Uncovering social urban form in dynamics

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Abstract

In the 20th century, there are many overlapping labels debated for the modern city, such as urban sprawl, network city, shrinking city, carpet metropolis, and generic city. All of these labels attempt to describe emerging, dynamic phenomena in the modern city, including economy, politics, culture, migration, and the impact of capitalism [1]. Nevertheless, the question of how to set up a framework for measuring, representing, and explaining urban dynamic forces remains to be answered.

By computerizing manipulation and satellite inspection devices such as General Packet Radio Service (GPRS), Global position system (GPS), the urban "contexture" can be recorded and represented not as a static city map, but a dynamic one like "*Nude Descending a Staircase"* drawn by Marcel Duchamp. It uncovers the layers of the invisible fragmentation and synthesis of an urban fabric. This study employs Sony GPS-CS1 (GPS Implement) in corporation with Google Earth (global platform), to investigate the dynamic force caused by residents' migration in cities. It selects nine types of residents and investigates their daily movements in the city of Taichung for five weeks. The database recorded by Sony GPS-CS1 and diagrammed on Google Earth shows how the interrelations exhibited in the residents' living purposes connect the points (places) to draw a dynamic force (fluid intensity) and form the living circles (network). Based on these concrete observations and experiences, the urban subtle effects are derived and presented in the paper including "injection" and "evacuation", which emerge from the interrelations between places. The study deepens our understanding about how the flowing strength affects the modern city. This is a good opportunity to measure and represent the city through a scientific methodology to exclude dubitable phenomenology.

1. Literature Review

Cartography is a way for measuring, representing, and explaining urban phenomena. By employing the figure-ground, the figure and background information of the urban context can easily be distinguished; however, it is difficult to launch the urban form into dynamics. Fields other than cartography, such as psychology, EBS, and computer science, have studied differentiation of figure from ground. Many studies have employed different experiments, communication, and computational simulation to determine the best way to find another possibility to use cartography to draw the dynamic forces of the modern city. Current trends in cartography are moving away from analog methods of mapmaking and toward the creation of increasingly dynamic or interactive maps that can be manipulated digitally. It seems more important now to create a "map" that could be studied by integrated science, even if this implies occasionally leaving the realm of factual discourse to enter a world of speculation [2].

In the Real Time Rome project by MIT SENSEable City Lab, the wireless detectable devices contribute and introduce digital cartography to understand how urban dynamics can be observed in real time. The project aims to show how technology influences the way of mapmaking and helps individuals make more informed decisions about their life. In today's world, the digital technology not only gathers and exposes the information in an "ubiquitous" connectivity environment, but also expands our understanding into the Earth's atmosphere. From the MIT News report, space-weather research uses GPS and space-based sensors to map the weather in space. It is not a typical forecast, but the operators of the hundreds of active satellites provide real-time images of weather dynamics. The images present the invisible variation in ionospheric density to explain how nature influences the artificial earth. After being engaged in research of wireless detectable devices, the discussion on human environmental dimension is no more limited within the artificial sphere. Wireless detectable devices provide a unique environment to embed information in applied geography.

From the description above, a way of cartography is shifted from a passively informational platform to an actively informational diffusion. By the resarch of "Real Time Rome project" and "Space-Weather research", the city is exposed by unceasingly diffused phenomena exceeding our perceptions. The purpose of "Uncovering social urban form in dynamics" would go further from this standpoint. Exploring GPS (Global Position System) as an investigative tool does not only extend perception, but also records the process of experience. The question of using GPS is like writing a diary in the movie "The Butterfly Effect"; it is possible to survey the key factors which affect the urban configuration. In order to examine the possibility of GPS study, the interactive platform is used in tandem with GPS technology to exhibit the daily life in "Taiwan Avantgarde Documenta (Co6)" in Taichung. By involving the participants' interactions in the exhibition, the people could help researchers to survey the possible points which could be discussed as key issues in this article. Firstly, the

small scenario is tabled below to design interactive platform:

<table>
<tr><td>Table 1

Urban Dynamics</td><td>Index

[Ud]</td></tr>
<tr><td>Description:

In Taichung City, there are nine actors invited to write a “mobile diary”, they accessorize GPS implement to move by different ways, such as taking a taxi, shuttle bus, bike, or just walking, when they move, simultaneously, the video camera is assigned to track and shoot. From the video record, the actor’s conversation attracts us to expand environmental perceptions objectively. On the other hand, compared with the actors’ experience, the distinct demands in the place are observed.</td><td>Scale
● local
● regional
actors/agents
1. Business man
2. Craftman
3. Artist
4. Merchant
5. Reporter
6. Production manager
7. Hotel executive
8. Student
9. Traveller</td></tr>
<tr><td>BRANDING</td><td>Co6 Exhibition</td></tr>
<tr><td>The interactive platform is a sensorial cartography which employs GPS to collect and represent the urban dynamical data on a web platform. Through the platform, the city should not be considered as an integer, but as a cooperation of urban fractions.</td><td rowspan="5">  </td></tr>
<tr><td>EARTH</td></tr>
<tr><td>The interactive platform can be used to record and represent the urban dynamic in real time</td></tr>
<tr><td>FLOW</td></tr>
<tr><td>The dynamic exchange would be influenced by consumption, politics, education, cultural events, and so on.</td></tr>
</table>

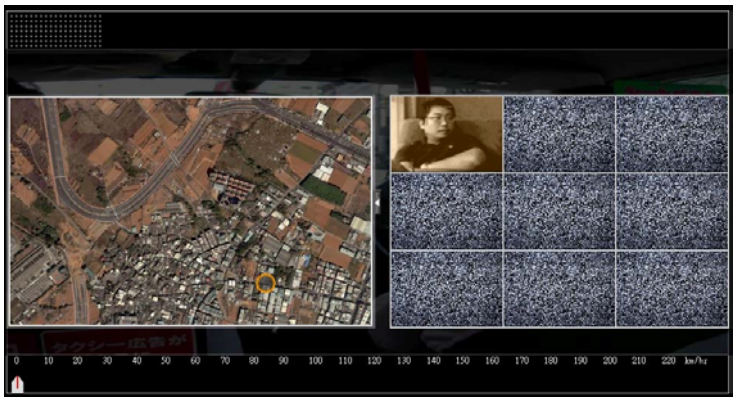
2. The Mobile Diary

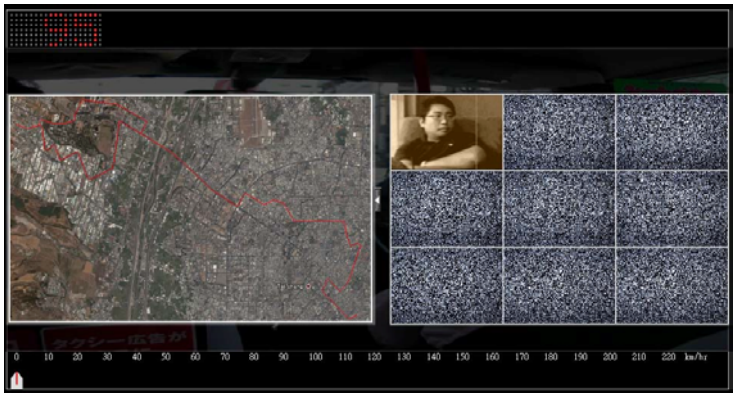
The interactive platform is designed as a kind of informational “container” to store spatial information obtained from satellites; such as time intervals, spatial positions, orientation flow, and frequency of move. A variety of issues could be possibly extracted from the container to show how actors migrate; how long to travel; who the people are they meet in places. In order to examine these possibilities, there are nine actors, including a business man, a craftman, a merchant, a reporter, an artist, a production manager, a hotel executive, a student,

and a traveller, who accessorize GPS implement (Sony GPS-CS1) to record the trajectories of their daily migration. In addition, camcorder is assembled with actors to seize on their remarks and images. After a day, the dynamic data (voice / video) captured from camcoder is tagged on a map by longitude and latitude captured from GPS implement to create urban profiles. After generalizing the database, the research integrates it into interactive platform to visualize geographic data (business locations, scientific observations, events, people, geotagged photos, etc.).

The interactive platform is divided into two windows: the window on the left shows how actors move and draw the trajectories on maps; and the window on the right shows the simultaneously geotagged images to illustrate where the visualized geographic data take place. On the interactive platform, there are lots of occasional places registered and shown at third step in Table 2. At those places, different actors are involved. In "Taiwan Avantgarde Documenta" Project, the participants were given a lot of questions: Why do they go to that place? Who are the actors that I can meet at this place? What do they do at that place? What is the meaning of those places? In order to answer these questions, the research would go further and focus on the places. All manipulative processes about the interactive platform are shown in Table 2:

Table 2: the interactive platform with GPS and camcoder records

	**Interactive Platform** The work includes the voice, video, and the Google Earth Map. The people can choose a substitute on the right window to re-experience the life in the city.
	**The first step :** Clicking on the map where you are. A small scenario will start at that moment, the window on the right starts to download images to help people to experience the city.

	**The third step :** Occasional place emerges, caused by the participation of other actors. What do we do at this place?
	**The final step :** After finishing small scenarios, the routes show how you occupy and territorialize the realm in the city.

3. Drawing the Profile of Urban Contexture

Seen from an orbiting satellite, Taichung is a city where all that can be perceived are the geologic traces that the different levels of urban events have successively imprinted. In Figure 1, the actor's record is mapped, a certain interpretation of the sequence of Taichung's urban events is linked by the actor's small scenarios. The interactive platform shows that actors occasionally meet with each other to involve their physical and mental demands in different places, hence, the places are realized as the extension of these demands [3]. After presenting the exhibition "Taiwan Avantgarde Documenta (Co6)", the research is interested above all in questions of specific urban characters at places.

One day itineraries are shown in Figure 1 and diagrammed in Figure 2 to sound out the idea of GPS research. The diagram draws two dynamic forces in which the research is interested. Firstly, the occasional places where the actors meet with others are marked as the joints from A1 to E1 to represent the intensity of urban events and density of actor's demands. Secondly, the junctions between places represent the fluid intensity. From the idea of fluid intensity, Figure 1 indicates that the high fluid density is located along "Jhong Gang Road", especially in the central district in Taichung City. Going back to the actual urban development of this area, there is an important commercial area called "Sogo Business Field" which relies on the conveyance on Jhong Gang Road to maintain and territorialize its realm. After

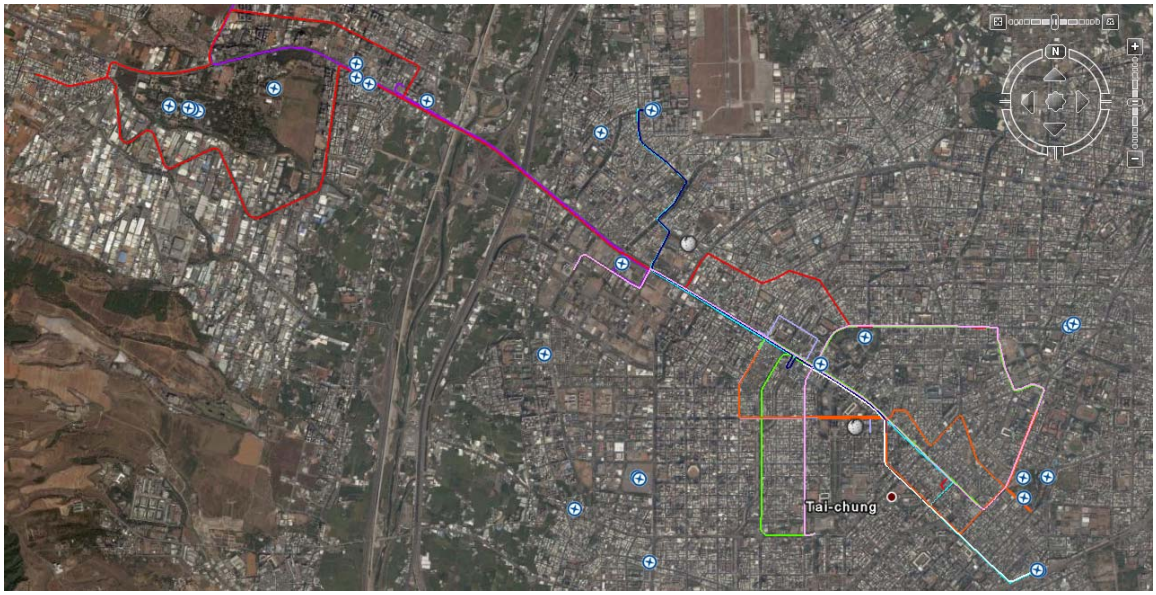


Figure 1: Actor's migration

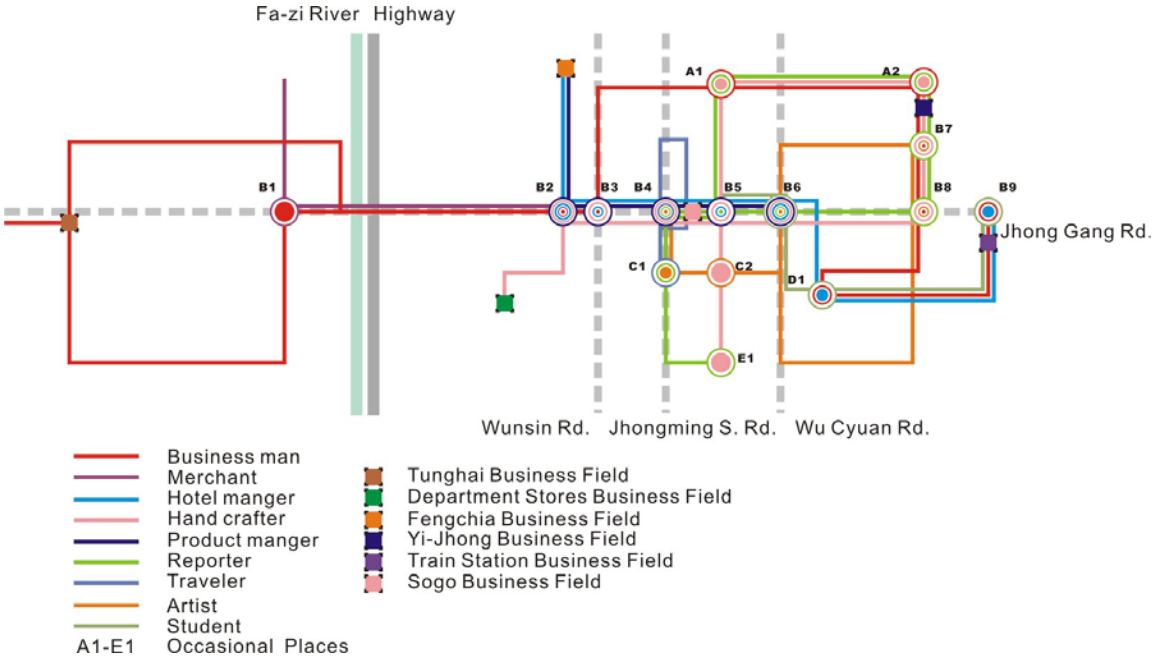


Figure 2: Intensity and Places

comparing these two flow perceptions, roughly, there is a relation between "Places" and "Intensity" in the city. "Places" and "Intensity" indicate that the development of the city cannot be considered as an integer phenomenon, it should be deliberated on dynamic forces. The city was born and throughout its growth, it is created in temporal forms of organization [4]. It is like a tree, the environmental changes influence the portage of nutrients to shape the tree, and these variations in growth cannot be told until observed in a section of the trunk. After understanding those environmental changes, the scientific research would effectively and precisely devote itself to improving the advantage of growth. In this chapter, we can't

deny the influences from “Intensity” and “Place” in a city. A place could have connections with more than one place to derive demands from them; a place could be mixed ground and spatial uses. One day itinerary shows the possibilities to frame these questions, but, the research is interested in an ultimate result about dynamic forces. In order to throw light on this question, the research attempts to continually record the actor’s migrations.

4. Two Dynamic Forces: Intensity and Place

After the exhibition in “Taiwan Avantgarde Documenta”, the actors continue to accessorize GPS implement to record their migrations in Taichung City. Five weeks later, the whole records of daily migrations are integrated with Google Earth and shown in Figure 4. The fluid intensity and the form of urban composing are different from Figure 3. Comparing intensity in Figure 3 and Figure 4, the highest intensive area has shifted from the “Sogo Business Field” to the “Fengchia Business Field”. Besides, there is a subtle variation between the old downtown area and the “Fengchia Business Field”. In order to visualize these dynamic changes, the research tries to use the perspective of intensity and the historical perspective to explain them.

In 1966, the First Highway and Taichung Harbor were constructed. Taichung City became the metropolis in central Taiwan. Simultaneously, the old downtown area was overcrowded with industrial and commercial businesses. Through the attraction of the highway and the harbor, the commercial and residential areas followed “Jhong Gang Road” and “Wu Cyuan Road” to spread to the west part of the old downtown area called “Central District". There is a famous area mixing shopping and banking called the “Sogo Business Field” in the Central District now. In 1990, many large constructions went on to increase urban development; including the Second Highway, the High speed railway, the East-west highway, and the Ching Chung Kang international airport. Since there is a lot of money involved, there are lots of commercial and marketing organizations which continue to expand along “Jhong Gang Road” to fill in the west part of Taichung City called the “Situn District”. From a historical perspective, “Jhong Gang Road” played a great role in Taichung City to convey a flow of economy and people. It is not difficult to understand why the highest fluid density is located along “Jhong Gang Road” in Figure 2. In addition, “Jhong Gang Road” also plays the character to redistribute and gather the resources from the places where it connects.

During the duration of record, two interesting points are framed. The actors are used to travel along certain routes to exclude redundant possibilities; the main structural connections between places are visualized. On the connections, the traveling flows penetrate through places, the dynamic fluidity never stops to change along the roads. This might be caused by “injection” and “evacuation”. In Figure 2, when actors pass through the places, the place shows the different opportunities to connect with other places, hence, there is a distinct

Figure3: GPS Analysis: the fluid intensity of a day

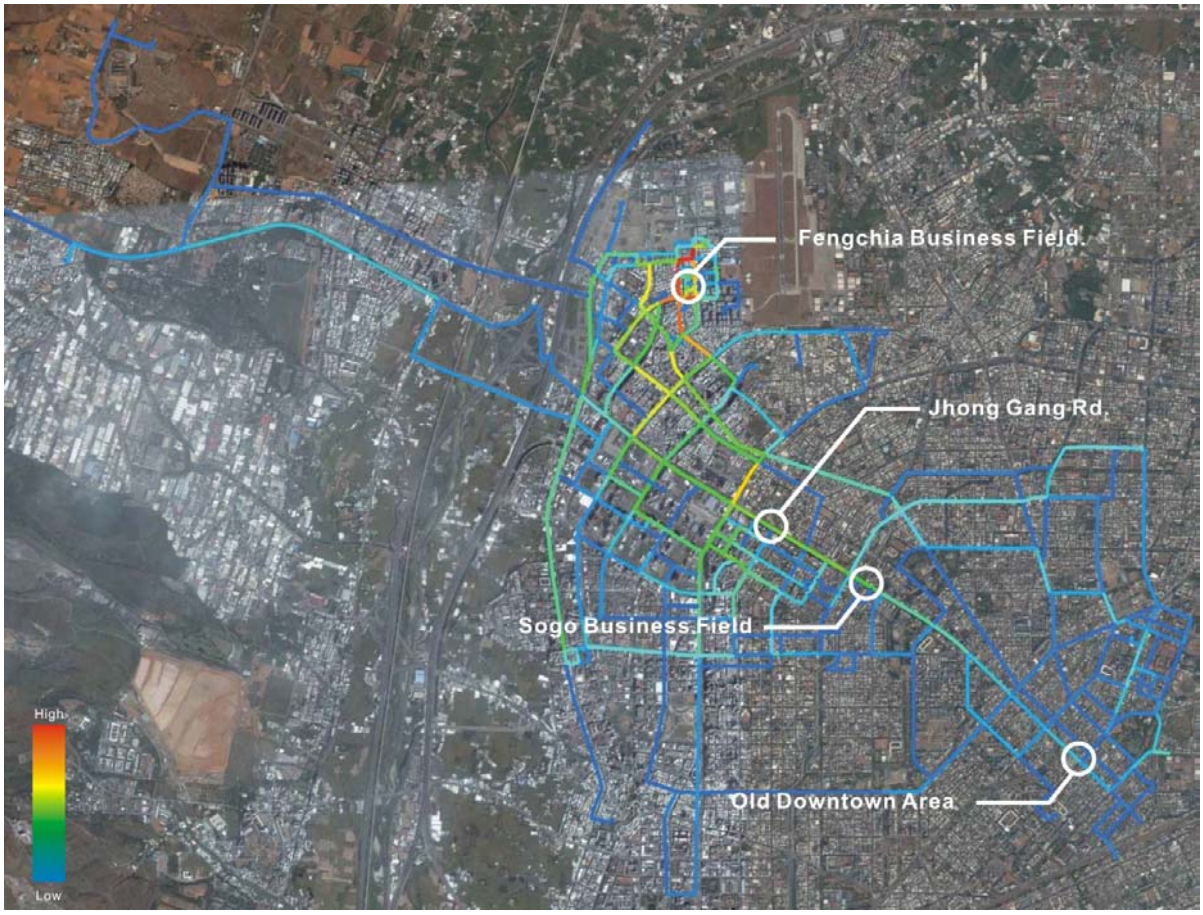


Figure 4: GPS Analysis: the fluid intensity of five weeks

connective intensity in places. This connective intensity interprets a variation of fluid frequency. In a high fluid area, on the one hand the place is injected with people flow to function as commercial demand, such as the B5 place in Figure 2, an area called “Sogo Business Field” mixed with shopping and banking, while on the other hand people flow could get a good opportunity to escape from the place, such as the B6 place in Figure 2 located at the intersection of “Jhong Gang Road” and “Wu Cyuan Road”. This place plays the role as a pivot. In order to perceive and comprehend the phenomena of “injection” and “evacuation”, the research translates the records of GPS into a map of fluid intensity to show how it occurs and interacts in Figure 3 and Figure 4.

From the observation of intensities given by Figure 3 and Figure 4, “Jhong Gang Road” is focused on how to string the “Fengchia Business Field”, the “Sogo Business Field”, and the old downtown area together. The “Fengchia Business Field” is a famous commercial area located in the “Situn District”; the “Sogo Business Field” is an area mixed with banking and marketing located in the Central District.

1. The fluid intensity between the “Sogo Business Field” and the old downtown area has a relation of direct proportionality. When the fluid intensity penetrates through the “Sogo Business Field”, the strength of fluidity continually declined in the old downtown area, on the other hand, comparing the intensity in Figure 3 and Figure 4, the “Sogo Business Field” seems to play a role to promote the condition in the old downtown area. The more fluid intensity concentrated in the “Sogo Business Field”, the more opportunities are injected into the old downtown area.
2. It seems that the “Sogo Business Field” performs as a fulcrum to adjust the fluid intensity between the “Fengchia Business Field” and the old downtown area. In Figure 3, when the fluid intensity is violently increased in the “Sogo Business Field”, the fluidity in the old down town area becomes stronger than it is in the “Fengchia Business Field”. In Figure 4, the fluid intensity decreased in the “Sogo Business Field”, the strength of fluidity in the old downtown area becomes weak, on the contrary, the fluidity enhanced in the “Fengchia Business Field”.
3. Focusing on the connections between the “Sogo Business Field” and the “Fengchia Business Field” in Figure 3 and Figure 4, there is an inverse proportionality between these two places; when the fluid intensity grows on the “Fengchia Business Field”, it decreased in the “Sogo Business Field”. On the contrary, if fluid intensity increased in the “Sogo Business Field”, it would be decreased in the “Fengchia Business Field”.

This mathematical proportionality might be caused by the maturity in the network. In Figure 4, the network between the “Sogo Business Field” and the “Fengchia Business Field” is more mature than it is in Figure 3. Like synapse, the more mature network creates more connective places to inject or evacuate the conveyance of people flow and economy. Consequently, the question about how to formulate the index number to measure the

maturation of a network should be proposed to uncover the threshold when the flow is injected or evacuated from the place. The place could be regarded as a constant container, if the place is overloaded with people flow or economy, the fluidity of these factors would be diffused. After the index number for the maturation of network is brought on the table, the influence of dynamic force would be brought to light.

5. Potential of GPS Research

In this research, the property of dynamic forces is found to flow in non-fixed orientations, but they still show certain regularities. The observations from "Place" and "Intensity" try to explain how the spatial order and urban space are dominated by this regularity. Bill Hillier mentioned that the pattern of intensity creates different types of social and required different kinds of control on encounters in order to be that type of society. If this is so, we could reasonably expect it to be the deepest level at which society generates spatial forms [5]. In order to examine the possibility of this statement, the cartography of GPS is introduced as an investigative tool to visualize the pattern of intensity in city. It is like Computerized Tomography (CT), the primary benefit of GPS could be the ability to record geographic informations at different depths within the city in the real world and help a policymaker to diagnose urban problems.

6. Reference

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