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**Digital Personal Space:**

**From the Plaza to the Global Canopy**

**Abstract**

This article discusses how ubiquitous computing, big data and the Internet of Things are changing the form of personal space. The study presented is substantiated by a series of tests conducted in the public space of the Plaza de Los Palos Grandes in Caracas. This square consists of a public library, a square and annexed services. The aim of this work is to visualise the discrete nature of the data cloud that surrounds people in the public realm while they communicate through the Internet. Building on a number of spatial definitions of personal spaces, including Sommer’s soap bubble and Sloterdijk’s notions of sphereology, this study suggests that today’s personal space can be more accurately represented through the form of a global canopy, where invisible vectors intersect without disturbance. This study describes how public activities in the square exceed the physical space of the plaza and extend to larger urban and global scales.

**Keywords**

Personal Space, IoT, Big Data, Plaza, Public Space.

**Introduction**

Data are everywhere, they surround us and are constantly generated as the outcome of our daily and mundane activities, such as sending emails, messages, looking for directions or phone numbers, or simply entering into a carpark. Data produced in the public realm can be regarded as the complex combination of algorithm-driven automated processes, artificial intelligence and data processing operated by machines that constantly observe our behaviour in the physical space. For each individual action in the public space (walking, entering buildings, communicating through connected devices), a set of data is produced, divided in packets, sent to a system of servers around the world, gathered again together, computed, analysed and finally stored in remote locations in the planet, awaiting to be retrieved for future use. Any action in the public arena corresponds to an increasing amount of data collected by machines. These data are invisible and, at the same time, ubiquitous (Greenfield 2010). But how and where are these data in the public space? To what extent do they surround us? How do they spatially relate to each individual and her/his personal space? What happens when the cloud of data generated by an individual encounters another individual’s cloud? Finally, how is the public space changing as a consequence of this increasing deluge of data pertaining to each individual?

This study explores these questions in the attempt at understanding the extent to which data have an impact on individuals in the public space, providing an insight on the physical dimension of information technologies in the built environment.

**Data, Individuals, and the Plaza**

The technologies available today pose challenges when seeking a comprehensive overview of all the data that each individual produces and consumes in his/her daily activities. Google provides a simplified list of the data that are generated or collected while carrying out usual daily online activities, such as Google searches, map directions, or streaming videos. The list includes: websites visited, videos watched, device-related information (location, device information, IP address and cookie data), and personal details (name, email address and password, date of birth, gender, telephone number, contacts, calendar events, photos and videos uploaded, documents shared, and emails sent and received on Gmail) (Google 2017). These data are gathered and owned by the companies that offer specific services (internet provider, email service, social media, etc.) and are most often not disclosed to the individual that generated them. The current difficulty in creating a reliable overview of all data around each individual is due to both the complexity and ramification of the datasets involved, and the challenge in accessing the data in their entirety.

Several experiments and projects have been successful in providing a partial view, isolating different datasets and online activities, including relationships established through the web and self-tracking. One type of spatial networking has been identified by Smilkov (2014) and Jagdish (2014). In their project, ‘Immersion’ (Immersion MIT Media Lab 2017), they analysed the relationships established by individuals through emails, resulting in a series of patterns generated by metadata. Self-tracking (Lupton 2014) represents another data type that can be gathered and easily isolated for partial analysis. Swan (2013) explained that individuals today are ’engaged in the self-tracking of any kind of biological, physical, behavioral, or environmental information’ (2013:85) through the movement known as quantified self (QS). An illustrative example of self-tracking of own daily activities can be found in the case of the German politician Malte Spitz. He decided to make the data gathered by his mobile provider from August 2009 to February 2010 available to the public (Bierman 2011).1 The online newspaper, ‘Zeit Online’, generated an interactive visualisation whereby Spitz’s activities could be sorted by date, time, or location. The data were combined by Zeit with other data freely available online, such as comments and other activities on social media, and related to the existing tracking (Bierman 2011). These visualisations provide a clear graphic representation of how data are generated and their spatial and temporal translation. However, they also suggest very little about the spatial relationships between the data and the individual who produces them.

Considered as a physical space, the square is one of the traditional urban settings where public life can be observed in all its complexity and richness. Setha Low offers an important account of how social, cultural, and political aspects of public life are intertwined with the physical space in squares (or plazas) (Low, 2014). A variety of case studies analyse this point is in detail, including the Moore Street Market, Brooklyn, New York (Low, 2014), the Parque Central and the Plaza de la Cultura in San Jose, the capital city of Costa Rica (1997), and the Latin American plaza in general (2010). In particular, Low explained how the vendors and shoppers of the Moore Street Market in Brooklyn, together with the neighborhood’s residents, generate space through their body and movement while carrying out their daily activities. Low defines this agency as spatial embodiment, whereby ’it is through this embodied space that the global is integrated into the spaces of everyday urban life and becomes a site of translocal, transnational, as well as personal experience’ (Low, 2015:37). Squares and streets become the place where space is produced through the mediation of social processes (2014:35).

Low’s work is seminal in providing both scholars and citizens with insights on use and production of space, on the relevance of specific architectural elements in the square, and the importance of the plaza in the context of the neighbourhood and the city. However, her findings do not include the digital connotations that seem to increasingly characterise the public space today. This aspect has been studied by many authors (among others Batty 1990, Thrift 1994, Dodge, Graham, and Marvin 2001, Kitchin and Dodge 2011). In particular, Graham and Marvin (2002) address how the public life has rapidly evolved finding new manifestations between the physical and digital urban environments. Graham argues that telecommunications and new infrastructural systems are utilised to ’recombine the urban world in new ways which bring the physical and social aspects of cities into continuous and constant interaction with the electronic worlds of telecommunications’ (Graham and Marvin 2002:49). This shifting of activities from the physical to the digital is in line with a sort of demise of the physical space as the main theatre of social life. A number of authors (Sennett 1978, Brill 1989, Krieger 1995 among others) emphasised the decline in the use of public space, mainly referring to the physical space, where many of the public functions that traditionally happened in the public have migrated to the private sphere (Carmona et al. 2010: 110). Since the 1990s, physical urban spaces such as highstreets or squares underwent a process of reconfiguration and adaptation to respond to the growing use of digital technologies, which are today almost ubiquitous. With the advent of social media, in particular, people started to engage with the digital sphere almost continuously, while inhabiting physical spaces. This has called for an adaptation of urban spaces to facilitate these new uses. In particular, this study examines the digital sphere as the personal space generated by each individual in the process of utilizing the physical space of the Plaza de los Palos, while simultaneously navigating the digital spaces at its reach.

[Figure 1 here]

**Plaza de Los Palos Grandes and The Digital Layers**

In order to understand the impact that data have on the social processes that happen in the public space today, and how data influence people at the individual scale, the author carried out a number of observations in a complex public space. The chosen place is the Plaza de Los Palos Grandes in Caracas, Venezuela. The Project is at the centre of a process of regeneration of the homonymous district, located in Chacao, in the east side of the city.

This square originates from a bottom-up approach, where in 2006 residents requested to the municipality the creation of a new public space in a vacant area. This plaza represents a fundamental area of redevelopment for Caracas as contemporary metropolis. For example, Gómez de Marín (2009) explains that Plaza de Los Palos Grandes is part of a number of projects of spatial reconstruction that generated new centralities as the result of a successful mixture of residential, commercial and industrial programmes (Marín 2009:5). This plaza, together with the whole district of Chacao, represents perhaps the most international and outward-facing part of Caracas, connecting the city to a network of global finance and trades (Cariola and Lacabana 2001). Mitchell (1998) described in detail the progressive economy and significant growth of this municipality. Its Plaza de los Palos Grandes epitomises the active urban activities that characterise Chacao, and is the result of major political and economic investments that resulted in a very successful social environment, where the public space is characterised by a high level of connectedness and social interaction.

The project of the square and annexed public spaces was designed in 2008 by the firm Arquitecto Edwing Alejandro Otero & Asociados, and opened to the public in 2010 (Entre Rayas 2017). The compound comprises a public square, a library and a series of open spaces freely available for people to meet, work, or simply relax. This urban space is utilised in a variety of ways by the locals. Outdoor sports activities are organised for elderly and youngsters, including Tai Chi classes, yoga, and other sport-related initiatives. With their outfacing orientation, the annexed buildings offer a constant visual and physical relationship to the square. The Toy library (ludoteca) and the library, for instance, interface with the open space of the square through a glass façade, creating a continuous permeation of the interior spaces into the exterior. The square is inhabited all day from morning to night and populated in the weekend with different activities. Bars, cafeterias and other retails provide a constant reference for the neighbours, and are combined with the temporary reconfiguration of the square (for instance to host the weekly local market on weekends, or extra social events).

The programme offered by this area provided a suitable combination of different types of spaces for the observation, including open and enclosed areas, interior and outdoor spaces with their hybrids (canopies, open entrances, spaces under the awnings, etc.) and, in general, an overall fluidity of public life within the available spaces of the built environment.

All the activities observed in the Plaza de los Palos Grandes entail social interactions of physical nature, where people can meet and see each other based on their physical position, presence and movement. The observation carried out by the author and his research team in this work targeted the invisible layers of social interactions and the way people produce their space by means of using digital technologies while navigating through the square.

[Figure 2 here]

In order to visualise the invisible layer of social interactions through data, we set up an open WLAN (Wireless Local Area Network) to which people could connect free of charge. We made the Wi-Fi available for 12 hours in order to collect a relevant number of data packets. Within the timeframe, 123 individuals connected to the network, establishing a total of 59,684 connections, each sending and receiving packets of information to a variety of servers across the world. The packets included the exact location (latitude and longitude) of the servers to which users had connected, the direction of the connection (in or outbound) and the number of occurrences. We then analysed the packets and the location of the servers to which each user connected. Figure 3 illustrates the connections from the access point provided to the servers around the world. Finally, we rendered the individual connections as lines in the digital model of the Plaza de Los Palos Grandes to visualise the presence of data produced by each person.

[Figure 3 here]

[Figure 4 here]

The nested lines in Figure 4 illustrate the complexity of the data traffic in the public space produced by these 123 users. Isolating one user at a time (Figures 5 and 6), the activity related to one person is clearer and its spatial relationship in space becomes more visible. We used the digital model of Plaza de Los Palos Grandes as platform to include the data connections gathered with the WLAN packet capture. The analysis of the digital environment created allowed us to speculate on the series of observations made on the Plaza. Considering the direct connections between people and servers, we noted that the digital environment of the Plaza is characterised by five common aspects that relate to the geometry of the lines that underpin the connections. A dense set of lines radiates from each individual connecting the person to a myriad of other points. The lines intersect the physical space (building and urban furniture) and other individuals, creating a dense and complex system, which is in continuous adaptation to the (digital and physical) environment. As individuals move around the physical space of the Plaza, and people connect to different websites or web services, the lines change their trajectory. Finally, the connections are made of data, namely invisible to the naked eye and, due to the global nature of the Internet, potentially infinite in their reach. The trajectories of all this data share the five features that follow.

[Figure 5 and 6 here]

1. Data are radial to each individual

From each individual originates a radial set of lines of which the centre is the individual him/herself, while the other end is located in servers in the global Internet system. As individuals move in the public space, the radial configuration that their mobile devices generate follows them. The far ends of the communication lines stay virtually in the same position (once the server has assigned a specific route for the packets), while the person can move within the area covered by the Wi-Fi signal.

2. Data are complex and nested

Albeit the visualisations of Figures 5-6 would suggest that the data are exchanged in a linear manner, the methods which are used to packet and parse the information are far from being linear. Depending on a number of variables, including size, type of data, servers, etc., data are discretised into small packets and sent through different routes and servers. Each packet maintains information about its final destination and sequence in the final reassembly of data. What, at the user level, is simple information (e.g. a text message), for machines represents an organised sequence of separated data. What, for users, may be easy to imagine as lines, for machines looks more like a complex and nested set of points that carry out bits of information.

3. Data geometry is dynamic

The linear radial representation used in Figures 4-7 exemplifies the way data are sent from an individual to the Internet. Looking closely, the geometry of such data exchange is more dynamic. The TCP/IP (Transmission Control Protocol/Internet Protocol) controls the movement of data on the Internet, dividing information into packets, routing them and ensuring that they are reassembled correctly at the intended end. In particular, the TCP protocol ensures that each packet has only one path to destination, and that packets are received in the same order of which they have been sent (Doyle and DeHaven 2005:41). To date, an accurate configuration of the TCP over the Internet does not exist; however, several attempts have been made to visualise it. For example, Burch and Cheswick (1999) have initiated the project of mapping the Internet (Cheswick 1999), whereby a series of visualisations are provided that show the complexity and dynamism of the data travelling across the Internet.2 The ISPs’ (Internet service providers) maps are characterised by an intricate ramified configuration built around nodes from which several connections branch off, explaining how the routing on the Internet can be regarded as a dynamic process to the most effective path finder, depending on variables like the time of the day (Dabbagh et al. 2014: 55).

4. Data are transparent

Figure 4 shows a complex network of intersecting lines generated by different individuals with their devices. As Wi-Fi signals are not repulsive to each other, the different packets sent via the WAN do not show any interference amongst them. They behave as if they were mutually transparent, crossing each other without contaminating the information carried out.

5. Data have a global canopy

Following the logic of the multiple connections, we observe that a mobile device sends the information to a Wi-Fi router, then servers, then –through the TCP- to other servers, and then, eventually, to the final address. Data originate from each individual, then are ramified and dispersed through the Internet. The potential global extension of each data set is worldwide. What starts as a personal information (e.g. an email to a close friend) generated in the intimate space of a personal device has global reach in spatial terms.

The findings of this experiment are a means to better understand the physical extent of the personal space in the digital era. Several forms of personal spaces have been compared to the findings of this study in order to speculate on a possible evolution of personal spaces as a consequence of the ubiquitous use of computing devices in public spaces.

**From Personal space to Digital personal space**

As this study shows, personal space is an intimate entity belonging to each individual within a shared space that is the public realm. Sommer (1969) developed a detailed account of this notion by wherein he described the mechanisms that underpin the spatial appropriation, the space perception and the application of spatial norms to specific settings for both individuals and groups. In particular, Sommer scrutinised the process of invading each other’s spaces (1969:26). He recurred to Schopenhauer’s metaphor of the Hedgehog's dilemma (1874) to illustrate the idea of an invisible aura of individual space of which boundaries are variable, depending on cultural values, density and specific situations. From a behavioural perspective, the individual space is related to the perception of distance between individuals, to the extreme point that: ‘if there is only one individual present, there is infinite individual distance, […], which has also been described as portable territory, since the individual carries it with him wherever he goes’ (Sommer 1969:27). Interestingly, Sommer described this aura as a soap bubble and ‘breathing room’ (1969:26).

Edward T. Hall (1966) offers a comprehensive study of the relationships between space and perception, chiefly through sensorial inputs. He related the distances humans maintain to each other with behavioural reactions, providing a taxonomy of what he defined as ‘situational personalities’ (1966:115). Within this, he included the intimate (overwhelming due to sensory inputs, p.116), personal (small protective sphere between itself and others, social (where the distance marks the limit of domination, and public distances (well outside of the circle of involvement) (116-123).

More recently, Sloterdijk (2011) analysed the idea of personal space through the metaphor of sphereology. He explained that ‘the sphere is the interior, disclosed, shared realm inhabited by humans –in so far as they succeed in becoming humans’ (2011:28). Klauser (2010:328) underlined the importance of considering the interlinked entities of today’s society in a three-dimensional framework due to its volume and complexity. He explained that: ‘the contemporary fortress city appears as a complex structure of more or less tightly regulated and hermetically enclosed spherical multiplicities that are formed by complex processes and bound together by relationships of reciprocal implication and cofragility’ (Klauser 2010:336). The idea of personal space as a sphere is extended to the urban scale with the notion of foams and foam cities (Sloterdijk 2007, 2008, 2016). Sloterdijk described individuals as insular entities that need to interact through their partially shared borders. He represented communal social moments like a ‘school class’, a ‘concert audience’, a ‘mass of automobilists caught in congestion, or a taxpayers’ association in a meeting’ as ‘co-isolated and networked islands that must be connected momentarily or chronically to adjacent islands to form medium-level and larger structures’ (2016:564). Within this perspective, Sloterdijk described large-scale buildings as containers of public life, where the ‘true function of metropolis […] is to provide the neighbourly coexistence of centres and non-centres […] as an agglomeration of layering of discrete spatial potencies: collectors, businesses, the dwelling and the moulded surface under the open sky’ (2016:611).

The considerations on the existence and possible morphologies of the personal space provided by Hall and Sommer are relevant per se, for they provide an account of the relationships between behaviour and physical space that characterise the human condition. Although these suggestions of forms (soap bubbles or spheres) are still applicable and observable today, the pervasive nature of digital technologies has recently modified our understanding of the idea of personal space. If it is true that, amongst the factors influencing the determination of the subjective personal space, are the social and cultural contexts in which we live, it is also true that (digital) technology plays a substantial role in shaping these contexts.

The increasing use of digital technologies characterises human relationships, mundane activities and contemporary ways of divertissement, both directly and unconsciously. In the former category fall activities, wherein the individual is actively involved in the production of information, in sharing, receiving or emitting data. Examples of this range from taking and sharing a picture of our own experience on Instagram or sending an email, to buying the weekly grocery in an online supermarket through a smartphone app. The latter category comprises those cases where individuals perform daily activities disregarding any active digital involvement. For example, walking on the street or parking the car are activities where digital connection to networks are not immediately considered, yet they are increasingly present as an underlay in our daily lives. These are subject to a radical shift, which Manuel Castells has defined as the gradual ‘disassociation between spatial proximities and the performance of everyday life’s functions’ (Castells 1996:424). He describes the gradual shift of the urban form from a location-based model, to an informational structure where ‘because of the nature of the new society, based upon knowledge, organised around networks, and partially made up of flows, the informational city is not a form but a process, a process characterised by the structural domination of the space as flows’ (Castells 1996:429).

In the digital era, personal spaces are not necessarily coinciding with the physical space occupied by an individual. They can be the virtual extension of his/her actions in a digital environment. Beslay and Hakala (2007) explain that these personal spaces ‘can be created whenever is necessary for personal, community or global use […] they can be shared between individuals […] with similar hobbies or […] for working teams’ (2007:72). In order to define such spaces, and similarly to Sloterdijk, they utilise the notion of bubbles as something that ‘may be described as a semi-transparent membrane that can be tuned to function differently depending on the direction of movement of data’ (2007:72). On the same note, it is interesting to consider that Castells developed his concept of ‘space of flows’, suggesting the idea of a continuous and adaptable flow of activities, where the ‘material arrangements allow for simultaneity of social practices without territorial contiguity’ (1999:295).

In 2002 Sommer provided an updated account of the personal space where the digital age is included (Sommer 2002). He considers the digital interactions of individuals as implications of ‘aspatial technology on human spatial interactions’ (Sommer 2002:654), where online activities such as telecommuting and teleworking are examined. Sommer related the personal space to questions of invasions, appropriation, privacy and regulations (Sommer 2002:655). Albeit Sommer’s studies on the possible transportation of the notion of personal space to the cyberspace are grounded on the very beginning of the new millennium, his contribution is helpful within this context to speculate on the relationship between virtual and physical personal spaces. These two types of space are interrelated. For Sommer, the distance between individuals in a physical encounter diminishes if the two have already met virtually (that is online, in a chat room, etc.) (Sommer 2002:654). Finally, in his research on the notion of personal cities, Leveratto (2016) explored the idea of the city in a continuous evolution of forms and configurations, whereby the individual is exposed to an increasingly complex urban environment: ‘The urban topography no longer appears codified into clear patterns capable of establishing objective positional values, but it is continuously redrawn according to individual needs, points of view and habits’ (Leveratto 2016:429).

A growing number of projects and studies are testing and scrutinising the potential of new forms of personal and public spaces with digital technologies, making it increasingly easier to understand the changing nature of this phenomenon in a data-pervaded public realm.

Perhaps the most extreme scenario is depicted by Mitchell (1996), wherein the boundaries between the body and its digital extensions are blurred, temporary and continuously reconfigurable. According to him, ‘We will all become mighty morphing cyborgs capable of reconfiguring ourselves by the minute – of renting extended nervous tissues and organ capacity and of redeploying our extensions in space as our needs change and as our resources allow’ (1996:31). Mitchell rethinks the ‘carbon/silicon divide’ that characterises our relationships with personal space, and concludes that ‘distinctions between self and other are open to reconstruction. Difference becomes provisional’ (1996:31).

With Cloud City, Jonathon Anderson and Ming Tang (IaaC 2012:280) illustrate how the continuous redefinition of the boundaries between physical and digital in personal space may appear. Cloud City: a project that embodies the application of the personal space based on the use of digital technologies. The project features a new type of city where insularity reaches an extreme level. ‘Cloud City is built on the idea of a nomadic lifestyle, where geography has become irrelevant’ (IaaC 2012:280). In a utopian perspective, all information needed and produced by people is hosted in a super-cloud accessible from everywhere. Individuals do not need to have their homes and workplaces in a permanent physical place, they can live in a continuous movement accessing their own personal and professional assets and facilities disregarding the place in which they are.

Albeit the scenarios described by Mitchell, Anderson and Tang appear today, in some respects, still visionary, their studies suggest that the nature and form of the personal space is changing. Today’s personal space is augmented by a ubiquitous digital environment that can be considered an updated version of previous simple geometrical descriptions (spheres, bubbles etc.).

**Personal space as global canopy**

Sommer’s personal space assumes the form of a soap bubble that is generated by each individual and carried out as (s)he moves in space. Because the encounter of two individuals results in its break, this bubble is rigid and not permeable, implying the invasion of the individual spaces and perceived as a potential threat. The personal space described by Hall allows for different degrees of publicness and mutual distances between bubbles, albeit they are still considered as constructs that inscribe a space. These bubbles determine an inside and outside spatiality where the individual is either defined (inside the space), or neglected (outside of the own space - potentially somebody else’s territory). Sloterdijk and Klauser’s personal space is described through the analogy of the sphere. For the latter, this space is still hermetic and enclosed, characterised by the relationships occurring among individuals. For the former, the spheres assume undefined boundaries. Sloterdijk uses the foam as metaphor to reflect on the ineffable nature of the sphere’s contours. Individuals interact in the space of these boundaries that are, by nature, variable and flexible. The nature of the personal space’s contours is furthered by the idea of the semi-transparent membrane of Beslay and Hakala.

For these authors, personal spaces still have a spherical topology where, as the level of entropy of societies increases, the boundaries gradually assume a blurring configuration. The observations carried out in Plaza de Los Palos Grandes suggest that personal space in the age of ubiquitous computing and global connectedness has gained multiple additional layers. The spatialisation of data around each individual generated by their own devices indicates the disappearance of the sphere as the shape that better embodies the personal space. Global connections characterise the social life of individuals, whereby social actions and communications are discretised into packets and scattered around the globe in a matter of seconds, to be re-materialised in somebody else’s device, leaving traces in a dispersed constellation of servers. The sphere appears no longer adequate to represent this space for two main reasons. The first is that, although the data have a radial configuration departing from the individual, they are nebulised into a large number of sequenced packets and distributed through various routes across the Internet. The configuration that these data assumes, representing the personal space of each individual, would be more realistically described through the metaphor of an atmosphere, rather than spheres. The second reason lies in the fact that the boundaries of the personal space have been blurred so much that they have disappeared. In other words, the extent to which boundaries have been stretched has become global. Information is pinged back and forth through the globally-extended network of the Internet of Things. In this scenario, it is unrealistic to identify clear boundaries in the observation of the personal space pertaining to each individual.

The change of shape to represent the personal space is also characterised by the permeability of such spaces. Spheres, bubbles and foams have been described through different degrees of transparency and interoperability, wherein the contours are the place of either clashes (in the case of Hall’s studies on behavioural reactions) or inter-relationships (Sloterdijk and Klauser’s blurring boundaries of personal spheres). The experiment carried out in Plaza de Los Palos Grandes suggests that personal spaces are completely transparent and spatially independent. Due to the encrypted nature of the personal data, and their discretisation through the multiple channels of the Internet, the individuals’ personal spaces overlap without interferences. The invisible vectors generated by each individual while producing his/her space intersect other lines, and, hence, other personal spaces belonging to other individuals. Figure 4 illustrates the complexity of such personal spaces while intersecting each other without disturbance.

The form of the personal space is mutating as new digital technologies increasingly represent a global platform for social interrelations. The space of interactions among individuals is no longer clearly identifiable within the boundaries of an enclosed shape. The personal space is dispersed in the atmosphere. Unlike the previous descriptions of this space, where the limit was a crucial element to define its shape and the lieu of encounters, relationships, clashes, or invasions, today’s personal space is everywhere. Everybody’s personal space co-exists within the same physical space and it is continuously discretised and reassembled in different places. With this in mind, the observations at the Plaza de Los Palos Grandes revealed that people in this space communicate both physically, in a traditional sense, through in-person social interaction, and digitally through data, packets and servers, forming a global canopy, where data are radially emitted from each individual. The model used in this study illustrates the global and simultaneous ways in which people communicate in the public space today in those urban contexts where a reliable and accessible Wi-Fi network is provided.

**Endnotes**

1. The database is available at: <https://docs.google.com/spreadsheets/d/1PMjIkymwzYNGhENCi9BZst63H-UPagYgPO6DwHVdskU/edit?authkey=COCjw-kG&hl=en_GB&hl=en_GB&authkey=COCjw-kG#gid=0>

2. A series of maps can be seen at: <http://cheswick.com/ches/map/gallery/index.html> last accessed 15 Oct. 2017

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