

# BiCi\_N, a CT-scan of Barcelona

## Mapping the human body into the city body

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**Abstract.** *BiCi\_N* is a “living” map of Barcelona that visualizes the intricate relationship between the human body and the city. Using GPS (Global Positioning System) and A/V (Audio/Video) devices on Bicing bikes the city is understood from above and from below as a dynamic quantitative and qualitative ever-changing entity defined through the activities of numerous inhabitants. From these a collective story is assembled as users go about their lives. The bicycle as an extension of the human body into the city becomes a full-scale mapping instrument, which captures both the sensual/experiential and the scientific/abstract notation of the human body into the city body and viceversa (Figures 1 and 2).

**Keywords.** Mapping, Audio/Video, GPS, open source, collective, daily life, body, city.

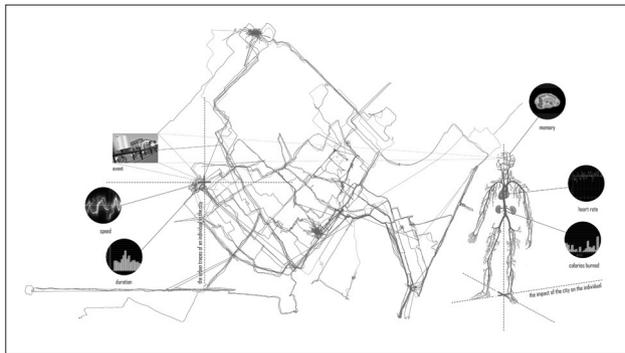


Figure 1. BiCi\_N, collective mapping of Barcelona

### Introduction

GPS (drawing) and audio/video (moving image) provide an interesting hybrid at the scale of the city. What is the potential of this fusion? The portable GPS, which uses satellite data to calculate exact geographical position of its users, is able to in utmost mathematical accuracy register the direction, speed, pauses, rhythm, density, rate, delay, detour, and so on of the inhabitants of the city as an abstract system of changing lines of various qualities and densities as well as provide charts of information about the city like altitude, weather, time, etc. and about the human body in the city such as calories burned, heart rate, etc. at that particular moment in time. While audio/video has the potential to capture and reveal the various activities happening along these trajectories as a series of life-like moving views and sounds into the interiority of this complex system, GPS reads and writes the quantitative while audio/video reads and writes the qualitative aspects of the city.

### Cycles: Collective and Individual

In 1957 the urban sociologist Paul-Henry Chombart de Lauwe created *Trajectes pendant un an d'une jeune fille du XVIe arrondissement*. The drawing, an accumulation of lines in a triangular pattern revealed the simple and repetitive movement of a girl through Paris during a one-year period. The abstract blurry geometry marked her movements from home, to school, to piano lessons as an abstract closed formation revealing her cyclical use of the city, visualizing her routine in time. In 1953 Architect Louis Kahn did a series of drawings of Philadelphia illustrating the city through the movement, speed, and flow of its vehicles rather than by the physical and static configuration of building blocks, where buildings are simply suggested as residual space against the accumulation of

marks that define the traffic flow of the city. While these Kahn drawings materialize graphically the ephemeral activity of the city, they do not capture or explain their patterns in time; they do not illustrate the cyclical aspects of the city that these movements define. The potential is clearly visible in the 1983 film *Koyaanisqatsi* by experimental documentary film director Godfrey Reggio where a series of stationary moving image views of the city are sped up. Here the infrastructure of the city is revealed in time as throbbing car and pedestrian stop and go to the rhythm of traffic light changes.

Recently with the ability of GPS instruments to record human movement in utmost precision, a couple of studies have taken what Paul-Henry Chombart de Lauwe did with *Trajectes pendant un an d'une jeune fille du XVIe arrondissement* to the scale of the collective. In 2002 Amsterdam's Waag Society and Artist Esther Polak provided several inhabitants of the City of Amsterdam with these portable (GPS) devices to create *Amsterdam RealTime*, a plan drawing of this city that emerges out of the movements of the participants as they go about their routines during the period of two months. This drawing, like the Louis Kahn example, “does not register streets or blocks of houses, but consists of the sheer movements of real people” (Ross, 2006). In this case it is the pedestrian movement that is captured but not as a frozen moment in time as in Kahn's studies but as an alive document, moving and changing. *Cabspotting*, by The San Francisco Exploratorium and Design and Technology Studio Stamen Design, maps the city of San Francisco via the trajectories of the city cabs. The *Cabspotting* web site regenerates constantly as the cab rides change, stop, pause, repeat, as passengers are dropped off, picked up and transported through the city daily.

### Cycles: From Accumulation to Accuracy

*Amsterdam RealTime* and *Cabspotting* demonstrate the possibility of understanding the city from the accumulation of individual acts. Through the multiplicity of itineraries, the collective order of the city begins to emerge, a map defined not from above but from below, from the interactions of individual inhabitants of the city. Geographer and graphic designer Rebecca Ross in *Perils of Precision* posits the question; is such a collective map in its accumulative “fuzziness” and x-ray quality even more precise than the maps “presented behind a façade of precision and expertise”. The accurateness in the “fuzziness” that Ross speaks about in the *Amsterdam RealTime* project is what emerges out of accumulation. It is like the blurry yet definite triangle revealed by the routine of the girl in Paris over a year. However in this case the “fuzziness” is the collective accumulation of the numerous users of the city and not the accumulation of one

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single user. More importantly it is the accumulation of ground level reality and not the abstract reflection of an authoritative single mapmaker. Ironically, Ross notes that this fuzzy quality is x-ray looking. It does reveal to us the inner-workings of the city as a body under analysis. The interiority of the city is visualized through the markings of activity that accumulate as GPS lines that emerge, move and flow like the life of the city and like the systems of a living body under analysis. But are they x-ray like in that it provides us with a view inside?

While these two projects attain the multiplicity of the city and of the multitude of trajectories happening daily and are temporal and changing as the city does, these documents are still views from afar, they are planometric and flat, and from above and do not possess the picturesque "evoking of lifelike images" aspect of the city. Is it possible to return to the balance between the "intellectual and mathematical" and the "pictorial and sensual knowledge" of the early maps that urban historian Luci Nutti speaks about in Mapping Places: Chorography and Vision.

## Mathematical and Sensual, the Body and the City

The attempt is to create a hybrid, a new kind of document, one that allows these dualities of the realistic and abstract, picturesque and analytical to coexist. Cycling as the city cycles, the inhabitants write and read their stories on the streets, alleys, parks and sidewalks of their terrain vividly and precisely as they go about their daily routines in the BiCi\_N Project. Described and narrated through the imagery of the scenery and conversations recorded on the A/V device and grounded with the details of the data inscribed by GPS, the city of Barcelona is revealed as "pictorial and sensual, intellectual and mathematical" via daily routines and interactions. A two-week sketch of the project has been completed in 2008 with the participation of 6 volunteers using the Bicing bike sharing transportation system of Barcelona. The next version will involve equipping directly numerous bicycles of the Bicing system directly with these devices. The hybrid A/V/GPS device will be housed within the bicycle's light enclosure on the handlebar and powered by the pedaling of the cyclist. The device will stream a live feed of data to be archived into a searchable database in which the collected time code (A/V) and (GPS) information will be synchronized, blending the realism and sensuality of experience with the detailed discovery of the physiology of the cyclist as related to the geography and place it occupies. Might it be possible for us to analyze this data the way that a radiologist analyzes a CT-scan?

The Chronocyclegraph of bricklaying by Frank Gilbreth of 1912 are uncannily similar to the GPS drawings generated by Amsterdam RealTime,

Cabspotting and BiCi\_N. The visualization of the "fine details of hand movement of an assembly worker over time" (wikipedia) in the chronocyclegraph resembles the accumulation of movements of the city's individual users in these projects. Both of these types of x-ray looking visualizations, the ones from 1912 and the recent ones reveal ephemeral details of a body in movement. The earlier version looks at the activity of the user as related to his own human body, the other extreme, the more recent studies looks at the relationship of the activity to the body of the city. In the same way that information such as weather, time and topography is derived and graphed from the longitude, latitude location, and altitude information of the city users as marked by the GPS device, the chronocyclegraph, from the Greek term Chronos (time), is itself a graph of cycles in time. This method/device charts and examines this information in order to improve ease of movement and efficiency. What does this suggest for the potential of the GPS as a device/method between the human body and the city body?

The photographs by scientist and chronophotographer Étienne-Jules Marey, which also look like x-rays in motion or Cine CT scans and GPS drawings, were significant contributions to the development of cardiology, aviation and moving image. As disparate as these areas seem, they refer to the extreme of scales and fields that I am proposing we merge here and of their latent relationship. Marey who started his research by examining the movement of blood in the human body, in 1863 improved the Sphygmograph from the 19th century into a portable device that not only measured blood pressure but also charted graphically the beat of the heart. He was able to amplify this repetitive internal rhythm of the human body of pulse waves into a drawing in what we know today as the 'blood pressure cuff'. The portable GPS of today is similar yet capable of not only measuring the human heart but also measuring the beat of the city. It is possible to write, measure and analyze both of these drastic scales simultaneously and in relation to each other? And what is the potential of combining this with quantitative abstract information with the sensory potential of moving image?

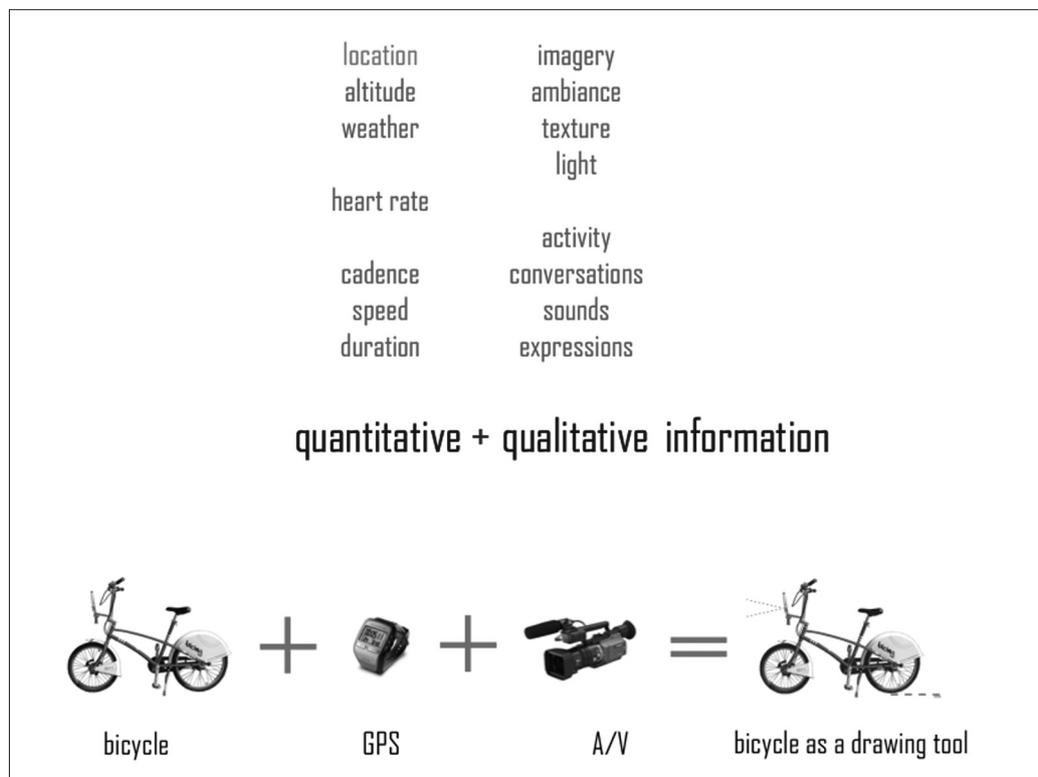


Figure 2. Bicing bikes equipped with GPS/Audio/Video

## To Scale: Reversal, the Map as Living Story(ies)

The convergence of video and GPS began occurring recently in the Internet on Google Earth and it has been used for the past few years for documentation of extreme sports. These professional athletes want to be able to both map their experiences but also map their performance data. In MotionBased, athletes are mapping a personal itinerary before a sport event and later uploading the retrieved data of their activity from the GPS device and a synchronized video camera to analyze their performance in great detail in order to improve their performance. Could we say that this is a collective version of what Marey and his contemporaries like Eadweard Muybridge were doing in the 1800s with chronophotography. In this case it is the individuals themselves who are able to analyze their own data, their own movements, deficiencies, forces at work, in order to strive for their optimum performance. As architects, urbanists, and other designers we need to tap into this potential. Will we understand our deficiencies if we visualize the data of both our bodies: our own and that of our cities as a kind of self-diagnosis? This is only possible if we visualize the interiority of our bodies, human and city in all of their qualities, qualitative and quantitative, pictorial and mathematical, sensual/experiential and scientific/abstract.

Just two years ago Immersive Media Corp. signed a contract to license street-level images of North American cities to Google Inc. to create an experience based mapping that you move through. The system which "generates synchronized, high resolution video streams representing a full-motion spherical world that can be experienced live or in a recorded form" has already documented many of the streets on our globe and these maps are already being used worldwide by people online. At around that same time Nokia, knowing the significance of the relationship between people's physical and Net space was competing with Google for the linkage between portable devices and the Internet, introduced the N96 portable phone, a device which allowed for videos to be shot on location and to be 'geotagged' (uploaded with their exact physical location) into a website similar to Google's video posting site YouTube. As a kind of body/city apparatus, the newest feature of the N96 is a 'walk' feature and an 'accelometer' feature, which detects shift of direction as the body walks the city. The free Internet sharing service share on Ovi allows uploading and sharing in a variety of formats in an interactive community similar to the online social networking site Facebook. Likewise many similar gadgets and online communities exist now. We are already immersed in these technologies and their potential, but not in a way that rigorously combines these various contrasting sensibilities and exploits the analytical potential of this multifaceted hybrid.

The implications of the understanding of the relationship between the body of the city and the human body are immense. This kind of document will facilitate collaboration between architects, planners, designers... with sociologists, doctors, physical therapists, environmentalists, scientists... a relationship which is necessary at a time when our environment is so quickly changing and being affected by our bodies and our actions, and at a time when we are being so negatively affected by the many cities that we have created which do not acknowledge the human body in need of movement and social interaction and at a time when our technologies presents us with so many possibilities at the collective level.

In *A Universal History of Infamy*, Jorge Luis Borges speaks of a map, which was the size of the territory, which it mapped. The map was so large that it had to be folded and unfolded and began to deteriorate becoming useless and irrelevant (Borges, 1972)

Why look at this cumbersome map when the information was also in the territory itself? Are we arriving to the full-scale map of this fiction? And is it irrelevant? Or does the map become even more relevant? As the city occupant cycles through Barcelona, Borges conceit of a map at full scale in *A Universal History of Infamy* is realized not in dimension but in precision in the BiCi\_N project.

Today we have the capacity to represent the city in all of its qualities; realistic and abstract, immersed and removed, qualitative and quantitative and to arrive at precision by the collective involvement of the routine of the city. With the representation of this material also as moving and changing, constant accuracy is maintained empowering us with an "improved flow of information from citizens to decision-makers, and a strengthening of the form of our built environment" (Ross, 2006). Will inhabitants participate more directly in the understanding of their actions and of their bodies and also therefore also in the design of their cities? Will the body of city and of the human body be continuously optimized? Does the living map become more relevant by remaining "daily and indefinitely other"? (de Certeau, 1988) The plan for the next stage of the BiCi\_N project is for it to exist online as a "living map" of anonymous yet detailed data of the life of a city and as an open source document for us to access and read our own deficiencies and potentials but also for scientists and artists to analyze and interpret. What do calories burned, and body mass mean as related to length, speed, imagery and sound? What do latitude, longitude and topography mean as related to heart rate and mood? What do we understand by density of movement, interactions, delays, detours as experiences accumulated on a place? What is revealed about the sensual and the abstract and about the intimate relationship between the city and its occupants? And how do we benefit from visualizing this intricate ecology?

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