area) are located along Qianmendajie (Qianmen Street). There are three reasons for choosing these particular cases: 1) both of them have strong agglomerations of metropolitan commercial functions and also locally-based functions. 2) Case A represents an old city/metropolitan shopping area which has been transformed by booming tourism, while Case B represents emerging new city/metropolitan shopping areas for people who live in Beijing and its larger region. Therefore a comparative study will demonstrate perfectly the shifting centralities from the centre to the Third Ringroad. 3, these two case areas also contain three types of neighbourhoods in terms of building typology and urban fabric: the north part of Case A is well preserved both in its architecture and street pattern; the south part of Case A has most of its traditional architecture demolished, but the street system is preserved; in most parts of Case B, both architecture and street system are new. As I mentioned in the introduction, I do not believe that architectural typology can have much influence here, so these cases will serve as counter arguments.

The comparative study started with an analysis of changing metropolitan functions within movement networks to give a general image of the sites. Later I will shift my focus to how local people use public spaces by mapping local markets, street vendors, local clubs and also some local activities, such as playing Chinese Chess or Mahjong in the street.

In what follows, I will analyse the metropolitan functions that can be found in each case. First, I will look at both cases from east to west, where these are located between Qianmendajie (mentioned before as one of the important crossroads in the outer city) and Taipingjie-Xinhuajie (the north-south road to the west). Taipingjie-Xinhuajie is part of the city-scale grid, while Qianmendajie somehow has retained its regional importance due to the Third Ringroad to which it is connected. Furthermore, because Qianmendajie is the central axis of Beijing, it has been extended to the south, and in this sense it is similar to Changan Street. As a result, most metropolitan functions are either originally located near Qianmen, or move towards it. While most specialised functions, such as the musical instrument street, are leaving Taipingjie-Xinhuajie because of its weakening role as part of the regional/metropolitan networks. (It used to be the regional network of old Beijing.) One exception is the Liulichang antique market, which still holds its position. However, this is because of the great investment made on that street. Even though, in terms of customer numbers, it still shows a tendency towards decline. (Again, beautiful traditional-looking architecture cannot help it much).

Secondly, I will compare two cases from north to west. As mentioned earlier, since the shopping centrality for non-tourists has moved toward the Third Ringroad, the north part of Case A (using Guanan Street as a dividing line) has become more and more tourist oriented. Most tourists come from the metro station (which is also close to Tiananmen Square). Intensely formed small-scale local fabric perfectly allows for pedestrian movement. When one moves to the south part of Case A, there is a

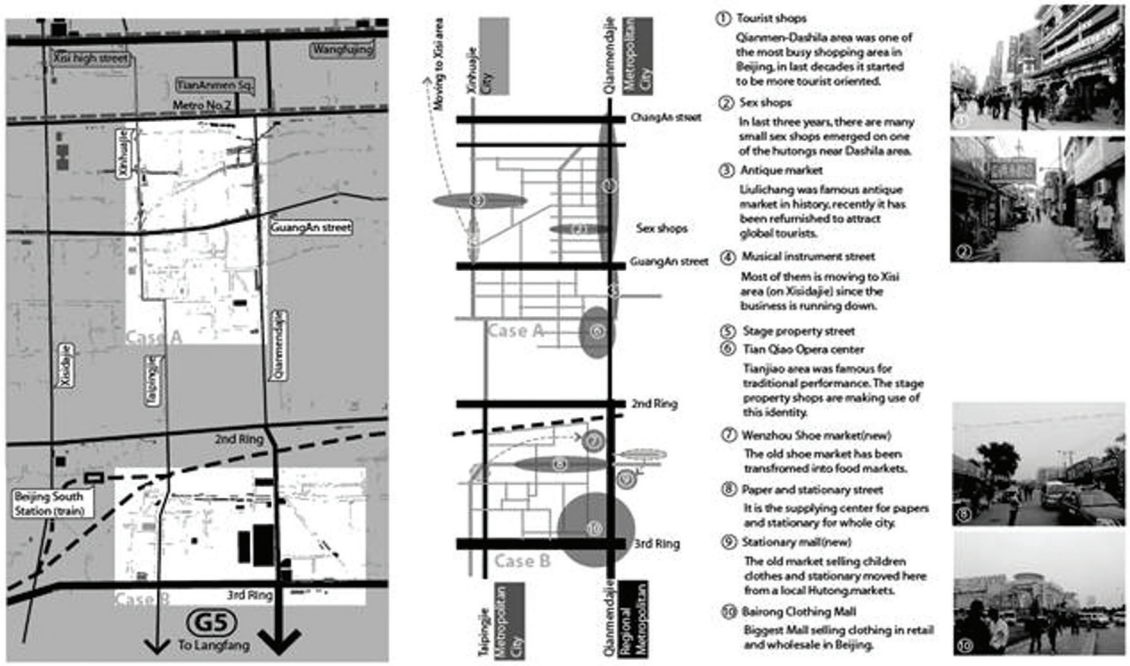

Fig. 3: Case A and Case B; Metropolitan functions.

sudden drop in tourist presence due the barrier effect of Guangan Street as an urban highway. However, the area still retains a certain level of centrality for local inhabitants. Since in this part I can only be concerned with the metropolitan-scale function, I will mention this part of the site later. Case B is located in a highly commercialised area, with different businesses selling specific goods compete for limited land. This used to be the situation in Case A fifty years ago. Now the biggest wholesale centre for clothing is situated here, and also the biggest paper and stationary wholesale centre in Beijing. In addition, it is close to where Wenzhou immigrants used to live in an 'urban village', (the so-called 'Zhejiang Village', named for the province they came from; I doubt whether many of them still live here). Now a Wenzhou Shoe Mall still functions well on the site (moved from Taipingjie-Xinhuajie to Qianmendajie). In general, one clearly see the changing intensity from both east to west and north to south, which is closely related to the scale structure of movement networks.

Now I will move onto local functions and activities. My central concern is how local people appropriate space in a site that has been heavily commercialised, either for tourism or metropolitan-scale shopping. What I would like to illustrate is a local spatial strategy and its emerging spatial pattern, instead of the influence of architecture typologies. As Stan Allen claims, '[f]orm matters, but only on what it can do rather than how it is looks like.'[5] Similarly, neither is high-rise housing nor courtyard housing, what is of account here is only how it affects the movement pattern, or to put it simply, how individuals move from private space towards outside public space.

The indicators I chose for the presence of local activity are food markets, groceries or other locally oriented economies, and also specific social activities, such as gathering to play Chinese Chess or Mahjong. At present these activities are being formalised by the emergence of many local clubs. Therefore this is also an important indicator.

The distribution of local shops and activities in Case A show that -in the northern part- the local spaces appeared in the middle of the block, stepping away from the high-scale functioning spaces. The spatial compositions of Liulichang (as an antique market) and Yanshoujie (as a local market) form a clear example of the sharp transition between these two types of spaces belonging to different scales. For local inhabitants, it is obvious that Liulichang should be a better place for local shops since it has a direct link to the outside, but considering the fact that the first choice had been occupied by metropolitan functions as a seepage into the local fabric, Yanshoujie logically became an ideal second choice. Another reason for Yanshoujie to serve as a local centre is its geometrical form as the space where many *hutong* meet. This is such an ideal typology for a *xiang*, although named a *jie*, that I believe it is not a mistake made by ancient Chinese people. From some of the old shops located here I can infer that this street indeed must have functioned as a city-scale street, or at least that it had city-scale functions as a seepage. As a phenomenon this is similar to what I already described as the down-scaling of several old regional networks to the city scale. It is clear that the labyrinthine spaces of the local fabric play an important role in preventing penetration from the urban flow, and leave spaces for local activities to retreat to. As a result, one can see a clear distinction between the local and the urban. However, this is not the case for the south part of Case A.

The south part of Case A (what I call the Tianqiao area) has quite a different local fabric compared to the north part and also to the inner city. This local fabric has been preserved in a housing redevelopment project. Here one sees a highly mixed pattern of different scales that is hard to classify. Xiangchanglu Market is possibly the only one that could be classified as very local, even though it is still

easily penetrated by urban flow in the north-south direction. Similarly, on Taipingjie (at the city scale at least), one sees a typical socialist-style public building (named the Beijing Technology Interchange Centre), which is in use as a local supermarket. One can also see that in comparison with the north part, the Tianqiao area has more overlapping streets for urban and local flows. As an effect, this kind of hybrid, or even chaotic, structure shows great resilience. Even with some blocks being totally rebuilt as modern high-rise apartments, on the ground the vitality of the street life rapidly returned. In the next case (Case B), I will focus on the pattern of local life in newly developed areas with a typical 'modernist' spatial structure.

The western part of Case B is a busy commercial area, a wholesale centre for clothing, paper, stationary and shoes, while there are also many apartments in this block. Although in general the local fabric is quite different from Case A, the western part of Case B still resembles the northern part of Case A in its clearly differentiated scales of activities within its space. Of course, there is also a gradual transformation taking place on one street; for example, on Gexinjie from east to west, functions change from a food market to agglomerations of shops and malls selling paper and stationary, but this is due to the configuration of the metropolitan- and city-scale structures which was explained earlier. And there are also some fake local gatherings, if I just base my judgment on certain functions. For instance, there are many food vendors near the parking area on Gexinlu, but most of them merely serve the passing customers and employees of the stationery shops. In this sense, they are principally no different from those specialised transportation agencies gathered around the Bairong Clothing Mall. When one focuses on where local activities are gathered, most of them are located in a T-shaped road to the south of Gexinjie. Here one finds many food and grocery shops, and also people playing cards, Mahjong and chess during the summer. From the network analysis one can clearly see that most high-rise apartments have their entrances on the 'T' road, which makes it an obligatory point of passage for the inhabitants travelling in and out. The functionalism embedded in the design of these apartments leads to this highly ordered but less flexible spatial use.

As a contrast, the eastern area in Case B appears as the reversal of the process visible in the northern part of Case A. Liulijinglu now functions as a good local street, while a few years ago it was famous for selling children's clothing, stationery and toys. As I mentioned before, due to the rescaling of regional and metropolitan networks nearby, most of these functions moved to Qianmendajie. Later on there was also an attempt to open a flower market, which was closed down again not much later, due to the fact that the existing spatial structure no longer allowed for this function. Therefore, what is taking place in the street in recent years, is that the markets have started to become used as local shops and clubs. The eastern end of the street is now being used as a rather large and informal food market, while in Case A it is the metropolitan function that occupies the niche for local function and has forced the latter to retreat into an even deeper local one. In this case it is the metropolitan function that has left out niches for the local to occupy. However, there are some differences between Case A (north) and Case B (east), as their street patterns demonstrate. Compared to Yanshoujie, Liulijinglu is very penetrable from the city-scale network. In this sense, the latter is 'doomed' to be local, while the former has more flexibility. This type of flexibility (or local resilience as I call it) depends both on how the street is constructed in the network as a whole, and on its local form (a kind of interfaceability with the city scale).

When focusing on how they reacted to the rescaling of metropolitan/city networks, it becomes clear that all of these cases demonstrated a certain

amount of resilience as living organisms. However, there are some differences based on their local fabrics. For the traditional local fabric (Case A's northern part) as a densely built grid with a clear hierarchy, certain scale functions just shifted back and forth to occupy the optimal available spatial condition; for the modernism fabric (Case B's western part), since there are far less public streets than traditional ones (many of them are gated tree-like structures) and the metropolitan/city and local fabric are very separated, there is little margin left for functions to shift. In this sense I can say its resilience to change is poor. For the traditional fabric with a less clear spatial hierarchy (Case A's southern part), the local area is both well integrated in itself and within the city scale, which means that during change it is not one scale of possible functions replacing others, but that all scales can co-exist and benefit from each other. As one can see, since the commercial centre moved to the Third Ringroad, and this area is relatively far from a metro station, the metropolitan function is being downgraded. However, even after the mass redevelopment (which is usually accused of murdering street vitality), this area is still full of street life, although in general the shops serve a smaller scale of customer. Practically speaking, the well-meshed street pattern offers many alternative passages for car and pedestrian movement, and local shops indeed benefit from being located near the city- and metropolitan-scale function, since they bring with them additional potential customers. As to local centralities, they normally prefer to be located one step away from the city-scale network.

In terms of this interface location preference, I do not see any difference between Beijing and western cities. It is rather the form of this interface that is different. In most western city centres, the interface of Case A's southern part as a specific case in Beijing is actually a general pattern to be found. In the last part of this paper I would like to reflect on Beijing's movement network development, and illustrate this alternative form of interface for shops to emerge based on the different local fabric.

Conclusion: Deep spatial structure in Beijing

In this paper I started with the spatial hierarchy of Beijing's inner-city fabric as a well-planned city with its movement-scale structure clearly defined and regulated by gates (both gates to the rural hinterland and gates connecting the inner and outer cities). Under the pressure of increasing car usage and urban expansion itself, the intra-city movement network evolved into a regular grid form, while the inter-city movement network started to include more ringroads and highways. This new spatial pattern transformed Beijing into a modern metropolis with an open grid system which can be easily used by people travelling inside and outside the city. In the latter part of this paper I have also clearly seen that the metropolitan functions followed the growth of its equivalent scale structure very well. In this sense this is exactly the same process one see taking place in most other cities today.

On the other hand, transformations which are normally criticised are taking place on the local scale as well. Many new residential districts have been built as gated communities. This modernist housing development seems to follow the same traditional spatial principle as a clearly defined hierarchy, but they are actually different with regard to the interfaceability with the outside: for traditional fabric, its smaller size and complex form offered a certain margin for local activities and urban-scale functions to be located as seepages; for modern ones, its limited space and huge size left little margin to absorb changes. In general, those productive interfaces in Beijing (no matter whether one focuses on urban- or local-scale centrality) emerged as a much more fragmented pattern compared to western counterparts and even some Chinese cities with less of a history of city planning. In the latter ones, those interfaces emerged as a network form in their own right, while in Beijing, they mostly function as seepages into the local, while barely having any

relationship to one another.

To describe this process in terms of spatial form, I can say that on the city and metropolitan scale, with the hyperlink effect of highways and city-scale grid structures, Beijing is becoming more and more flat and (topologically) shallow, while at the local scale its deep structure still remains. This local spatial pattern could explain the form/formation of public spaces in Beijing which surprise us as tourists when one encounters these 'hidden' places. Meanwhile, it also leads to traffic problems for the city and metropolitan scale, since there is definitely a shortage of second-level grid structure to help reduce congestion. However, to offer a solution for a traffic problem is not the aim of this paper; what I have tried to do is to give a description of the modernisation process in Beijing, and to find the underlying principle on which the morphology of movement networks is based.

Notes

1. Bill Hillier, 'Centrality as a process: accounting for attraction inequalities in deformed grids', in *Urban Design International*, 4(3&4), (1999) pp.107-127.
2. In *KaoGongJi* (a technical book on architecture and urban planning written 3,000 years ago), most regulations deal with the spatial arrangement of government buildings, markets, width and number of roads, based on a hierarchical division of cities (from imperial capital, provincial capital, to small city).
3. Chang, *Y. FeiChang|JianZhu*, (China: Heilongjiang Science and Technology Press, 1996).
4. The Second Ringroad is located on the former city wall. For a long time after the wall had been demolished the site was in use as a rubbish dump. Only certain parts of it were used as part of the city-scale network. By the way, there is no First Ringroad, even today. This might be because the tram system in old Beijing functioned as a first ring, as has been mentioned earlier.
5. Stan Allen, 'Infrastructure Urbanism', in *Points+lines: diagrams and projects for the city*, (Princeton: Princeton Architectural Press, 1999).

Biography

Qiang Sheng has been undertaking Ph.D. research at Spacelab, TU Delft, since 2006. His work examines the relationship between changing centralities and movement networks. He graduated from TU Delft in 2004 with an M.Sc., and his thesis was entitled 'Urban Labyrinth', it also examined a similar subject and methodolgy. Before he came to the Netherlands in 2002 he studied Architecture at Harbin Architecture University and also won 1st prize in the National Architectural Student Competition (2000), 3rd prize in the Tianzhuo Architecture Competition (2000), and 2nd prize in the 'Liangsicheng' Cup Competition, (2001).