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DEFINING DOMESTIC ACCESS PATTERNS:

The link between the house and street network in Newcastle upon Tyne

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ABSTRACT

The spatial interface is situated in an interesting place between a street, part of a macro-scale network, and a building, a single urban cell with its own internal structure. In this paper we investigate the relationship between residential buildings and the street, while searching for links between syntactic measures of the street network and micro-morphological properties of building entrances. Building on the syntactic concept of the spatial interface, we analyse the structure of the space between a building and a street segment in speculative developments in Gosforth, a district of Newcastle upon Tyne. We argue that understanding the logic behind the building-street interfaces provides additional data in order to better explain and describe both street and building entities. The study of through-movement potential in the district of Gosforth and micro-morphological properties of the interfaces in speculative estates revealed common access patterns amongst all estates. We observe a change in the treatment of the interfaces over time and in relation to the position in the street network hierarchy. We conclude that micro-morphological information introduces another dimension into macro-scale analysis. In order to make both micro- and macro- analysis as complete as possible we must not treat them as isolated entities but as a part of the system.

KEYWORDS

Urban interface, access pattern, micro-morphology, space syntax

1. BETWEEN BUILDINGS AND STREET: INTERFACE IN SPACE SYNTAX

Each residential building is, in some way, connected to a street network by being situated on either a residential street, a walkway, or a courtyard. The space, which is an outcome of the requirement to provide a building-street access and the relationship between those two different entities, can be defined as the interface.

The concept of the interface in space syntax theory was introduced in *The Social Logic of Space* as public space situated between buildings, primary cells in the urban system, and the space outside of the system (Hillier and Hanson, 1984). Interface, which creates and maintains the relationship between the inhabitant-orientated domain of the building and the outside world of strangers, is an amalgamation of open spaces, streets and secondary in-between spaces (ibid, 1984). Through the interface, each settlement constructs its unique way of handling the

relationship between the inhabitants and strangers within the system. Although the importance of the urban interface was emphasised in *The Social Logic of Space*, the concept was not developed further and space syntax literature has focused either on macro-scale studies of street networks and urban forms, or on analysis of building interior configurations. Outside the space syntax community, interface is considered as an important element in maintaining liveability in the street and generating probabilistic encounters while exercising individual control over the private-public boundary (Whitehand et al., 1999; Brown et al., 1998; Skjaeveland and Garling, 1997; Lawrence, 1987; Gehl, 1986; Jacobs, 1961). Recently, the concept of interface was re-introduced to space syntax research in the form of micro-scale spatial analysis, described as the 'missing link' in the macro-orientated space syntax community (Palaiologou et al., 2016; Koch, 2013; van Nes and López, 2007).

Interface cannot be viewed on its own as it is an outcome of the amalgamation between the house and the street and is strongly affected by their characteristics. Therefore, we argue that the syntactic properties of the streets and their position within a bigger network influences the structure of the interface. We treat the interface as a set of boundaries and thresholds which guide inhabitants and strangers through the transition between the public street and private house. In the on-site observational study in Gosforth, a district of Newcastle upon Tyne, we gathered data on access patterns between street segments and the adjacent buildings, documenting whether there is an access point, the type of access point and its position in relation to the building. While our preliminary analysis of access patterns showed that in most cases there are at least two access points, this work chooses to focus only on main entrances. Furthermore, to compare the data gathered on the access patterns of each building to syntactic properties of a street segment we grouped individual building interfaces adjacent to the same side of a street segment into a cluster, referred to as a block interface. The properties of the block interfaces were juxtaposed with through movement potential, a measure of the likelihood of a street segment being used (Hillier and Hanson, 1984).

2. INTERFACE AND ACCESS PATTERNS IN NEWCASTLE UPON TYNE

The street pattern of Gosforth developed as connections were made between the urban nucleus, Bulman Village and the mines, collieries, churches and private villas in the area. The urban form was developed through the building of speculative developments on *empty* rural areas. Five main time periods representing phases of the urban development of Gosforth can be distinguished dating back to the first speculative estates in 1890s, which followed a rapid industrialization and a booming mining industry. With the first estates sprouting up around the Coxlodge and Gosforth Collieries, the area grew steadily without major adjustments to the existing urban tissue. As the growth of Gosforth's urban form was influenced largely by the development of new speculative estates built in different morphological periods (Whitehand, 2001), we treat each estate as a unique entity and the surrounding district of Gosforth as the 'outside world'.



Figure 1 - Mapping comparison between through-movement potential of street networks and types of block interfaces within a 1890s estate. Diagram a) illustrates syntactic differences between street segments and shows which street is more likely to be used. Diagram b) represents four interface types observed in 1890s estates.

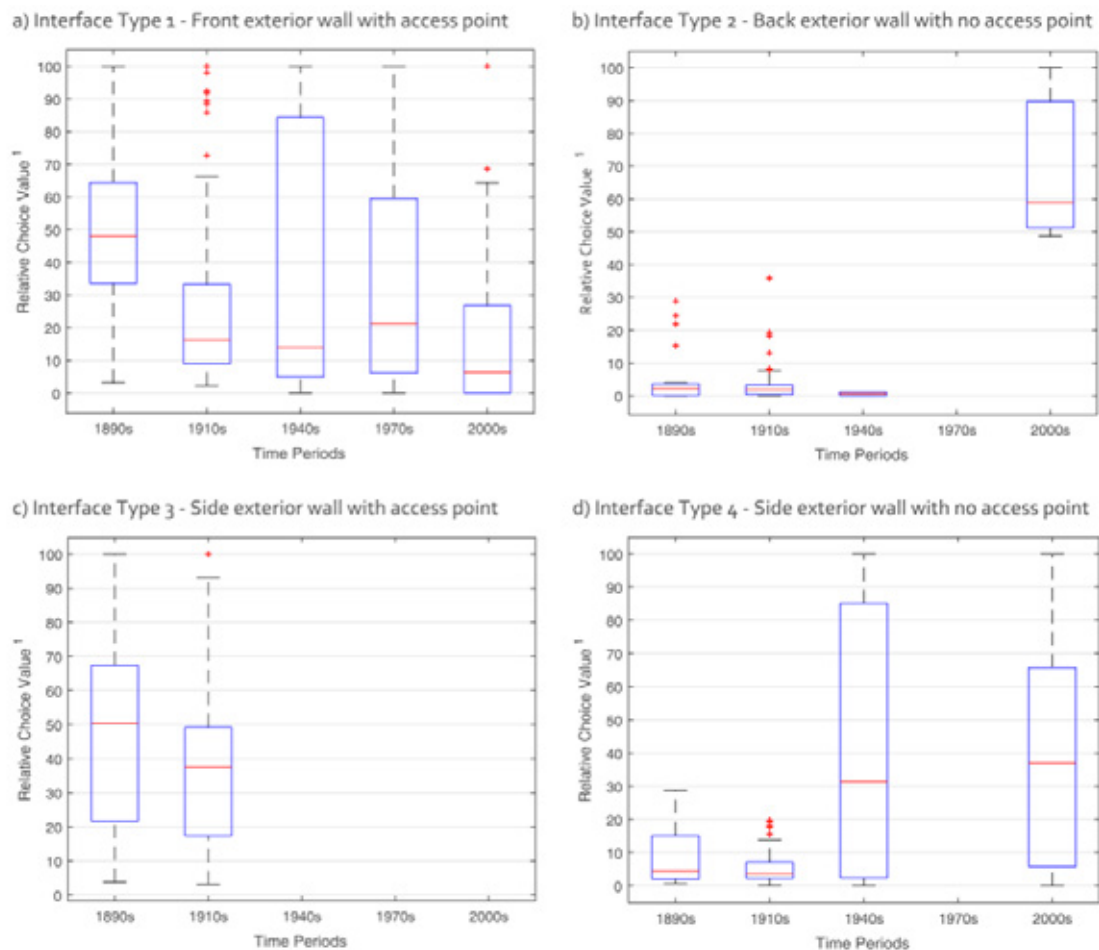


Figure 2 - Illustrating the change in the distribution of four interface types over time. Diagrams a) and c) show the frequency of front and side exterior walls with access points, while diagrams b) and d) represent back and side exterior walls with no access.

Speculative estates are essential elements in the urban development of Gosforth and Newcastle upon Tyne. Therefore, to preserve the syntactic properties of the street network within each estate we conducted angular segment analysis within radius $R = 600m$ from every house in the estate. The radius was chosen based on the average dimensions of each estate. Within each speculative development, we distinguished between two types of streets, either busy or quiet. To distinguish between those two types, we chose to use through movement potential value (choice), which describes the likelihood of a street segment being used based on the structure of the system (Hillier and Hanson, 1984). Because we analysed each estate in separation, in order to compare the block interfaces across all the estates we assigned a relative measure – relative choice value. We define relative choice value as a ratio of the choice value of an analysed street segment to the highest choice value of the street segment in each estate. The relative choice value ranges between 0 and 100, with 100 being the highest relative choice value street segment within the estate. We then compare the relative choice values to the observed block interface morphologies. The main properties we identified were: the type of exterior wall adjacent to the street segment (e.g. front, side or back) which expresses the possibility of access, and whether there is an access point. After analysing 20 estates and 683 street segments we documented up to four types of block interfaces: front exterior wall with an access point, side exterior wall with access point, side exterior wall with no access point and back exterior wall with no access point. To simplify the description, we refer to those block interface types as *front access*, *side access*, *side no access* and *back no access* respectively.

The earliest examples of terraced housing estates date back to the 1890s and exhibit the highest variety of block interface types – four (see Figure 1). The street segments with adjacent block interfaces consisting of either *front access* or *side access* have high choice value. While street segments with interfaces consisting of either *side no access* or *back no access* are potentially more secluded streets with low choice value (in this case back alleys). The access patterns of terraced housing in the 1910s change completely in comparison to the previous period. The number of block interface types is lowered to three: *front access*, *side no access* and *back no access*. The high choice value street segment is adjacent to the block interface with the *side no access* type. Moreover, the low choice value street segment is adjacent to the block interface with either the *front access* or *back no access* types. With the introduction of a new housing typology, semi-detached, in the 1940s the number of block interface types was reduced to two. The block interfaces of type front access are adjacent to low choice street segments, while the *side no access* interfaces occupy the high choice value segments. In the 1970s the street segments were adjacent only to the interfaces consisting of one type: *front access*. Any other types of block interface were absent. The detached tree-like estates in the 2000s returned to the variety of block interfaces types previously seen in the 1890s with a different distribution of types. The street segments with *front access* interfaces were more secluded and private with low choice values, while the *back no access* and *side no access* interfaces were exposed to high choice value segments separated by a wall running the entire length of the street (see Figure 2).

3. CONCLUSIONS

Due to a gradual development of the urban form in Gosforth, we are able to observe a variety of spatial interface types across a number of different housing typologies. We identified similar interface patterns across the housing typologies and distinguished four main types of block interface based on whether there is an access point and its position in relation to the building. There is a clear change in the structure of the interface in relation to the: time period, housing typology and syntactic properties of the street. With early terraced houses the main access points were situated on front and side exterior walls adjacent to the high choice value street segments, while late terraced housing reversed this pattern locating their main access on the low-choice value streets. Despite the introduction of a new housing type, semi-detached, the access followed previously established patterns. We observed a chronologically diminishing number of access patterns with the earlier four types of the 1890s being reduced to one type in the 1970s. Additionally, the main access points changed from facing the potentially busier high choice value streets to more privacy-orientated streets with low choice values. This could be interpreted as a reflection of the socio-cultural trends towards a more segregated and privacy-orientated society. The addition of the micro-morphological level to the macro-scale syntactic analysis helps to explain more complex intricacies of the urban form and prevents the culture-specific characteristics of both buildings and streets from being overlooked. Moreover, including the macro-scale measures into the micro-scale analysis may provide insight that otherwise would be lost.

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