

Spatial representations of neighbourhoods

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Abstract

The concept of neighbourhood may imply setting up boundaries that are often diffuse and with different levels of complexity. Six case studies with different urban, morphological and social characteristics in the municipality of Lisbon were analysed using surveys conducted on residents and non-residents. The aim was to expand on the concept and essence of neighbourhood through the analysis of cognitive representations of physical space, including their spatial configuration, and to point out the main limiting factors. The use of Geographic Information Systems enabled obtaining, processing and integrating spatial data, as well as analysing the synthesis results and subsequent crossing with different levels of geographical information and historical cartography, identifying patterns and establishing the fundamental factors for delimiting neighbourhoods.

Keywords: Neighbourhood; Geographic Information Systems; Lisbon; Spatial Planning; Urban Morphology.



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Spatial representations of neighbourhoods and Geographic Information Systems

1. Neighbourhoods in Lisbon

The concept of neighbourhood is diffuse, not only due to the complexities of the socio-spatial realities that define it, but also regarding the difficulty to set its physical boundaries, although its identity often allows identifying certain limiting factors and territorial homogeneous characteristics.

There have been several attempts to delimit Lisbon's neighbourhoods. Efforts made by various entities may give some clues on the studies of neighbourhoods. Examples include: *Direção Geral do Património Cultural* (General Directorate for Cultural Heritage) – DGPC, presenting several boundaries of Groups, Historical Centres and Areas; *Sistema de Informação para o Património Arquitetónico* (Information System for Architectural Heritage) – SIPA, currently part of *Instituto de Habitação e Reabilitação Urbana* (Institute for Housing and Urban Renewal) – IHRU, which has been conducting and disseminating several contents and boundaries of Urban Groups (www.monumentos.pt) and has also published the *Atlas SIPA dos Conjuntos Habitacionais/Bairros do IHRU* (Atlas of Housing Projects/Neighbourhoods of IHRU) – SIPA in 2011, identifying about 120 neighbourhoods, of which 12 in the district of Lisbon (Marques & Ferreira, 2002); The *Património Metropolitano* (Metropolitan Heritage) CD-ROM (Tenedório, 2001) of the Lisbon Metropolitan Area (AML) displays several urban centres for this territory, with particularly attention paid to the municipality of Lisbon; the *Atlas Urbanístico de Lisboa* (Lisbon Urban Atlas) (Salgado, 2006) features 56 neighbourhoods in Lisbon through maps, texts, profiles, parametric indexes, and photographs based on urban criteria, such as the quantitative and morphological relationship between built and open space, public and private space, organic and inert areas, land use and functional distribution. However, besides criteria such as architecture, morphology, genesis, urban fabric, the chronology of consolidation, functional distribution and the promoter, others like social, cultural and symbolic issues may be added (see the text by Gato in this volume, 2014).

The project Neighbourhoods in Lisbon 2011 addresses the spatial representations of neighbourhoods from the perspective of residents and users of the neighbourhoods. Based on the spatial surveying of six case studies in the city of Lisbon and resorting

mainly to mental maps, the project aimed to identify the different criteria and key elements for the spatial delimitation of each neighbourhood.



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2. (Spatial) Internal and External Representations

The mobility of some animals and humans is associated with the (sensitive) ability to read the territory and with orientation capacity, where mental maps play a major role. In addition, the human capacity to create/interpret symbols and external spatial information allows expanding the navigation skills. Cognitive maps are fundamental to the orientation process, enabling registering what we know about the physical space, providing navigation or orientation support, without which we would feel disoriented and lost. Reginald Golledge (1998) states that this process allows determining a route from the point of origin to the point of destination. Internal (mental) representations are processed dynamically and are interrelated with the information obtained from external representations (Zhang, 1996). External representations determine cognitive behaviour by providing inputs and stimulating the mind. Mental representations diverge from the physical environment, eliminating and/or adding entities (some non-existent) to the real world and inducing distortions and artificial structures (Engel, 2002 & Barkowsky, 2002). From a cognitive viewpoint, the structure of geographic and cartographic information can contribute to deepen the understanding of individuals in terms of perception, representation and interaction with the surrounding environment, especially with regard to value, which is evident for recognizing the properties of underlying mental structures and spatial cognition (Berendt *et al.* 1998). Kevin Lynch (1960) identifies five key elements associated with visual quality or readability of the territory:

- Reference elements;
- Roads;
- Limits;
- Confluence points;
- Neighbourhoods, urban areas or sectors.

The strong image retained by the observer or his/her imagination is further broken down into components: identity, structure and meaning. In a way, in terms of individual perception of space, (internal) maps allow understanding the essence of a neighbourhood and the main characteristics that individualize some of its internal homogeneity and heterogeneity in relation to adjacent neighbourhoods.



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3. Cognitive Maps, Geographic Information Systems (GIS) and Geobrowsers

Digital representations using Geographic Information Systems (GIS) as a tool for collecting, processing and disseminating data obtained through surveys on the civil society allow externalizing individual perceptions of cognitive internal (spatial) maps. Integrating a set of variables on the same system permits analysing, verifying, modifying, exploring, extracting, and modelling hypothetical situations that are unrealizable in the real world (Eve, 2012). Using digital representations in research has a number of advantages, especially with regard to the ability to create detailed models capable of viewing the evolution of past, present and future phenomena. Technological advances, particularly the capacity to represent the physical world, and computer modelling enable developing a growing number of virtual objects and/or environments (Koller, *et al.*, 2009).

Geobrowsers (navigation/search through digital geographic information on the Internet) have introduced innovations in data mining (in geographic terms), allowing viewing several levels of information (overlapping) provided by the public and private sectors, as well as by citizens who voluntarily introduce new data (Goodchild, 2007 *in* Marques, 2009). The development of Geobrowsers (e.g. Google Earth, Microsoft Virtual Earth, NASA WorldWind, ESRI ArcGIS Explorer) enables performing functions such as: pan, zoom and fly over for certain areas of interest. Satellite images and aerial photographs are the key base elements with the capacity of overlapping a number of other layers, often just for only one single function, which is visual perception, without any analysis capacity (Goodchild, 2008 *in* Marques, 2009). However, the overlapping of information layers enables the perception of these data and their correspondence with the bank of available images, thus falling far short of the equivalent capacity of a GIS (Goodchild, 2008 *in* Marques, 2009)¹. Indeed, "Google Earth goes substantially beyond traditional GIS in the ease with which data can be integrated on the fly" (Goodchild, 2008 *in* Marques, 2009). Geobrowsers allow a greater range of users, mainly with regard to the dissemination and viewing of spatial data.

4. Project Neighbourhoods in Lisbon 2012

The Project Neighbourhoods in Lisbon 2012 aimed to investigate the main characteristics of the spatial configuration and the major factors in defining six neighbourhoods in the municipality of Lisbon. The analysis of results was conducted considering the key elements addressed by several authors² (such as prominent features and points of confluence; roads, limits and boundaries; areas and surfaces), at the same time identifying their main functions, centre(s), unity and identity. The six case studies were selected according to criteria described by Soares, Ramalheite and Neves in this volume, resulting in neighbourhoods with different characteristics, especially concerning the genesis (mainly with regard to seniority and the existence, or not, of a plan) and urban morphology (implantation in the territory and topography, as well as the more or less regular layout: reticular, linear, radial or organic mesh): Ajuda, Alvalade, Campo de Ourique, Galinheiras, Graça, and Telheiras.

4.1. Methodology for preparing the cartography

For each case study, 100 surveys to residents and 20 to non-residents of six neighbourhoods in Lisbon were conducted. In addition to the definition and concept of neighbourhood – its characteristics, living conditions, relationship with neighbours, activities conducted in the neighbourhood, main functions of the neighbourhood, preferences, and level of satisfaction/needs - surveys focused on 1) identifying the centre of the neighbourhood and 2) setting the boundaries of the neighbourhood by drawing them on a map provided at the time of the survey and demarcating the border of the neighbourhood in question. These are two key issues for developing cartography using GIS.

The various boundaries obtained in the surveys were scanned, vectorised, overlapped and included in a GIS, allowing the processing of data into five classes (percentage) of levels of integration, with 20% variation intervals for the two sets of data: residents (in a total of 100 maps) and non-residents (in a total of 20 maps) (0-20%; 20-40%; 40-60%; 60-80%; 80-100%), the 80-100% class accounting for the spatial area that gathered more consensus in defining the neighbourhood, with the 0-20% representing the residual area.



Figure 1 – Overlap of the neighbourhood boundaries for the Alvalade case study taken from the surveys to residents (i) and non-residents (ii).



Figure 2 – Summary of the levels of intersection of the neighbourhood boundaries for the Alvalade case study taken from surveys to residents (i) and non-residents (ii).

Based on the definition of the neighbourhood boundaries obtained in all surveys, for each case study ten classes of spaces were obtained (5 classes per group) with greater or lesser incidence of intersection (intersection level synthesis maps). The survey results enabled identifying the centre of the neighbourhood for the six case studies. The digital representation of the synthesis results allowed to comparatively analysing the boundaries identified by the two survey groups with several biophysical and human factors that may influence the delimitation of the neighbourhood.

In order to relate the synthesis results for each case study, we also georeferenced several historical maps of Lisbon dated from 1857/1858 (Filipe Folque), 1807/1826 (José Fava) and 1905 a 1907 (Silva Pinto), to verify and explain some borders according to the evolution of the urban form and pre-existing layouts.



Figure 3 – Alvalade and Telheiras case studies. Georeferencing of the historical cartography of Lisbon from 1857/58 by Filipe Folque (sequence of transparencies: i, ii, iii). Historical cartography and intersection synthesis residents (iv) and non-residents (v). Synthesis cartography of the residents and Track Centres (vi).

Similarly, we included thematic mapping relating to the built area of Lisbon, especially regarding dating, chronology, category of buildings and neighbourhoods, and to the roads, railways, walls, ownership type, land use and occupation, in order to identify

physical and human barriers in the territory that are important to the delimitation of each neighbourhood.

Finally, the land digital model based on the current topography of Lisbon was also introduced with the aim of identifying the morphology/landscape features, such as inclines, orientation of the slopes, valleys, watercourses, and elevations which, associated or not with the urban layout, can be determining factors in establishing the boundaries of the neighbourhood. In addition to processing and integrating the geographical data in a GIS, we also made the summary results available to the general public in an interoperable and accessible format, through conversion into a geobrowser at no cost to the user.

4.2. Analysis of results

4.2.1. Neighbourhoods and the presence or absence of a plan

The characterisation of neighbourhoods through a typological analysis based on the presence or absence of a plan contributes to the interpretation and identification of limiting reference factors – planned neighbourhoods, whose urban plan (the architecture of the built space) results from a planning choice, and neighbourhoods without a plan, of organic nature and growth over time.

Generally speaking, one notes that in the case of planned neighbourhoods, the delimitation of the neighbourhood is inextricably linked to urban design (like Alvalade, Telheiras and Campo de Ourique). The dominant urban layout is clearly the main factor defining the neighbourhood. The routes (roads and railways) are crucial for its spatial definition, such as Alvalade and Telheiras, both in the sense that they often delimit the project area as well as within the plan. Accordingly, they establish perceptible spatial units (visible in the definition of the different classes of consensus of respondents) or form limiting physical barriers.

Regarding the case studies without a plan (Graça, Ajuda and Galinheiras), the determining factors that define the neighbourhood coincide, in addition to urban layout and roads and railways, with other prominent and limiting factors, such as physical barriers (i.e. landscape, hydrography), pre-existing zones, paths, lanes, walls, fences, convents, and churches.

However, the analysis of the maps shows the wide divergence between the presence or absence of planning in the formation of the neighbourhood, which is particularly evident in the more consensual or diffuse definition of its borders. Planned neighbourhoods have a more rigorous and concordant definition than neighbourhoods “without a plan”.

4.2.2. Landscape and urban morphology

The importance of topography in the delimitation of the neighbourhood is also highlighted in the analysis of the six case studies. In a city like Lisbon with a patterned landscape, ravines, valleys, and even the orientation of slopes are determinants for perceiving a neighbourhood as a unit, both in the case of planned neighbourhoods, such as Campo de Ourique, where the limit of the plan is in part defined by the actual topography, and

in the case of unplanned neighbourhoods like Graça. As for Alvalade and Telheiras, due to the fact that they are relatively flat areas of the city, one finds, interestingly, a more consensual interpretation of the territory, which may be explained by the prevalence of structural features in the area.

As regards the different types of urban space, in most cases the street turns out to be the backbone of the neighbourhood, identified both as a limiting factor and as the centre and the structuring element of the neighbourhood.



Figure 4 – Synthesis results for the Ajuda, Alvalade, Campo de Ourique, Galinheiras, Graça, and Telheiras case studies for residents (i) and non-residents (ii)

Despite being important confluence points, especially in defining the neighbourhood, squares and plazas attract less consensus with regard to defining the centre (although in the cases of Graça and Galinheiras, they are precisely identified as the centre of the neighbourhood). Some green spaces, gardens and urban parks may be delimitating areas and factors due to the break and discontinuity with the built area. These spaces may be considered marginal or excluded from the delimitation of a neighbourhood even when inserted in its physical environment – such as the Alvalade Woods and Campo Grande Garden, in the case of the Alvalade neighbourhood, or the Tapada da Ajuda in the Ajuda neighbourhood.

However, the Parada Garden in Campo de Ourique is the place consensually referred to as the “centre” of the neighbourhood. For the six case studies and in general, the neighbourhood area tends to be vaster for residents than for non-residents (figure 4), although in the strongest levels of interaction of the synthesis results (60-100%), this trend dissipated, with a higher level of detail and precision in the delimitation made by respondents.

4.3. Case Studies

Ajuda – The synthesis of non-resident surveys highlights the fact that there are no intersections above 80%, i.e. in this case it was relatively problematic to define the neighbourhood and above all to establish a well-defined centre. However, in the case of residents, two areas with a high level of intersection (80 to 100%) emerged, which may account for the same difficulty in defining the neighbourhood and an exact centre. Similarly, regarding the issues related directly to the centre of the neighbourhood, it was the case study with greater dispersion in the responses, with 29% indicating Boa Hora (trade and services area with great market importance), 26% choosing Calçada da Ajuda

(major trade area) and 18% indicating Igreja da Memória. However, only the 40-60% class of the residing population considered Boa Hora as part of the Ajuda neighbourhood.



Figure 5 – Synthesis results for the Ajuda neighbourhood case study, classes 40-60%, 60-80% and 80-100% for residents (i) and non-residents (ii)

Set in a south-facing area, the Ajuda neighbourhood has a diverse morphology, with some rugged terrain. Accordingly, it has a complex urban structure, which is reflected in the difficulty to delimit the neighbourhood. Several limiting factors were identified, with the Monsanto Park and the Lisbon-Cascais motorway, in the North, standing out; the Av. Da Ponte (main access to the 25 Abril Bridge) in the East and the River Tagus in the South constitute similar examples. Being a neighbourhood originally “without a plan”, when one observes the 60 to 80 % intersection class, both in surveys to residents and to non-residents, it appears that it clearly corresponds to the oldest urban structure around Calçada da Ajuda. Similarly, one can also establish a parallel with the elements’ Legibility and Imageability proposed by Lynch (1960), especially with regard to Memória Church, the Market and the Nossa Senhora da Boa Hora Convent (reference elements); Calçada da Ajuda (road) and the Square of the Ajuda National Palace (confluence point); the Conde de Lippe Barracks or the Ajuda Cemetery, reference elements and urban areas/sectors which, nonetheless, are not delimiting factors of the neighbourhood.



Figure 6 – Centre of the Ajuda neighbourhood (Boa Hora: 29%; Calçada da Ajuda: 26%; Memória Church: 18% of responses)

Tapada da Ajuda is considered to be an integral part of the neighbourhood, albeit at the lower intersection classes of 0 to 20% of respondents, as well as the Ajuda University

Campus (included in the 20 to 40% class), which may reveal some disarticulation with the surrounding urban fabric.

Alvalade – this is the case study that gathered more consensuses regarding its delimitation, presenting well-defined boundaries coincident with the several classes of interaction of the results of residents and non-residents. The so-called “Plano de Urbanização da Zona Sul da Av. Alferes Malheiro” – Urban Plan of the South Zone of Av. Alferes Malheiro - (currently Av. do Brasil) allowed residents and non-residents to establish the boundaries of the neighbourhood. The western limit of the neighbourhood is defined mostly through pre-existing areas verified in the historical cartography (~1905) near Campo Grande garden. In this area, which corresponds to the western limit of the neighbourhood, there are several delimiting elements, which, together, establish an urban discontinuity, both due to existing vegetation in contrast to the oldest built area, and to major structural axes, such as roads. The remaining delimitations made for the Alvalade neighbourhood correspond largely to the surrounding main roads. In the east, a high percentage of responses mention Av. Almirante Gago Coutinho as the boundary of the neighbourhood. In the south, three main roads are indicated: Av. Estados Unidos da América, the railway around the Roma-Areeiro station and Av. João XXI. In the north, Av. do Brasil is mentioned mostly by the class above 40% of the resident and non-resident population. Of note is the extension of these limits, especially in the lower classes (~0 a 40%) until 2ª Circular (including Júlio de Matos Hospital and the Laboratório Nacional de Engenharia Civil – Civil Engineering National Laboratory), thus outside the area covered by the plan.

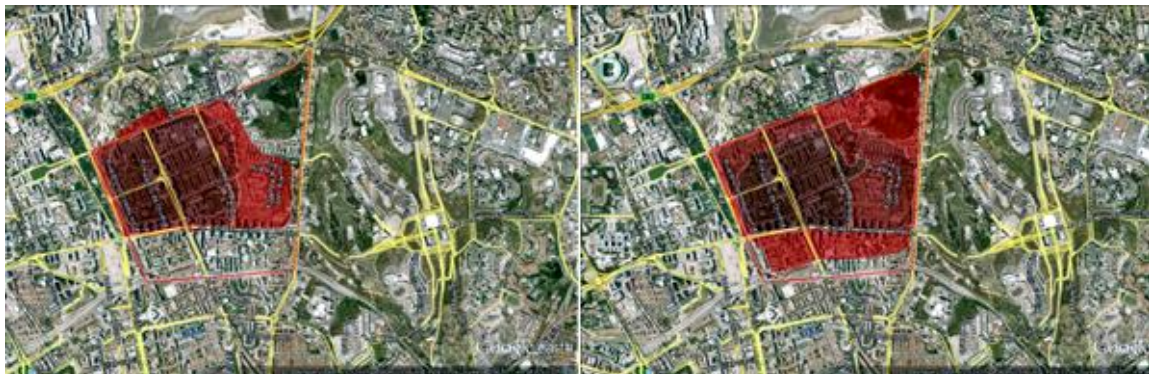


Figure 7 – Synthesis results for the Alvalade neighbourhood case study, classes 40-60%, 60-80% and 80-100% for residents (i) and non-residents (ii)

The landscape may also be a determining factor in defining the neighbourhood. The fact that it is a relatively flat area facilitates the consensual legibility of the neighbourhood, with the roads becoming the major structural elements of the territory. Since the Alvalade neighbourhood grew out of a plan, the urban layout is defined according to different homogeneous units, both in terms of urban space and of the architecture of the buildings. This interpretation according to urban space units is clear in the analysis between class transition, where the included elements are homogenous units and not diffuse limits, such as the inclusion of the area of houses, Júlio de Matos Hospital, the Av. E.U.A. and the Alvalade Woods.

The cell delimited by Av. do Rio de Janeiro, Av. dos E.U.A., Av. do Brasil and Campo Grande is the one that gathers more consensus (referred to in the classes of 80 to 100%)

of resident and non-resident respondents), and is characterized by high homogeneity in the urban morphology. Regarding the 60 to 100 % class and in the case of residents, the Church of Alvalade and the eastern street front of Av. do Rio de Janeiro are included, while in the case of non-resident, this class also covers the area of single-family houses to the east. As regards the inclusion of prominent features, one notes that only 0 to 40% of residing respondents consider the Alvalade Woods to be within the limits of the neighbourhood, which may illustrate the weak relationship that this park has with the neighbourhood.



Figure 8 – Centre of the Alvalade neighbourhood (Av. da Igreja: 57%; Praça de Alvalade: 16%; Igreja de Alvalade: 10% of responses)

The Alvalade Square (confluence point) and the strip (road) extending to the São João de Brito Church (prominent element), i.e. Av. Da Igreja, are mentioned the most as the centre of the neighbourhood.

Campo de Ourique – Its urban morphology, particularly the reticular mesh of the neighbourhood, stands out in the delimitation made by both residents and non-residents. However, this homogeneity may be associated with the landscape and pre-existing built areas. The flat topography gives homogeneity to the urban morphology and explains the consensus in delimiting the neighbourhood. The steep slope of the Alcântara Valley clearly defines the western boundary, in the opinion of all respondents.

The historical cartography shows that Av. Ferreira Borges (one of the main roads in the neighbourhood) coincides with the layout of the Águas Livres aqueduct (or subsidiary section), and was referred to as being a strong boundary. Residents also included (in terms of intersection percentages of around 60-80%) the Campo de Ourique Barracks, while non-residents set a boundary closer to Av. Ferreira Borges, albeit less defined. The place names also give some clues regarding the inclusion of Rua de Campo de Ourique in the delimitation of the neighbourhood in the north. Rua Saraiva de Carvalho is the main boundary of the neighbourhood in the south, both for residente and non-residents, while in the west, the boundary is divided between Rua Sampaio Bruno (limit of the reticular mesh) and Rua Maria Pia (which somehow circumvents the west/southwest section).



Figure 9 – Synthesis results for Campo de Ourique case study, classes 40-60%, 60-80% and 80-100% for residents (i) and non-residents (ii)

The centre of the neighbourhood is Jardim da Parada (which is simultaneously the prominent feature, confluence point and end of the urban continuum), with about 57% of survey responses.



Figure 10 – Centre of the Campo de Ourique neighbourhood (Jardim da Parada: 57% of responses)

Similarly, Campo de Ourique Market and Santo Condestável Church are within the boundaries of the neighbourhood. However, Prazeres Cemetery comes out as a diffuse boundary between classes, as well as the Josefa de Óbidos High School, which is only included as an integral part of the neighbourhood by the lower classes (~0 a 60%).

Galinheiras – For both residents and non-residents, the Galinheiras neighbourhood is the smallest area, with a high degree of detail in the definition of its delimitation. This exclusion and precision in delimiting it may be due to some stigma associated with this neighbourhood, even when different intersection areas in the 80 to 100% class are individualized by both residents and non-residents. In the case of residents, out of the three identified areas, two are irrelevant due to their size, and the third area, larger, also presents a relatively restricted area that is not coincident with the highest intersection area, out of the two defined by non-residents.



Figure 11 – Synthesis Results for the Galinheiras case study, classes 40-60%, 60-80% and 80-100% for Residents (i) and Non-Residents (ii)

The Galinheiras neighbourhood, unplanned and of informal origin, features a type of delimitation associated with pre-existing constructions. In the 1911 historical cartography, the defined area that gathered greater consensus among residents (80-100%), corresponding to the intersection between Estrada da Póvoa and Azinhaga das Galinheiras, stands out. In the case of non-residents, Largo das Galinheiras, at the crossing with Estrada Militar, is the area chosen. The south zone characterized by the “villages” is still included in this class. Generally speaking, the results from non-residents point to a boundary further south, where more recent housing and the Galinheiras Basic Education School can be found. Residents tend to identify the north part, defined by pre-existing areas like Azinhaga do Reguengo. The Estrada Militar - Military Road - associated with the steep topography defines a strong boundary of the neighbourhood in the north for classes 40-60%, in the opinion of both residents and non-residents. The “Galinheiras Municipal Allotment” (EUROPAN) is only considered to be part of the neighbourhood in the 40-60% classes of non-residents and 20-40% of residents.

In the defined boundaries, administrative borders are respected and quite clear to all respondents, especially given that the neighbourhood is located in an adjacent area of the municipality of Lisbon.



Figure 12 – Centre of the Galinheiras neighbourhood (Largo das Galinheiras: 88% of responses)

Largo das Galinheiras (confluence point) is indicated as the centre of the neighbourhood (with the highest percentage of responses: 88 %), where users of public transport commute to and from on a daily basis, creating a dynamic atmosphere that excludes residential areas.

Graça – The boundaries of this neighbourhood are quite coincident with the responses given by residents and non-residents in the various intersection classes. In this case study, topography is, once again, a crucial element in defining the neighbourhood, showing a strong relationship between urban morphology and the modelling of the landscape and inclines. This is particularly evident in the eastern delimitation, marked by the area around Vale de Santo António, and in the west side by the slope adjacent to Miradouro de Nossa Senhora do Monte.

The 80-100% classes include, for both groups, Largo da Graça and the axis that extends from it northbound across Rua da Graça to Rua de Sapadores, to the east across Rua do Sol à Graça and to the west to Rua and Travessa de Nossa Senhora do Monte. With regard to the remaining classes (below 80%), there is an extension up to Miradouro da Graça in the 60-80% class and to Calçada da Graça in the south in the 40-60% class. The north border remains in Rua dos Sapadores and in the east, in the surveys to residents, the boundary is located approximately in Rua da Bela Vista à Graça in the 60-80% class and in Vale de Santo António in the 40-60% class, while for non-residents, both classes coincide approximately, indicating Vale de Santo António. In the west, the boundary basically crosses the various classes in Rua Damasceno Monteiro, including Miradouro de Nossa Senhora do Monte, Miradouro da Graça and Igreja da Graça.



Figure 13 – Synthesis Results for the Graça case study, classes 40-60%, 60-80% and 80-100% for residents (i) and non-residents (ii)

The Graça neighbourhood has a strong identity associated with pre-existing constructions – often reinforced by place names – permanence of the urban layout and connection to popular festivities. Much of the current urban morphology corresponds to the urban form of the historical cartography (~1858), indicating prominent features, routes and major confluence points, such as the church, the barracks, the square and the parade ground.

The urban morphology associated with topography and pre-existing structures and prominent features are determining factors in the delimitation of this neighbourhood, with the 80-100% class of respondents choosing Rua da Graça, the remaining classes indicating Miradouro da Graça, Largo da Graça and Miradouro de Nossa Senhora do Monte as exception and meeting points in the urban fabric.



Figure 14 – Centre of the Graça neighbourhood (Largo da Graça: 82% of responses)

In terms of identifying the centre of the Graça neighbourhood, about 82 % indicated the area that encompasses Miradouro da Graça (important recreation area), Largo da Graça and Rua da Graça (large concentration of trade and transport).

Telheiras – The synthesis results coincide strongly with the two fundamental axes that limit the neighbourhood: Av. Padre Cruz in the east and 2^a Circular in the south. However, the other boundaries of the neighbourhood turned out to be more diffuse, although some routes/ prominent features that may influence delimitation can be identified in the north, such as Estrada do Lumiar/Parque de Monteiro-Mor or, further south, Azinhaga dos Ulmeiros/Cemitério / Eixo Norte-Sul.



Figure 15 – Synthesis Results for the Telheiras case study, classes 40-60%, 60-80% and 80-100% for residents (i) and non-residents (ii)

The military school area in the southwest of the neighbourhood could be one of its limiting points. In the 60-80% intersection class, there is correspondence between the boundaries established by residents and non-residents. However, in the strongest intersection class (80-100%), non-residents set the boundary in line with pre-existing areas (~1905 historical cartography) and older buildings in the area around Rua Professor Francisco Gentil, while for residents the same class corresponds to more recent buildings between the latter street and Rua Professor Damião Peres in the north.



Figure 16 – Centre of the Telheiras neighbourhood (R. Prof. João Barreira: 31%; R. Prof. Francisco Gentil: 19% of responses)

Although with a relatively low number of responses, the centre of Telheiras has two key business areas: Rua Professor João Barreira (31 %) and Rua Professor Francisco Gentil (19 %).

5. Conclusions

The difficulty in defining each neighbourhood with unique defined borders is made clear in this study by residents and users of the neighbourhoods. The results show diffuse and varied boundaries. However, it is possible to identify consensus areas and determine spatial elements that are fundamental to identify neighbourhoods and their centres, as well as buffer zones, barriers and ambiguous regions that are likely to intersect with other neighbourhoods.

We can also conclude that the factors determining the boundaries of the neighbourhoods are varied and, in most case studies, are simultaneous, that is, we cannot restrict them to urban or morphological, historical, social, functional or cultural criteria to define a neighbourhood, but to all of them.

The origin of each neighbourhood also allows drawing general conclusions about the factors that seem to influence the spatial representations of neighbourhoods. While in neighbourhoods without a plan the urban morphology associated with striking elements such as pre-existing structures, landscape, convents, and churches determine the delimitation of the neighbourhoods, in the case of planned neighbourhoods, urban design associated with the city's major traffic routes that act as physical barriers define the boundaries of the neighbourhood.

The project allowed analysing the integration of internal representations and the several cognitive perceptions of urban space, framed in a perspective of recognition of the design/individual perception and the integration of factors and assumptions that underpin the notion of neighbourhood. GIS contribute to the acquisition, processing and integration of the various representations and conceptions of space, enabling the inclusion of synthesis information and its relationship with several biophysical and human factors. Spatial analysis also allows drawing the attention and involvement of civil society in the concept of neighbourhood, seizing the main physical, psychological and/or symbolic barriers, as well as their level of relevance when compared to other case

studies (with different characteristics), also identifying the components deemed to be fundamental to their homogeneity/heterogeneity and identity.

The aim of this project was to bring the high analytical ability of GIS closer to civil society from a perspective of a two-way cooperation. On the one hand, we sought to understand the concept of neighbourhood through the representation and interpretation of the mental maps of the population, their main attributes and interpretation of prominent features to define boundaries (and human behaviour). On the other hand, this research tried to contribute to graphical representation by enabling users to manipulate it using platforms like Google Earth for a better perception of the territory, thus promoting identity and the citizens' close relationship with the places where they live.

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¹ Examples include the limitations of GE and its inability to overlap using overlaying techniques for logical and arithmetic combinations, among other basic concepts in GIS; or the GIS' almost total absence of analytical procedures, with the exception of some measurement tools.

² e.g. Kevin Lynch (1960) and Reginald Golledge (1998)