Places as Intersecting Flows: Mapping Urban Morphologies, Functional Constellations and Pedestrian Rhythms

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Abstract

Starting from an open and dynamic conception of place as a socio-spatial and temporal assemblage, this paper explores high density urban areas as dynamic environments of social interaction. While Lefebvre's call for a rhythmmanalysis of the city, significantly influenced contemporary urban discourse, such understanding still lacks empirical depth. This paper seeks to advance the empirical grounding of rhythmmanalysis through a comparative study of nine selected street intersections in London, New York and Melbourne. It explores the links between the observed, filmed and measured daily and weekly rhythms of pedestrian flows on the one hand and density, permeability, grain size and functional mix, the four preconditions of urban vitality according to Jacobs, on the other hand. Further, mapping is used as a means of revealing the forces underlying each place. It is shown that the overlay of regular patterns of everyday habits and routines, rhythms of social interactions and mechanical micro-rhythms of transportation systems, all mediated by urban form, lead to place specific polyrhythms. Place is thus conceived as emerging from the intersection of rhythmic flows, mediated by urban morphology and functional mix.

Keywords: place, intersection, urban morphology, mapping, rhythmmanalysis, pedestrian flows, functional mix

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Introduction

While the concept of place has been continuously present in Western philosophy for over two millennia, this hasn't been always explicit, and theories varied broadly. With an integrative approach that aims to avoid the common reductionism of place to phenomenology or social construct alone, this paper uses a broad, open and dynamic conception of place, as "integration of space and time", as "spatio-temporal event" (Massey). Drawing on Deleuzian philosophy, place is seen as a territorialised assemblage, constituted of temporal connections of spatial and social elements, at and in-between various scales. A good starting point for a comprehensive analysis of place as temporal socio-spatial phenomena is provided by Lefebvre's proposed rhythmmanalysis, a science aimed at investigating time and space together, as "localised time" or "temporalised space".

As Lefebvre's approach was decidedly from the abstract to the concrete, his theoretical oeuvre's limited empirical underpinning has been a recurring point of
critique, including by urban sociologists Chombart de Lauwe and Castells. Although in the last decade the increasing influence of rhythmanalysis in the Anglophone literature has led to numerous new empirical explorations, there were only limited attempts that go beyond phenomenology, despite Lefebvre's indication that rhythmanalysis cannot simply be 'phenomenology from the window'. As it has been shown that comprehensive empirical explorations of place have to be based on multiple methods, including spatial analysis, discourse analysis and phenomenology, and considering the earlier emphasis given to the later two, this paper explores new methods of place-analysis focused on the connection between the spatial, social and temporal aspects of place. This approach is from the particular to the abstract, complementary to Lefebvre's progression from the abstract to the concrete. As a basis for the empirical investigation nine case study sites have been selected from London, New York and Melbourne. The daily rhythms of each of these places and the underlying urban morphology have been captured through spatial analysis, pedestrian surveys, mapping and time-lapse video recording.

Methods

While numerous new technologies are opening up ways for socio-spatial analysis, the technical limitations of GPS tracking, video-tracking and automated counters are still ample. GPS data is only available for a limited number of volunteering participants and lacks precision in dense urban environments, video-tracking requires manual identification of individuals, its accuracy is dependent on consistent image quality and there is a high rate of data loss as result of visual obstructions, while automated people counters (laser or infra-red) pose difficulties of deployment, have limited range, significant error rates and high costs. Thus this research relied on new uses of earlier techniques: non-participant observation in order to record daily rhythms and time-lapse video recording in order to record micro-rhythms of social interaction. Both methods are constrained to a spatial scale within the limits of visual continuity. For counting a smart-phone app was used, which allowed operating multiple counters at the same time. This has been found to be much less conspicuous than traditional counters, minimising the intrusion in the observed social space.

The capacity of video recording to capture and illustrate rhythms is well exemplified by early cinematographic experiments such as Berlin:Symphony of a Metropolis. As a research tool video recording has been used in the past for studying pedestrian behaviour, notably by Whyte observing plazas and streets in Manhattan. In this research video recording of the pedestrian movement has been used to capture multiple attributes of the peak midday flows in each case study area. The videos capture social, spatial and temporal aspects of streetlife such as groupings of people, gender mix, presence of small children and pets, diversity of dress styles, diversity of activities, street portions of more intense use, barriers to
pedestrian movement, dominant directions of flow, ways in which street furniture and interface type influence behaviour, micro-rhythms of street crossing, situations of crowding and the visual interaction between people engaged in static and dynamic activities.

As place cannot be understood without its links to other places, the analysis requires a framework of multiple relevant scales (Figure 1). This research comprised three spatial scales (intersection, neighbourhood and metropolis) and three temporal scales (micro-rhythms, daily rhythms, weekly rhythms).

Figure 1. Multiple scales of analysis, exemplified for the Seven Dials intersection in Covent Garden, London. Streetlife in each intersection is linked to the scale of the neighbourhood (walking distance) and metropolitan area (commuting distance).

Case studies
In order to develop refined methods of capturing and representing urban rhythms, a set of case studies has been selected. The aim was to explore a diversity of urban morphologies, while containing social variations. Thus case studies have been chosen from the realm of the cosmopolitan Anglosphere. The nine case studies form a matrix of three distinct urban types and three cities, as follows:

(1) Central city areas characterised by the dominance of a mix of daytime activities (work, shopping) over residential activities. These are also characterised by heterogeneous grain size and high building density. This type of urban area has been previously studied by Gehl and Whyte, with a particular focus on peak usage of public space. The selected sites are the Seven Dials area in Covent Garden, a late 17th century development, Midtown NY laid out in the early 19th century and Melbourne CBD characterised by mid-19th century grid. This urban type is labelled here Central Business Districts (CBDs).

(2) Areas characterised by relatively high residential densities and fine-grain mix of uses. This type of urban area has been the focus of the research of Jacobs and Sennett, with a focus on social vitality. The selected sites are Notting Hill, Greenwich Village and Fitzroy (Melbourne). All three neighbourhoods have been described as important creative clusters and have experienced gentrification in the past decades. Greenwich Village became a bohemian cluster in the early 1900s,
with gentrification from the 1930s and more significantly since the 1960-70s. Notting Hill started to attract artists in the mid-1960s, with gentrification intensifying since the 1990s, but remained moderate and contained by the presence of poorer areas. The transformation of Fitzroy from industrial to an artistic hub started in the 1970s, with middle class gentrification since the 1990s. This type is labelled here Gentrifying Creative Clusters (GCCs).

(3) The third place type is relatively new, characterised by high density developments of office and residential uses in waterfront locations. As a result of the accumulation of capital specific to the period, these areas are characterised by a large-grain mix of uses. The selected urban renewal areas of South Quay London, Battery Park City NY and Southbank Melbourne have been subject of in-depth analysis among others by Carmona, Gordon and Dovey, with a focus on planning policies. These have been labelled here Neo-Liberal Developments (NLDs).

These three urban types (Figure 2), representing a specific combination of functional mix and grain size correspond to distinct patterns of historic change: (1) the mixed-grain character of central city locations, is the result of multiple overlapping layers of change in the built and socio-economic environment; (2) the small grain creative clusters are characterised by much slower, gradual change, an attribute considered by Sennett a key precondition for "urban culture to take root", and (3) recent large-grain developments, are characterised by the rapid and radical shift of industrial sites or reclaimed land to living and working precincts.

This framework of case studies provides a matrix of commonality of linear historic time processes resulting in a shared history within each city on the one hand, and shared patterns of change within each urban type on the other hand.

Within each of these nine case study areas, a representative intersection with one of the highest levels of pedestrian activity has been selected, based on preliminary observation within the broader neighbourhood. To avoid local rhythms being obscured by metropolitan rhythms, the highly localised impact of major public transport access points has been limited by selecting intersections at a minimum distance of 200 metres from railway or subway stations.

**Mapping urban morphology and functional constellations**

An early writer of rhythm analysis, Jacobs described the link between street life, urban morphology and functional mix. What she referred to as urban vitality and since has been variously referred to as urban intensity or buzz was linked to four preconditions: density, permeability, grain size and functional mix. In this framework building density is a precondition for accommodating a large enough number of people to provide a critical mass for a diversity of social interactions, a high level of permeability increases walkability and thus opportunities for encounter, small grain size enables social and functional diversity, while a good functional mix between residents, workers and visitors assures a good time-spread
of public activities. Remarkably, half a century after Jacobs' seminal work, there are few tools that allow capturing these four dimensions in a comprehensive and useful way. While perhaps most attention has been directed towards density, single measures such as the number of dwellings per hectare used by Jacobs, are inadequate for describing the multi-dimensional character of urban concentration.  

Figure 2. Nine case study areas: streets, lots and building footprints.

To capture these urban dimensions, the case studies have been mapped with the main focus on functional mix, as the key structuring element of daily rhythms. To capture the specific functional mix of each study area, a new mapping form has
been developed, representing entries to various functions with a dot size proportional with the number of people potentially using that entry. The functional categories have been defined based on the specific time period and frequency an entry is used: residential (red), leisure (yellow), work (green), spectacle (blue) and public transport (white). To represent the potential number of people using an entry, three size categories have been defined for each functional type. For residential uses the dot size increases as the number of units passes the thresholds of 10, respectively 100 dwellings, for retail and office uses dots increase with the gross floor area (500m², 5,000m²), for spectacle with the capacity of the venue (500 seats, 1000 seats) and for transport with the capacity of the system. Besides the functional mix, the map also provides an indication of building density and grain size (dot size and frequency). Thus these maps of functional constellations (Figure 3) illustrate the morphological conditions mediating pedestrian rhythms, visualising key forces underlying each place. They reveal much stronger similarities between the urban types, than between the three cities.

The three Central Business Districts (CBDs) are the oldest part of each city, and as such their morphology is characterised by a mix of block and lot sizes, net building densities and functions, as a result of the overlap of different layers of historic development. Gross floor area ratio (FAR) is above 3 in each CBD. The functional mix is dominated by retail and office space, with a mix of 20-25% residential floor area. They are also at the centre of an extensive public transport network, and attract a large number of daytime visitors. The functional constellation maps illustrate these similarities, but also the key differences: Covent Garden has a more irregular street network and highly mixed grain size, Midtown New York has larger grain size and clustering of offices along Park Avenue on the western side of the study area, while Melbourne has a less heterogeneous mix of uses.

The three predominantly residential neighbourhoods (GCCs) are located in close proximity to the CBDs of each city and have one of the highest residential densities within their metropolitan areas. The building density is significantly lower than in CBDs, with gross FAR of 1 to 2. All three areas have a significant number of mostly retail jobs, with a rate of job to residents of 1:2. The spatial patterns of retail distribution are however different: in Notting Hill a linear pattern along Portobello Rd; in Greenwich Village a network of streets comprising the north-south running Hudson St and Bleecker St and several east-west running streets connecting these, while in Fitzroy the retail distribution follows a cross pattern along Brunswick and Johnston Streets. Permeability is high in all three neighbourhoods. All three study areas are characterised by a fine-grain pattern of small lot subdivisions, with medium sized lots occupied by larger apartment buildings or public housing. The functional constellation maps illustrate this fine grain and highly structured functional distribution.
The three case study areas dominated by neo-liberal developments (NLDs) are characterised by high building densities, despite the significant extent of water, vacant land and construction sites. Gross FAR ranges from 2 to 4 and all three are characterised by large grain and low permeability. The functional mix is predominantly residential and office, with limited retail.

**Figure 3.** Functional constellation maps (FCM).
Pedestrian flow rhythms

The daily rhythms of pedestrian flows have been recorded between 6am to 12am. The time sample was 15 minutes per hour for each flow, recorded every two hours. As the aim was to capture characteristic streetlife activity, peaks caused by singular events, annual rhythms or extreme climate (mid-winter/summer) were avoided. This approach differs from Gehl’s worldwide surveys aimed to capture peaks of stationary activities, predominantly carried out around middays and in summer months. As the focus is on the level of social interaction, flows in each direction have been recorded separately and represented in a chart graph as an overlay of northbound rhythms (blue) and southbound rhythm (orange) (Figure 4). Two-directional flows corresponding to face-to-face contacts thus appear as a mix of the two (green).

Comparing the daily rhythms in the nine case study areas shows that there are much stronger similarities between urban types than between cities. The CBDs show the highest pedestrian flows corresponding to the high job and visitor density, and a clear pattern of three daily peaks, with a very sharp and one-directional morning peak, perfectly balanced two-directional midday peak and a more diluted evening peak. The high number of pedestrians in Melbourne can be attributed to its mono-centric structure, and thus relates to the larger metropolitan scale. In the gentrifying creative clusters (GCCs) daily rhythms are much more even and smooth. The numbers of pedestrians are high relative to building density. The unusual pyramidal shape of Notting Hill graph is due to the day market on Portobello Rd. In the neoliberal developments (NLDs) flows are remarkably small relative to the building density, but still showing the three sharp and often one-directional peaks.

The video recordings (Figure 5) demonstrate the diversity of micro-rhythms and spatial patterns of pedestrian flows at midday, when in all study areas there is an even distribution of flows in both directions of each street. Thus switching the time scale from 1 hour to 1 minute, reveals other differences. Here the patterns seem to be defined by the characteristic traffic regulations and culturally specific walking habits. Pedestrian flows in Covent Garden are most informal, with no strong patterns of choosing the left or right side of the footpath and high frequency of street crossings at almost any point. The patterns of pedestrian flows in New York’s Midtown are more constrained, with a limited level of informal crossing. In Melbourne’s CBD, pedestrian flows follow highly formalized patterns, with a strong tendency for people to walk on the left side of the footpath and crossings strongly structured by the mechanic rhythms of traffic lights. The time-lapse video also reveals the occasionally highly significant interaction between static and dynamic activities, wherever the public space design allows or encourages sitting or standing. This is most intense in Covent Garden, but also Notting Hill, Fitzroy and Midtown NY.
Figure 4. Daily rhythms of pedestrian flows (people / hour) between 6am and midnight. One-directional flows appear as orange or blue, while two-directional flows corresponding to face-to-face contacts appear in green.
**Places as Intersections**

This paper shows that Jacobs' work concerning the relationship between urban intensity, morphology and functional mix can be further developed towards a more detailed and nuanced understanding of these connections. One area of research in this direction can build upon Lefebvre's rhythmanalysis, examining the relationship between the experiences of everyday rhythms of intensity to the materiality of the city.

It is also shown how a place can be mapped in a way that reveals its potential rhythms. The Functional Constellation Maps (FCMs) presented in the paper illustrate the spatial distribution of attractors relating to different functional types,
defined by the frequency and magnitude of peak activity at the public-private interface. This method is seen as a tool that can be useful to advance urban design theory towards a better empirical grounding.

The comparison of nine high density neighbourhoods showed that similar urban rhythms are produced by similar morphologies and functional constellations in different cities. Concomitantly each place has its own specificity resulting from the intersection of rhythmic flows, mediated by urban morphology and functional mix.

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