Towards a typomorphology of public spaces: Relating place type and measures of enclosure

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Abstract. *Architecture has a rich vocabulary of morphologically defined elements, but urban design has relatively few. This is believed to limit the ability of urban designers to articulate, compare and share ideas on urban spatial typomorphology, and hence limit the richness and diversity of different types of urban morphological intervention. This paper reports on some exploratory steps towards identifying aspects of the challenge of creating a 'typomorphology' of open space components related to enclosure. The paper first introduces the site used for morphological analysis; describes some of the identifiable place locations on the site; and then develops and demonstrates two measures of enclosure (εP and εS) for capturing some of the qualities of those place locations..*

Keywords: Typomorphology, place type, area structure, enclosure, courtyards, housing estate, participation, urban design.

Introduction

Architecture is endowed with an extensive lexicon of elements, a large proportion of which are, by their nature, morphological. Traditional architecture, in particular, has a rich vocabulary – from architraves and entablature to purlins, lintels and squinches. A classical column on its own contains a raft of detailed elements that are inherently morphological – a simple Tuscan column, for example, comprises sub-components such as: plinth, fillet, torus, apophyge, astragal, neck, echinus, abacus, cyma reversa, ovolo, corona and cyma recta (Hopkins, 2012:64). Modern architecture, though typically more stripped down (morphologically and lexically), nevertheless has its share of morphological components from podia and piloti to ribbon windows and curtain walls.

In contrast, the vocabulary of urban morphological features seems to be much more sparse. Granted, it is possible to identify many street types – and associated spaces such as alleys (wynds, closes,...) and squares (piazzas, circuses…) (for example, Marshall, 2005, identified aa multitude of examples of street type). However, this range of street types seems relatively limited, especially in terms of those types defined morphologically. In particular, there seems to be a lack of a way of describing many of the kinds of space that lie between the scale of a whole street and an individual building or building component.

This potentially raises the question as to whether urban design is poorer for its lack of such detailed articulation, as it is possible that designers have a reduced or diminished 'palette' of possible interventions, individually and in combination – to learn from.

If a design – or an artwork, such as a sculpture – is truly unique, of utterly unprecedented form, a singular creation devised form the imagination of an individual designer – then there is perhaps less need for the articulation and naming of component parts, as the end product is conceived and executed as a whole. At the other extreme, if urbanism is considered as simply an emergent assemblage of buildings and spaces, with no design intent considered

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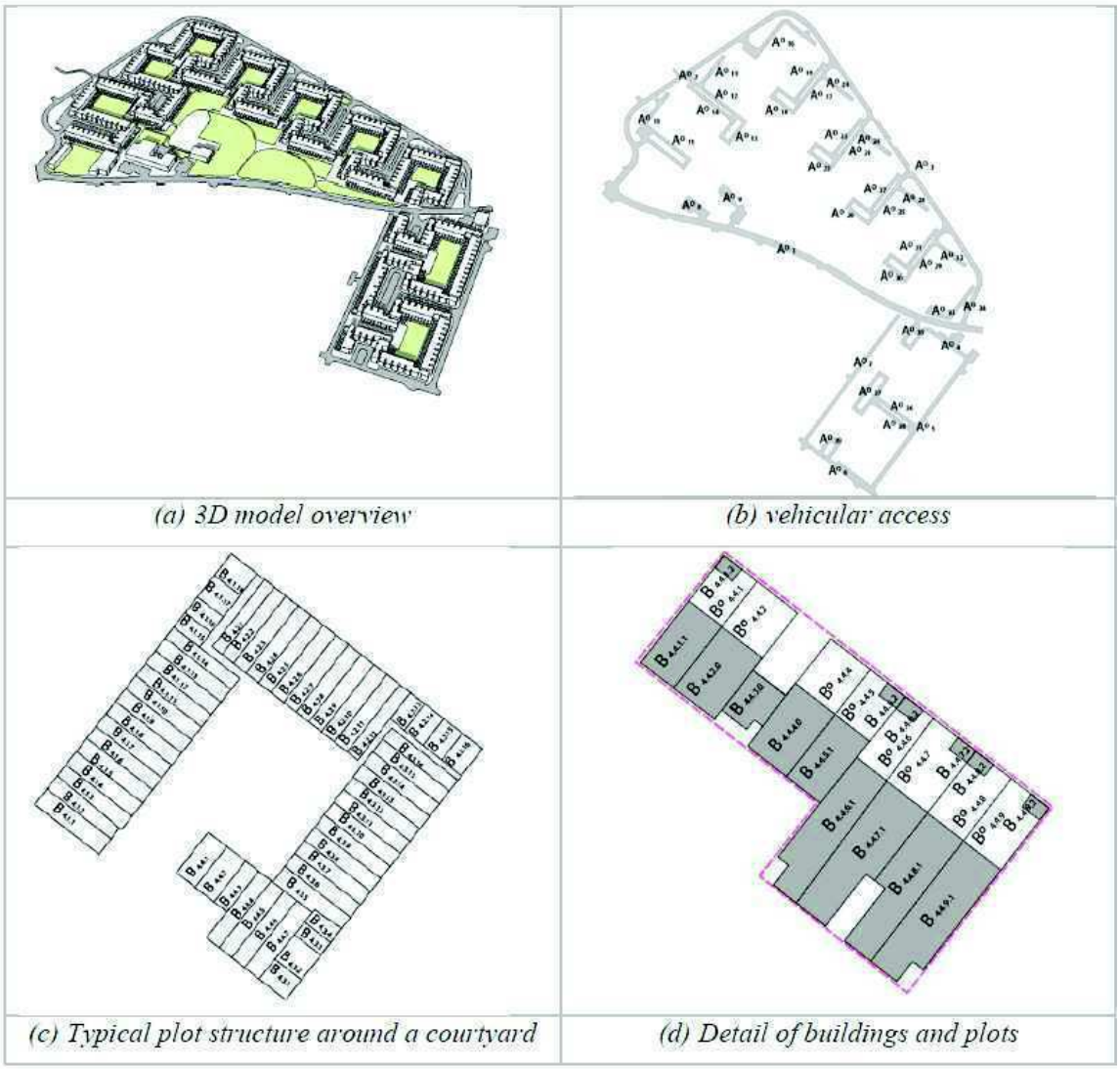

Figure 1.
Representations of the Pollards Hill housing estate, London.

necessary or desirable, then it is fine for spaces to be created from leftover design operations on buildings and other positively intended interventions without those emergent spaces needing to be catalogued or named.

However, for all other, in-between cases – surely the majority of contemporary urban design scenarios – the value of named components lies in the ability to identify and articulate parts in relation to wholes, to build up parts of an urban fabric over time, incrementally, and to compare and share knowledge of those resulting designs and spaces.

This leads to an agenda for creating a richer lexicon of urban design components relating to the configuration of public space.

The need for this is further intensified by the advent of digital design software, where options for interventions need to be articulated, and in participatory design scenarios, where multiple actors – many hands – need to be able to compare and share ideas for interventions I the creation of the urban fabric.

Creating ontologies for identification of possible design elements is an ongoing project (see for example, Berta et al., 2016). But the emphasis tends to be on architectural objects, or more generally physical solid interventions (from trees to benches), or else two-dimensional surface treatments (grass, paving) while the articulation of kinds of open space configuration or place type seem less well developed.

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This paper reports on some exploratory steps towards identifying aspects of the challenge of creating a 'typomorphology' of open space components, in part defined by enclosure. The paper first introduces the site used for morphological analysis; describes some of the identifiable place locations on the site; and then develops and demonstrates two measures of enclosure (*εP and εS*) for capturing some of the qualities of those place locations.

This paper is a snapshot of work in progress; it is part of a larger programme of research addressing typo-morphology and the use of types of intervention in an online design platform for participatory urban design of public spaces (Caneparo et al., 2017).

Methodology

This paper reports on some analysis carried out at a site at Pollards Hill, south London (Figure 1). This is a housing estate (14ha, built in the 1960s/70s) in the form of a distinctive 'Greek key' configuration of linked courtyards, where housing blocks partially enclose rectangular green spaces, linked by narrow alleys. Figure 1 shows the morphology of the plots and blocks, interpreted in terms of its area structure (Marshall, 2015). The development and demonstration of the place interpretation and enclosure is carried out within this paper. There is no scope within this paper to detail the online platform itself or the typological interventions therein but these can be found in Caneparo et al., 2017, and other any subsequent papers.

Distinctive Places

This is an informal analysis of what are felt to be distinctive places within the housing estate. This is admittedly subjective, based on the authors' experience of the site on a few visits, and further research would be needed, to work with residents to get other perspectives on the perception of the distinctive places. The emphasis here is on morphologically defined places rather than those aspects of place generated by other means (for example, the informal appropriation of discarded furniture, or use of benches for social – or anti-social – activities).

Figure 2 shows an attempt to distinguish what might be some morphologically defined

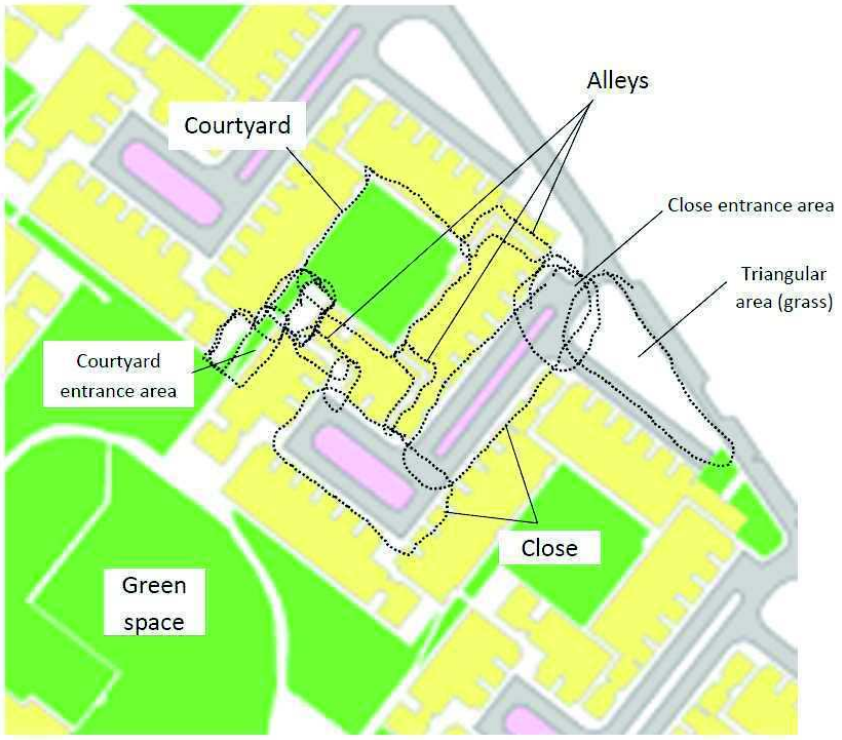

Figure 2.
Different morphologically identifiable 'places'. The dotted lines are deliberately vague to indicate that these are not definitely pinned down spatially.

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Table 1.
Description of different places identified in Figure 2

Place	Description
Courtyard	This is a publicly accessible, more or less rectangular space bounded on four sides but with four access ways off it. The courtyards in this case do not appear to have formal names, other than being identified by the Closes that they back on to.
Close	In this case the 'close' is not necessarily a morphologically coherent category; here, the Close is comprised of two different types of space: an elongated street section and a more enclosed, courtyard-like space. In fact the generic term CLOSE typically refers to a small enclosed alley, which may even be enclosed by or pass through buildings, to being a non-morphologically specific generic street name (cf. 'Street', 'Place' or 'Court').
Alleys	These are the third of the three most distinctive places (as interpreted by the authors). Like the courtyards, they do not appear to have any formal names, but they are distinctive enough spaces to be the identifiable subject of discussion about the locality (e.g. relating to access and security).
Green space	The green space extends beyond the area of focus of the present exercise; it is clearly a visible and identifiable 'place' with its own name (Donnelly Green), though it is not clearly bounded spatially.
Triangular area (grass)	The triangular grassed area could be thought of as a definitely identifiable 'place' although it could also be considered a 'leftover space'; it appears to be not used for anything while an individual left over' triangular space might not attract much notice, the fact that this is one of a series of such triangular spaces probably increases the identifiability of the space as a distinct and not accidental space. Note: at the time of writing, one of these triangles is occupied by a contractor's site offices. This lends a definite sense of enclosure both in facing the adjacent residential facades, and within its own boundary walls, and demonstrates how much use could be made out of this small, awkwardly angular space.
Close entrance	There is a sense of a sort of threshold space here. When approaching this point from the outside, the somewhat undistinguished facades of the residential blocks are broken by the close, to reveal a 'busy' space with lots of cars parked, and trees, giving glimpses of the interior of the closes that is not otherwise visible from the perimeter road.
Courtyard entrance	There is a sense of a sort of threshold or transition space or spaces here. Through here, one moves from the wide open space of Donnelly Green to the more enclosed space of the courtyard. In fact this transition spaces acts as a sort of 'throat' between two wider spaces. This space is morphologically intricate or ambiguous and is analysed further below.

'places'. Here some natural language terms are used which could be interpreted as types of space: COURTYARD; ALLEY; CLOSE; while in some cases we refer simply to a description of the space. These places are described in Table 1.

It is then possible to observe in more detail the different morphologically tractable or definable spaces. A preliminary analysis is carried out in Figure 3 (overleaf).

In Figure 3 the first cases are based on rectangles while the more complex shapes are at the bottom (L-shaped and dumbbell); these latter can of course be seen as composites

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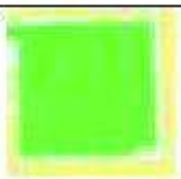
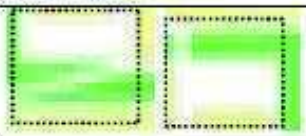
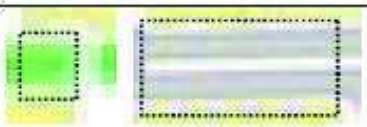
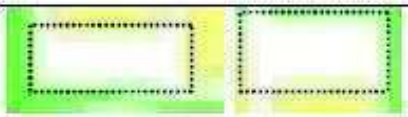
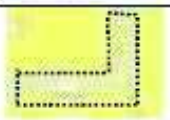
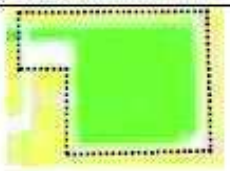
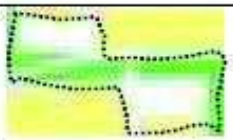
Element (plan)		*Element (description)*	*Geometry*
(a)		Courtyard 'square'	Square or rectangle fronted on 4 sides
(b)		Close or 'square' or 'court'	Rectangle fronted on 4 sides
(c)		Partially sided square, with access on 3 sides (one wide aperture occupying one side and two partial openings)	Rectangle fronted on 3 sides
(d)		Partially sided square, with access on 2 sides (one wide aperture occupying one side and one narrow opening)	Rectangle fronted on 3 sides
(e)		Throat: has walls/ enclosure on two parallel sides, joining two wider spaces. The more elongated form could be called 'street'.	Rectangle fronted on 2 parallel sides
(f)		Alley – lined by (mostly blank) walls or fences either side, with some doors	Rectangle fronted on 2 parallel sides
(g)		(left) Raised patio / platform, or (right) flat patio; enclosed on two sides by walls of buildings.	Oblong fronted on 2 sides
(h)		This has two frontages at right angles with a relatively large aperture between them.	Space defined by frontages on 2 sides
(i)		Dog-leg alley – alley with 90 degree bend.	Thin L-shape (hexagon)
(j)		Courtyard with 'panhandle'	L-shaped (hexagon)
(k)		Transitional space with narrow throat and a patio at either end.	Dumbbell (octagon)

Figure 3.
Abstracted morphological elements of different types.

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comprising sub-components from the categories above. In this analysis the following different aspects are be used to distinguish cases:

1. The number of sides fronted;

a.Whether these are wholly or partially breached by access ways;

b.Whether, in the case of two sides, those are parallel or perpendicular;

2. The proportionality of sides (e.g. whether the space is elongated in the direction of passage between parallel frontages or not; or square);

3. The number of accesses per frontage;

4. Whether the interior of the space is paved (footway), roadway/parking, or grass (though this distinction is not interpreted systematically in the above example);

5. The absolute size of spaces (this is used to select spaces and the resolution of shape boundaries in the first place).

It would be possible in principle to further distinguish

6. Whether the ground plan is level or has level changes (this is not systematically distinguished in the example above);

7. The angularity of boundaries could also in principle be distinguished, though in this example in all cases the boundaries are more or less orthogonal;

8. The orientation (e.g. south-facing) could also be distinguished;

9. The type of boundary (e.g. wooden fence or concrete wall or façade with windows, etc.).

We can note some relationships between the different cases as follows:

1. Two of the most prominent elements – (a) courtyards and (b) closes (the end part) – could be considered part of the same morphological class (though, separate sub-classes if we distinguish the presence of roadways, etc).

2. Similarly, two other prominent elements – (f) alleys and (e) closes (middle part) – could be considered to be part of the same morphological class (though in separate sub-classes, if we distinguish the latter as a 'throat' where it links between two more open spaces, which is not the case for the alley).

3. In principle we could distinguish morphologically between a 'throat' that was wider than it was long (case e, left) and one that was longer than it was wide (case e, right);

4. We can note the morphological similarity between cases (c) and (d), though these are distinguished by size, presence of greenery, and the slightly different access arrangement.

5. Cases (g) and (h) are distinguished by the latter being not so spatially well defined, and the rectangle indicating enclosure could be larger or smaller, according to purpose.

6. Cases (i) and (j) demonstrate how two very contrasting spaces (almost diametrically opposite in sense of spaciousness) could have the same geometric definition.

7. Case (k) shows an example of a composite space made up of five other elements, namely (g) (c) (e) (c) (g)[1]. This case could be an example of typological fluidity, as the existence of the 'transition space' could be either considered to be the whole of (k) or just the spatially more focused 'throat', (e).

8. Case (j) could also be said to feature a degree of ambiguity, about where exactly the courtyard (a) starts or stops, as the space 'flows' through to the throat (e). The space (j) itself is a composite space comprising (a), (c) and (g).

9. Finally, one could note that the union of a straight-sided alley (f) and the small 3-sided square (d) could be interpreted as a kind of differently proportioned dog-leg alley (i).

We may draw the following conclusions from this analysis:

1. From what appears to be a rather small-scale courtyard area with simple rectilinear elements, there is yet quite a rich diversity of micro-scale places that are morphologically definable;

2. From the cases considered, and the dimensions revealed (at least half a dozen actively used, perhaps more than ten implicit in principle), it is clear that a much larger set of classes and sub-classes could be generated;

3. There is not an exact correspondence between place type and morphological (geometric) definition;

4. There seems to be a relationship between the sense of ambiguity and the more complex shapes;

5. The more distinct place types seem to be related in some way with enclosure – a topic we now investigate in more detail.

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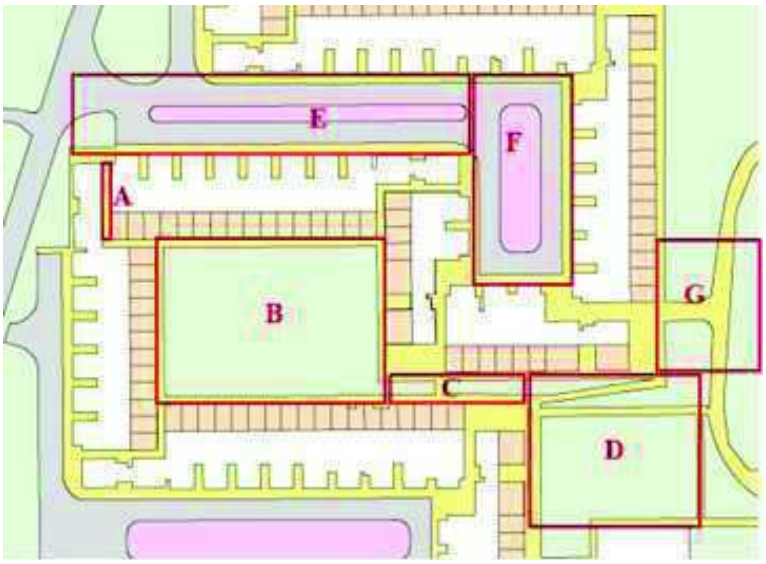

Figure 4
A selection of seven spaces (A–G) for further analysis in terms of enclosure.

Enclosure

The aim here is to see if we can characterise different types of space by their degree of enclosure. This implies using some indicator(s) of enclosure, as well as an agreed means of identifying what spaces to recognize as distinct entities to be measured in the first place.

A general point here is that we already distinguish some kinds of space, implicitly, by their degree of enclosure, or at least by physical proportions: for example, a STREET is wider than an ALLEY, while both imply a degree of enclosure in the vertical plane, as opposed to being a ROAD or PATH in open space. Similarly, a STREET implies a space that is elongated in one direction relative to the other two, while a SQUARE implies something extensive in both horizontal dimensions.

In the case of Pollards Hill, we can identify a number of spaces that seem to form more or less distinct entities. Here we select seven for further analysis; for simplicity we use rectangular cases (Figure 4).

We can express these loosely, typo-morphologically, as follows:

• Space A is an ALLEY (a rectangular part of a dog-leg);

• Space B is a COURTYARD;

• Space C is a transitional space (including the THROAT previous identified);

• Space D is a three-sided space, which could be regarded as an 'arm' of the continuum of Donnelly Green;

• Space E is the 'STREET' part of the Close;

• Space F is the 'COURT' or 'end' part of the Close;

• Space G is a partly defined portion of the wider green space of Donnelly Green.

One possible measure of enclosure is to consider the fully three-dimensional extent of enclosure of space, which could include consideration of a number of possible indicators, including fractal dimension. However, it proves in practice much simpler to work in terms of degree of enclosure. Here we demonstrate two measures of enclosure: perimeter enclosure (εP) and surface enclosure (εS), which have been developed for the present purpose.

Perimeter enclosure (εP)

This is an indicator of the two-dimensional enclosure of a space, where enclosure implies a bounding by the third dimension, while openness implies access. We can define an indicator εP (perimeter enclosure) as the proportion of the perimeter that is enclosed. (This implies physically bounded in the third dimension, whether or not that boundary is punctuated by access, such as a doorway). Obviously the value will depend a lot on where the boundary of the space is drawn (Figure 5).

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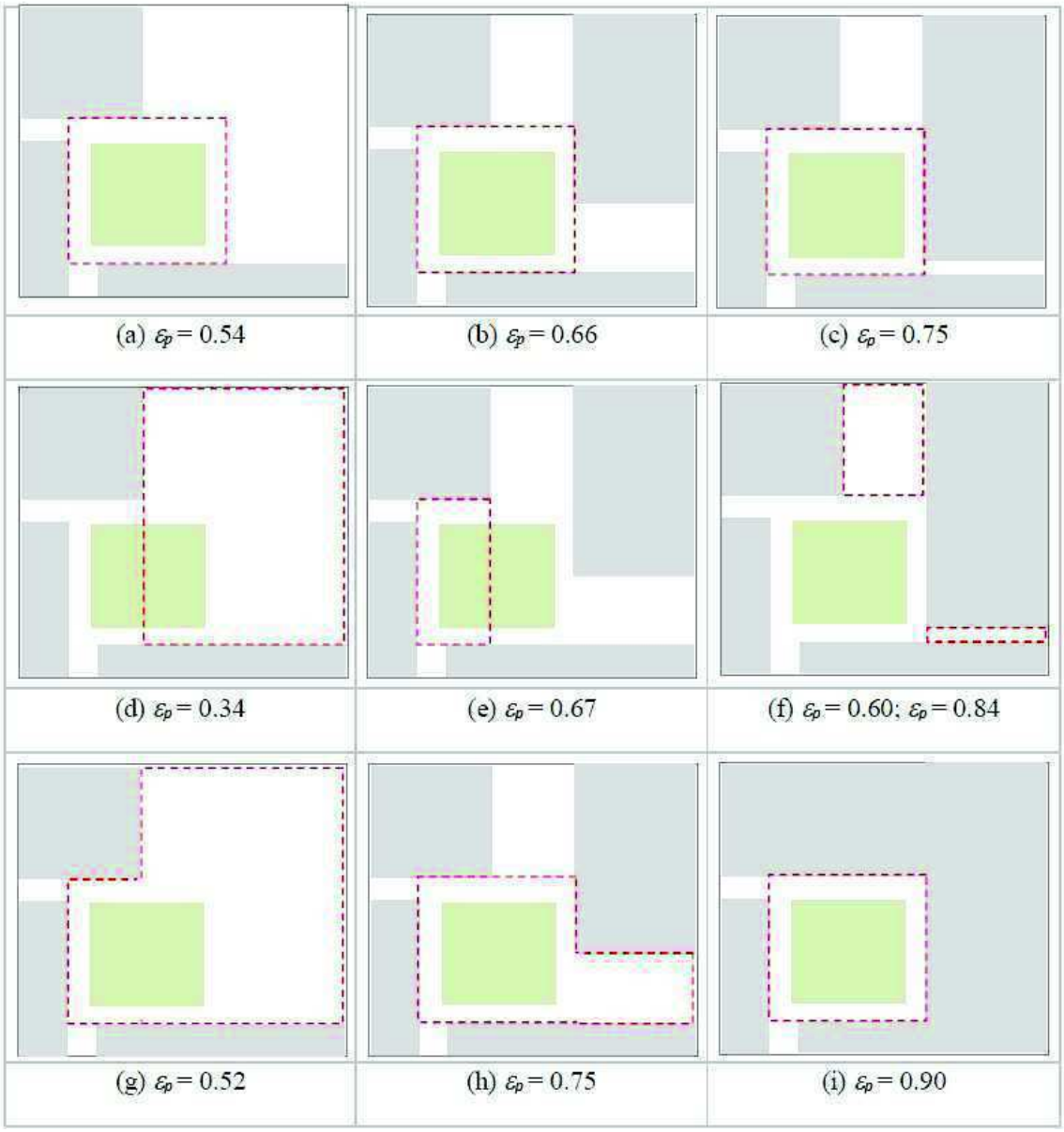

Figure 5.
Degrees of perimeter enclosure for hypothetical example layouts.

The first row in Figure 5 shows the effect of adding increasing lengths of building frontages, leading to increasing values of εP. The first column shows the effect of including more of the larger open space (reducing εP), or introducing an L-shaped boundary which picks up more frontage, raising εP as we go from (d) to (g). The second column also demonstrates this effect, for a different layout. Case (f) shows how a section of street, being open at both ends, could have a lower enclosure than a square, but if it is elongated enough, enclosure could be higher. Case (i) shows an example of very high enclosure. This could also simulate a case where the white areas are roads, and pedestrian alleys are present but not represented, i.e. where a low resolution interpretation of an area omits some of the unenclosed access ways, and therefore generates an artificially high measure of enclosure. Note that the reference polygon area (red lines) of case (g) is the sum of that of cases (d) and (e); the εP value is in between those two.

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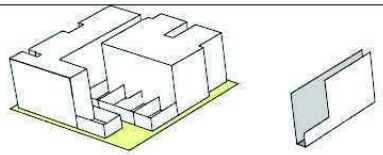
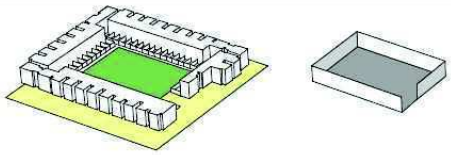
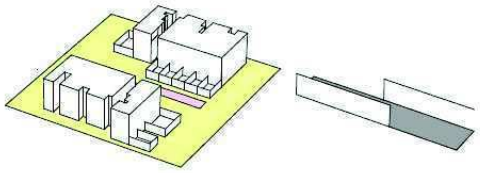
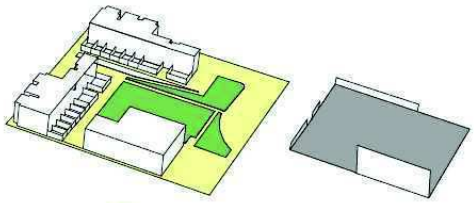
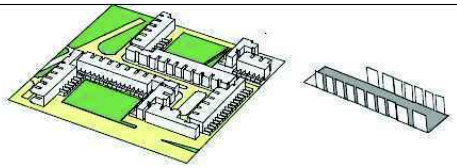
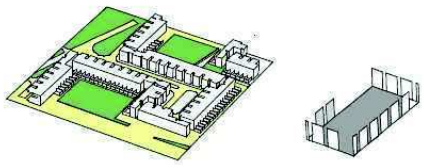
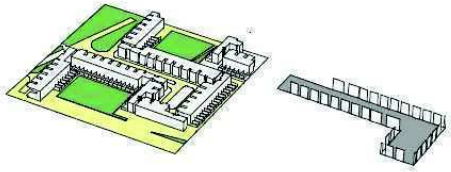
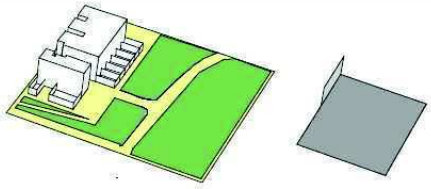
Type of space		*3D context and surfaces considered*	*Perimeter Enclosure* (ε_P)	*Surface Enclosure* (ε_s)
A	ALLEY, linking closes and courtyards		0.906	0.745
B	COURTYARD		0.925	0.516
C	Transitional space, open at either end		0.476	0.489
D	A partly defined space (fronted on 3 sides)		0.427	0.403
E	The 'street' part of the 'close', a transitional space		0.450	0.432
F	The 'closed end' of the close, a mostly defined space		0.438	0.498
E+F	'L' shape space (the whole 'close')		0.493	0.459
G	A random, amorphous open space		0.136	0.287

Figure 6.
Calculated values of perimeter and surface enclosure for selected spaces.

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Surface enclosure (εS)

Whereas the perimeter enclosure only takes account of the presence of the vertical dimension, as defining enclosure of a polygon on the ground plan, we can introduce a measure called surface enclosure which takes account of the physical extent of the vertical dimension, i.e. height. Clearly heinght has an important perceptual dimension as well as physical influence on the spatial definition of a place – relating to access, the sense of enclosure, spaciousness, etc.

Here we define surface enclosure as follows:

$$\varepsilon_s = \frac{S_0 + [(\varepsilon]_p * C * h)}{S}$$

in which εP indicates peripheral enclosure and εS indicates three dimensional surface enclosure; So represents the area; S is the area of surfaces, C is the perimeter of the space, and h indicates the average height of the surroundings, such as comprising building facades and garden walls.

By simplifying the above function, we can see that

$$\varepsilon_s = \frac{S_0}{S} + \frac{C}{S} * \varepsilon_p * h$$

Generally speaking, for a given εP, the higher εS of the space indicates the higher value of height (h). (This interpretation is based on the presumption that the area of the space is not that large.) Further consideration of the C/S value or shape index (depending how defined) may also allow interpretation of the relative influence on εS. A possible suggestion here is that by combining two enclosures (εS and εP), we could have a better way to depict the characteristics of three dimensional spaces.

Finally, we depict below (Figure 6) some examples of enclosure values for the spaces shown in Figure 5.

Here we may note the following:

1. The two most enclosed spaces (by both enclosure measures) are two of the most distinctive places identified – namely, the alley (A) and the courtyard (B). In terms of perimeter enclosure, these two are significantly higher than all the rest, while they are moderately higher than the rest in terms of surface enclosure.

2. The third most enclosed space is either the whole Close (E+F) (measured by perimeter enclosure) or the 'closed end' of the Close (F) (measured by surface enclosure).

3. Hence there seems to be a relationship between distinctive places and enclosure, at the level of resolution (and subjectivity of interpretation of 'distinctive') considered here.

4. That said, the Close (however measured) is only marginally more enclosed than the next spaces (e.g. street, transitional spaces) (C, D, E) and these could all be considered in a second, mid-level category (with F and E+F); while the 'amorphous' space (G) would be a separate, third category of low enclosure.

5. The surface enclosure measure picks up cases where there is a higher degree of vertical enclosure, with the ALLEY having the highest value of surface enclosure, as one might expect of a narrow passage with walls on both sides.

6. The perimeter enclosure value is higher than the surface enclosure value in 5 out of the 8 cases.

7. It is interesting to consider the case of comparing E, F and (E+F). For surface enclosure, the value of (E+F) lies between that of E and F, while for perimeter enclosure, the value for (E+F) exceeds that of both E and F.

8. For case (G), the enclosure values could be made arbitrarily large or small (within limits) by varying the size of the ground rectangle, while the boundary façade remains constant.

Conclusion

This paper has identified different distinguishable spaces or 'places' and considered the extent to which those are related to morphology. It is found, so far, that those place types are not uniquely defined morphologically (i.e. there is not a one to one correspondence between morphology or geometry and place type); however, there seems to be a strong relationship between the more prominently distinguishable place types and degree of enclosure (always subject to the subjectivity of judgement on what is a 'distinguishable' place type. Moreover, it is found that there seems to be a relation between the more ambiguous and transitional spaces and the different ways that

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those could be constituted, or put another way, the more complex shapes (which can be broken down into more, smaller constituent parts) tend to be associated with more ambiguity about whether they are distinctive places or not (again, subject to subjectivity).

Clearly, the foregoing work can be further investigated in more detail, but more importantly there is a need to research the actual (commonly understood) 'distinguishability' or 'imageability' of the place types by consulting a wider range of people, such as local residents, which could also be augmented by doing a content analysis of planning and other documents referring to the different parts of the site.

Overall, this paper suggests the value of enhancing the vocabulary and definition of morphological elements towards a typo-morphology of public spaces. This could enhance the likelihood of establishing a richer palette of interventions for the positive shaping and configuration of public space, whether by traditional urban designers or participative design platforms.

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Notes

1 Clearly, it would be possible to map the relationships between these spaces in terms of containment relations (cf. areas structure analysis, Marshall, 2015) but this is not done here due to space constraints.

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