OPTIMISTIC SUBURBIA 2

Middle-class large housing complexes

International Conference

A syntactic analysis of the Portela Urbanization using Prolog

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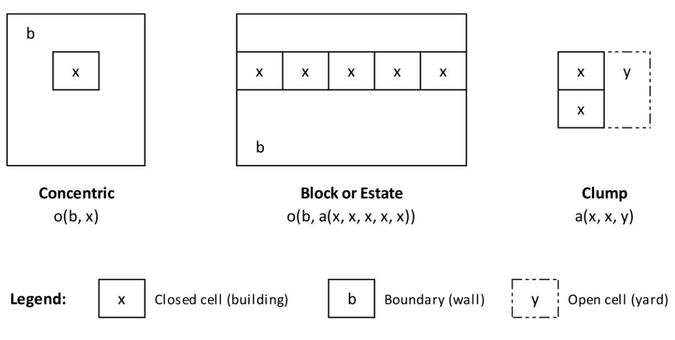
Session: 11 – Demolition vs Renovation: an open question with regard to Middle-Class Mass Housing in the contemporary city.

ABSTRACT

Portela is a paradigmatic modern housing complex located at the vicinity of Lisbon. Developed since the late 1960s, it combines several syntactic schemes, namely, concentric towers, asymmetric blocks and primary open-closed cells typically distributed along a ring-shaped road. It is also structured by a central space with a mall and other facilities. In this paper we introduce Prolog, a Logic Programming language used in Artificial Intelligence, to describe the internal logic of Portela Urbanization. Firstly, we explain how the syntactic schemes present in Portela can be generated in a recursive way using Prolog and following an approach like the ideographic language introduced by Bill Hillier and Julienne Hanson in their seminal book *The Social Logic of Space* (1984). Secondly, we performed a settlement (alpha) analysis of Portela by computing connectivity, control, depth, integration and other syntactic measures using Prolog predicates. These two complementary approaches proved to be useful to understand the ideal of the Modern city as far as the Portela complex is concerned. And show how Logic Programming is a useful tool to describe the patterns of discrete systems as social knowables due to its declarative nature. In fact, a Prolog program represents a certain amount of knowledge, namely, of an urban settlement (or building), which is used to answer queries about the social and economic consequences of some spatial design.

INTRODUCTION

Portela is a high-rise housing complex located in the northern periphery of Lisbon, near Olivais Norte. Portela was inspired by the Athens Charter with an hierarchical system of roads and strict zoning. Its central zone includes a mall, a church, schools, a green park and sport facilities. The majority of Portela's inhabitant established in the 1970's still live there (Pereira, 2017). This capacity of the settlement to retain its original residents, their sense of attachment as well as the general social profile of its inhabitants (from upper middle class) explain the relative success of Portela in the universe of Portuguese large housing complexes. A clear syntax might contribute also for this outcome.



ELEMENTARY GENERATORS

Portela can be generated with Prolog from the elementary types described above (concentric, block and clump) as illustrated in https://swish.swi-prolog.org/p/egenerators.pl. Firstly, we must consult the predicate:

distributed(X,X).

distributed(a(Z,X),X):-distributed(Z,X).

Then, we may ask Prolog about a process Z generated from a specific generator, namely:

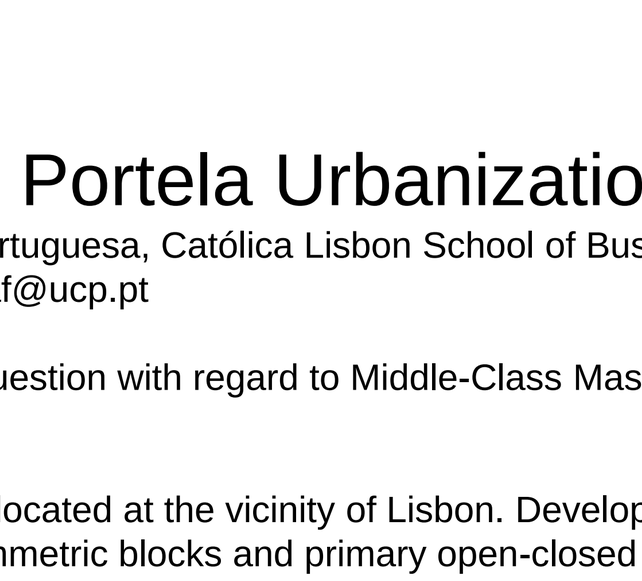
?- distributed(Z,o(b,x))

…to get the pattern of the eastern side of the park, i.e. a succession of towers inside walls:

Z = o(b, x) ;

Z = a(o(b, x), o(b, x)) ;

Z = a(a(o(b, x), o(b, x)), o(b, x)) ; …



SETTLEMENT SYNTACTIC ANALYSIS

The starting point was the axial map of the complex (above) and the declaration of the connections between its lines in Prolog, e.g.

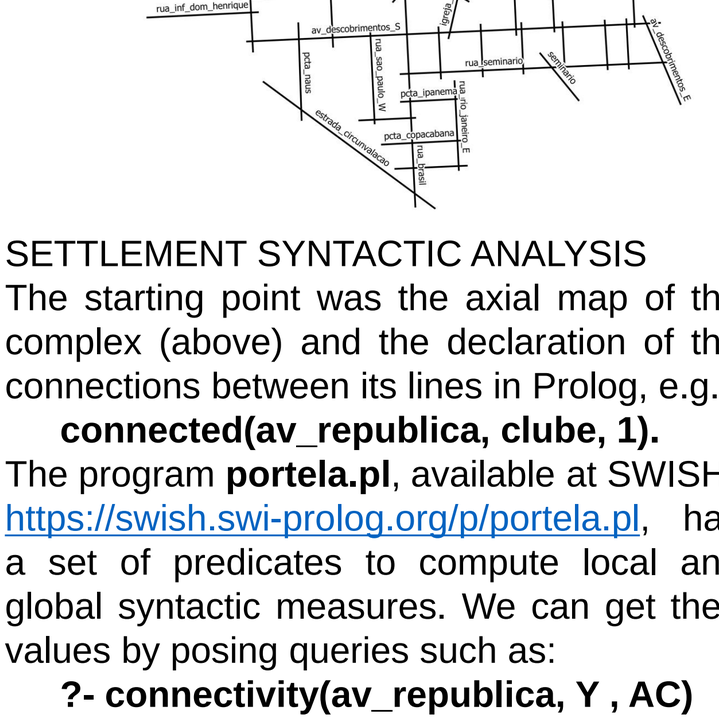
connected(av_republica, clube, 1).

The program **portela.pl**, available at SWISH: https://swish.swi-prolog.org/p/portela.pl, has a set of predicates to compute local and global syntactic measures. We can get their values by posing queries such as:

?- connectivity(av_republica, Y , AC)

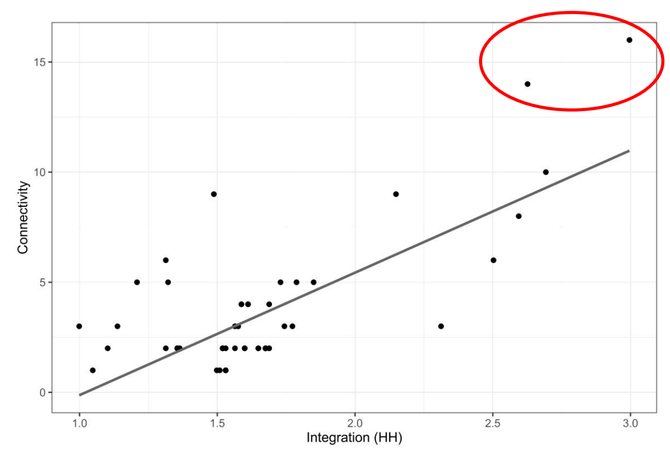
?- asymmetry(av_republica, Y, D, RA)

?- ringiness(av_republica, Y, Z, RR)



MAIN RESULTS

Portela is an intelligible settlement with a high correlation between connectivity and integration (0.74). This close relation between what can be seen from each space and what cannot be seen is suggested by the agglomeration of points around the line in the scatterplot. The two outliers (red circle) are Avenida dos Descobrimentos and Avenida da República, the most integrated and distributed spaces with a relative ringiness of 0.246 and 0.197. Nevertheless, Portela suffers from the 'L-shaped problem' of modern complexes (Hillier, 2007).



CONCLUSION

The investment in convex/open space at the middle of a complex was not an originality of Portela that occurs in Nova Oeiras, Olivais Norte and in the traditional Bororo village. However, noninterchangeable facilities (e.g. mall) highly synchronized with towers and blocks is a distinctive feature of Portela. The transpatial relations between housing estates and the central zone were maximized either by a distributive ringy network or by a smart grid of pedestrian paths. The result was a compact and integrated settlement with a strong identity and sense of belonging.

REFERENCES

Hillier, B., & Hanson, J. (1984). *The Social Logic of Space*. CUP.

Hillier, B. (2007). *Space is the machine*. Space Syntax.

Pereira, S. M. (2017). Mass housing in Lisbon: sometimes it works. *Journal of Housing and the Building Environment*, 32, 513–532.