

# The Rhythm Analysis of Kampung Gebang Wetan

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**ABSTRACT :** The phenomenon of kampung development in Surabaya has received more attentions in recent days. One of the most interesting kampungs is Gebang Wetan, a resilient kampung situated near the university complex at the eastern part of Surabaya. Due to greater governance, the spatial issue of kampung has been addressed with various improvements whether structural or architectural by respecting socio-cultural context and active community participation. The most important concerns lie in the preservation of kampung’s communality and commonality that is captured in the kampung spatial rhythm. It is prime in the kampung and becoming more urgent as the rapid urban development often neglects the total gesture of the kampung spatial body. This research aims to present Kampung Gebang Wetan rhythm analysis to comprehend the spatial algorithm of its network. The research methodology is rhythm analysis by using genomic architecture as a research instrument to present variations and highlights based on domination and recession in a kampung network. The steps are: 1) kampung mapping, 2) genomic extraction, 3) rhythm analysis. The output is the network’s algorithm that presents sequential module, constructed based on the organic rhythm of its spatial construction. The finding shows dimension typicality that produces kampung unit type variation. The novelty of the research offers three-dimensional perspectives of kampung spatial rhythm as a contrast image of the city.

**KEYWORDS:** genomic, informality, kampung, rhythm analysis,

## I. INTRODUCTION

Located in the Gebang Putih sub-district, Sukolilo district, Surabaya, East Java, Kampung Gebang Wetan is an urban kampung that serves the nearby educational neighbourhood. The kampung acts as a producer, supporter, and alternative accommodations due to its proximity to the Sepuluh November Institute of Technology, Airlangga University, Muhammadiyah University, Widya Mandala Catholic University, including commercial areas such as Pakuwon City Mall, various hotels and ecotourism in the eastern part of Surabaya (Image 1). This kampung has gained recognition and labelled as an urban supporting village [1], a healthy village, a green village, and a model village [2] through its architecture has not been fully improved.



Figure 1. Kampung Gebang Wetan location

Source: <https://2.bp.blogspot.com/-ef1ZPLVIkCM/WpP5HCOXFKI/AAAAAAAAAE0/-HpMRXmPP98MYqRZWw1qQp75-QbCp0wqgCLcBGAs/s1600/peta-tanah-surabaya.png>, downloaded 26 January 2024

This kampung spatial experience is one of the most potency that is required to be explored especially for promoting Surabaya tourism [3]. Though this kampung has been notified as an asset, its collective form is one of the important elements in elevating the global perspective towards the Surabaya’s kampung spatial paradigm [4]. The general issue can be recognized based on the dominance of local research investigations on kampungs in Surabaya that are oriented towards manual visits, in situ repairs, and snap-shoot techniques on individual

Buildings. Most of them target certain points or parts rather than a series or a whole kampung. Apart from its effectiveness in investigating spatial experience based on emotions, feelings, and on-site findings, conventional methods have not succeeded in presenting the totality nor dialectic relationships that are prime in Kampung. Commonality should be taken to complement the structural and reconstruction aspects of the kampung while representing communality. This has become urgent to position the kampung as a city network, not to mention the pressure for digitalization in industry 4.0 towards 5.0 which is the technology and infrastructure-oriented development [5]. Thus, the way of looking at the kampung does not always have to be traditional [6], encouraging the application of new methods is important for improving conventional techniques while stimulating the kampung toward integration into the new city system (Fig. 2).



Figure 2. Kampung Gebang Wetan connectivity to the city's infrastructure  
Source: Redrawn by Tri Putra Bhakti (2024)

This research aims to present the rhythm analysis of Kampung Gebang Wetan, while examining the structural experiences. An itinerary outlines the experiences of the space sequentially which can be used for investigating its construction as a process [7]. The rhythm of the experience is built through visual slides, displaying the reality of the structure three-dimensionally [8]. In contrast to general research on kampungs, this research is oriented towards satellite data extraction and digital processing in reconstructing the kampung in real-time, though the algorithm is presented conventionally. The research reconstructs the kampung by visualizing the overall mass (Fig. 3), in parallel with archiving its genomic algorithm. By focusing on structural experience, this research filters the research object to only focus on the architectural silhouette that forms the overall space, analysing its rhythm while eliminating elaboration, ornamentation, and details. In this sense, the research ought to concentrate on the structure, and the totality of the kampung mass series as a fundamental part of the network rather than just being oriented toward specific, individual, or tertiary experiences.

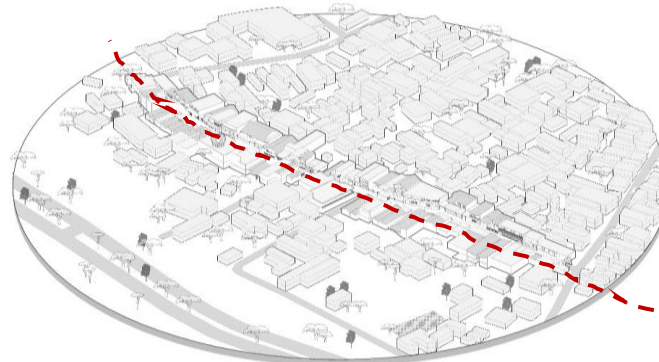


Figure 3. Kampung Gebang Wetan massing series  
Source: Redrawn by Tri Putra Bhakti (2024)

As an architectural and relational element of kampung, the mass series not only represents the space inside and outside of the building [9] but also reveals a pattern of the environment [10]. That is why, in this research, a combination of algorithm and visualization is used to present both science through mathematics and art via images. Mass connects internal and external space in a neighbourhood in the form of spatial relationships, both are reflected in the silhouettes of the buildings. By presenting a sequence of relationships, the masses are no longer seen as isolated individual buildings, but as a series that forms environmental gestures with spatial structure as the fundamental elements (Fig. 4). In the kampung's context, the mass series acts as a sample of the urban fabric, the architecture that forms the organicity of the kampung as an organism.

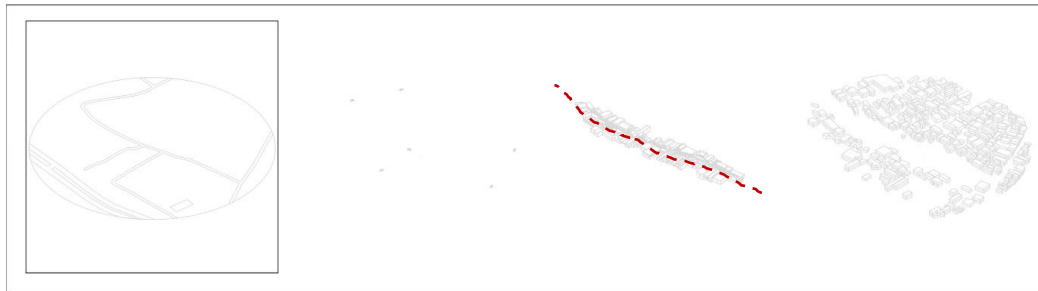


Figure 4. Left to right infrastructure, landmarks, Kampung Gebang Wetan, Gebang Putih subdistrict  
Source: Redrawn by Tri Putra Bhakti (2024)

As a form of urban daily spaces, kampung space exhibits different rhythms and tones in comparison with its city. Apart from visually showing an irregularity, the kampung indeed organizes its own rules that manifest in a unique aggregate [11]. The asymmetrical kampungs reveal a specific structural sequence that constructs the overall gesture of kampung bodies. It possesses an arithmetic series and ergonomic measurement based on traditional knowledge, displayed as a disordered-order representation of spatial images of the kampung architecture. As a method, rhythm analysis can be useful for highlighting the concepts of modules, units, and volumes in a non-conventional way in the field of architecture. In contrast to the standardized modules in planning, the rhythm found in the kampung masses may display an irregularity or un-uniformity yet surprising variety if presented in a certain tempo and formula.

## II. THEORETICAL APPROACH

**Kampung Gebang Wetan :** Kampung is a form of urban informality, a collection of indigenous or traditional settlements in the city. Although showing a similar appearance to a village, kampung is always situated in the city's context. More often translated as the kampong throughout South Asia, kampung is a specific jargon for Indonesian informality and may not have the same meaning or concept. Kampung Gebang Wetan is named after a street where it is located, Gebang Putih as its sub-district may also be pronounced as the other name of this kampung. Kampung Gebang Wetan is bordered by the Kalidami River to the north, the Rijk River to the south, the Mayar Kerta Adi Road to the west, and the Keputih River to the east sides. It is located at a height of 7 meters above sea level, a latitude of 7.2837 LS, and a longitude of 112.7845 LB. Due to its proximity to the seaside and showing naval characteristics, Kampung Gebang Wetan can be categorized as a coastal kampung [12], although administratively, this village is located around the center of the educational and commercial area. The kampung is neighborly to the sub-districts of Keputih, Mulyorejo, and Manyar. It is equipped with the city's networks and facilities, such as education, worship, health, government, sports, shopping, and even green open spaces. This kampung actively contributes to the supply of greenery production, food distribution, waste processing, conservation of urban forests, and preservation of coastal mangroves [1]. Thus, the existence of this kampung has been supportive of the overall development of the urban area, especially in the eastern part of the city.

Apart from Surabaya's various topography which forms various hills and wavy contours. Kampung Gebang Wetan is categorized as a lowland of 80.72%, having a height of -0.5-15 m SHVP, or 3-8 meters above sea level. However, the overall Kampung Gebang Wetan topo-plan shows the formation of the kampung aggregate, reflecting a slight slope, while relatively flat towards the river as its boundaries [12] This influences the natural infrastructure formation of the kampung which is much dictated by its terrain. From the formation of organic network patterns to

The spatial adaptation of the population towards infrastructure formations is greatly influenced by the overall movement of the kampung's gesture which contributes to its building configurations posed in different rhythms [13]. A strong aerial organic visualization of kampung has been manifested in different building sizes, modules, and dynamic positions of the houses in the kampung, suggesting renovations and rearrangement for greater aesthetics.

**Massing Networks :** Even though it is important to pay attention to the orderly aspects of architectural beauty proportion, the naturalness of the space in Kampung Gebang Wetan shows the unique massing configuration which becomes an anomaly from its external environment. In contrast, while the surrounding environment is dominated by modern planning and shows strong uniformity, in this context Kampung Gebang Wetan offers a completely different totality. With organic characteristics, physically the space offers better flexibility and configuration to accommodate different functions such as production, economics, recycling, and even tourism [9]. Its collective network shows a combination of centralized and decentralized dense, small, and dynamic spatial grain sizes in various parcels, which are alternatively effective for offering compact, adjustable, and economical space in this particular context in a semi-parametric way.

**Kampung Spatial Experience :** Having various types of mass in the kampung, its daily spaces show a specific rhythm in comparison with the generic city's space [7]. This means the kampung possesses a different potential itinerary if it is strategically planned in sequence. The kampung offers a contrasting spatial experience from its surroundings by showing irregular patterns, modules, and fields. Apart from the many criticisms of kampung as a slum, kampung may potentially have different aesthetics and dynamics, research focused on the imagination of a well-defined spatial structure is needed to stimulate the future development prospect of the kampung. As an alternative, the visualization that concentrates on structural reconstruction may display the experience of kampung's structural space thereby providing a variety of different angles and perspectives to seeing kampung differently. The development of virtual kampung is also beneficial for conserving, archiving, and preserving temporal characteristics of this space, if continued and synergized with a smart building system it may be connected to the rest of the world [14].

**Rhythm Analysis:** The term rhythm analysis was once introduced by Henri Lefebvre to suggest a method for analyzing the space and time of everyday Life. Although it successfully, gained global recognition for highlighting the importance of temporary and daily space rhythm, the actual is presented more as a generic concept highlighting various possibilities of sensing everyday objects differently. Therefore, more research is required to scrutinize the specific naturalness of the kampung as the other type of informality rather than just utilizing it as a generic method of analysis [1]. However, by reflecting on the advantages of the general concept of rhythm, a broader view of precedence analysis initiated by Lefebvre helps to stimulate a possible method of investigation toward arrhythmia (conflict), polyrhythmia (co-existence), eurhythmia (interaction), and isorhythmia (rarity) that similarly shown in dissecting method for understanding organic architecture. For instance, genealogy and genomic architecture have moved the study towards contrast, similarity, domination, and recession of the space, offering a new way of highlighting elements of rhythm in a genetic sequence [6] Especially in the context of modern and fast-paced spatial trends, digitalization and virtual spaces potentially detect and elevate various images of the kampung genetically, apart from precedence methods that may not be commonly implemented yet in these informal spaces [5].

### III. RESEARCH METHODOLOGY

This research combines conventional architectural research methods of typology and morphology with a digital reconstruction [8] This method uses a combination of satellite image extraction for developing virtual kampung based on 5-year snapshots and cross-research studies in building kampung images. The reconstruction is mainly based on layout and skyline for presenting sequential rhythm analysis, visualized as an itinerary of structural space experience in the form of animation. The map is drawn by focusing on building silhouettes as structural elements in a network, eliminating elaboration and ornamentation, and converting the rhythm into modules, units, and measurements then later analyzed rhythmically. The animation is broken down into a collection of slides to present the dynamics of the space, using a combination of QGRS, Cad, Sketch-up, and 3DMax [7] The research was carried out from February to May 2024 by synchronizing initial data with the satellite.

### IV. RESULTS

The Kampung Gebang Wetan mapping generally shows a contrasting micro-sized urban grain and informal fabric configuration in comparison with its surrounding neighbourhood.

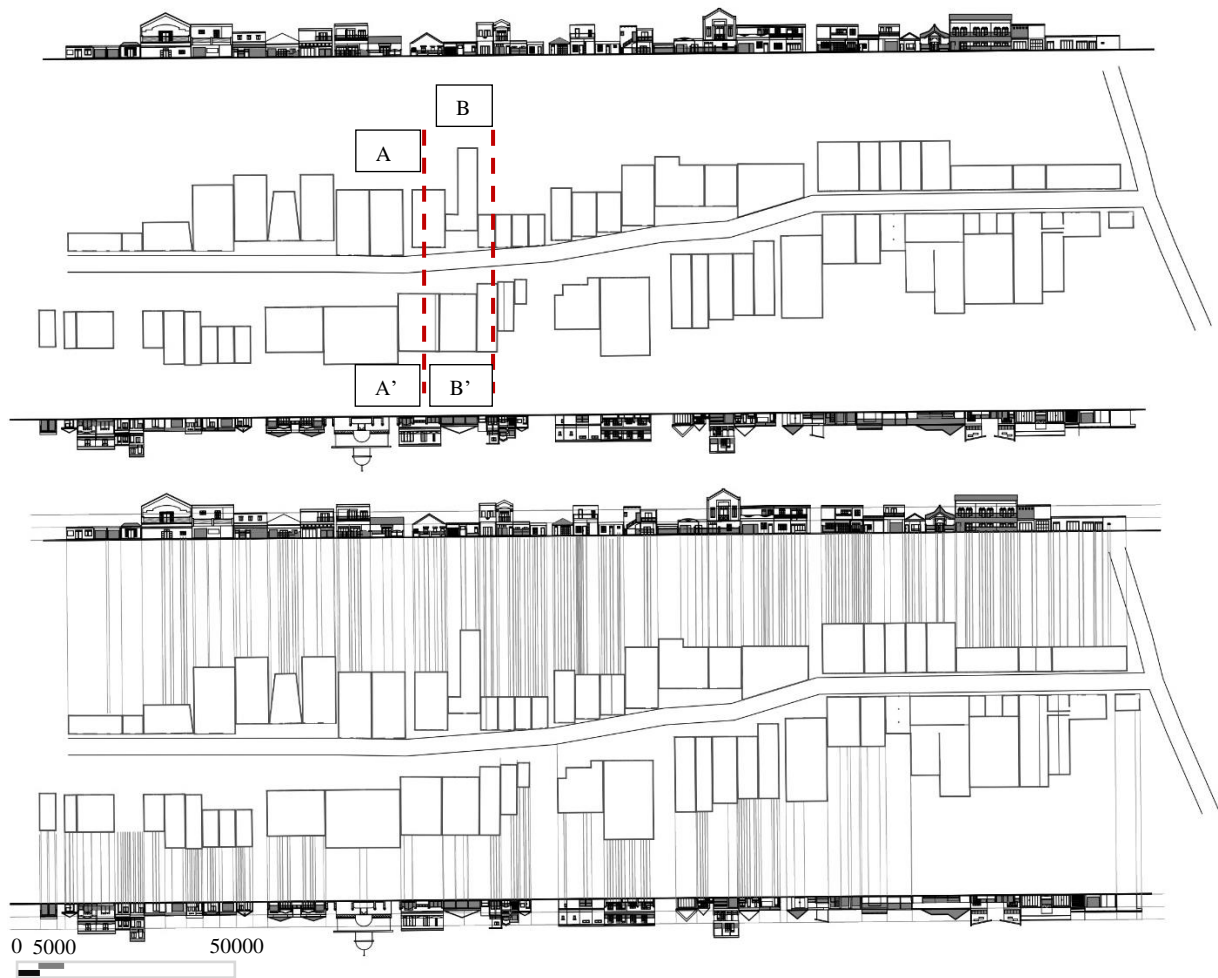
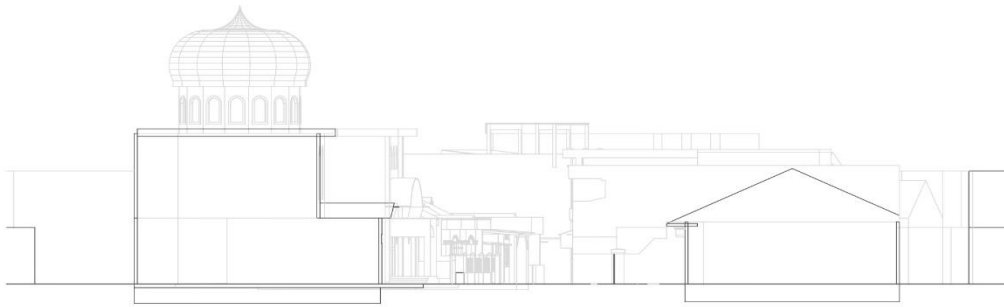


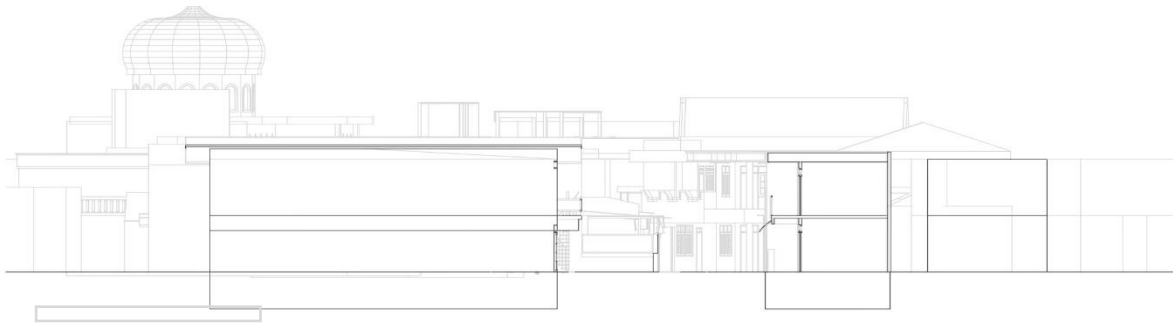
Figure 5. Kampung Gebang Wetan layout. From data actualization (above) to rhythm analysis (below)  
Source: Redrawn by Tri Putra Bhakti (2024)

It is visually dominated by quasi-organic shaped infrastructure, predominantly by traditional houses positioned perpendicularly to its corridor. In contrast to other networks, Gebang Wetan Street expresses a slightly zig-zag corridor, sandwiched with a compact and dense massing series. A collection of building types along the corridor shows a particular grouping based on sizes and types. The map also displays a variation of modified conventional housing types with a rectangular as the basic silhouette, row houses as most common structure implemented in smaller size units. Different layouts and orientations are expressed along the corridor, showing a distinct proportion and unusual composition. Trapezoid, staggered form, thin shape, and subtractive volume are easily noticeable along the corridor. Some gaps are found along the corridor, they act as extended space, providing alleys, communal space, port, and yard that serve the internal neighbourhood. Thus, the general kampung mapping indicates a dynamic movement of the kampung bodies, in shaping the fluidity of its fabric.

The massing series elevation illustrates a generally various geometric shapes, sizes, and building heights, thus resulting in abundant textures and mixed colours to the environment. Even if they vary, the overall facades suggest a tendency towards earthy tones with domination of natural materials. There are various organic and natural finishing are found as the building accents, while the main construction is built generally by using bricks and wood. Metal and glass are added preference, while greeneries are commonly planted in the external area of each house. The dual skylines show a contrast rhythm, differentiated by compounds of lower and higher height ones found at the dispersed locations. The building heights also displays a silhouette of macroscopic roughness rather than monotonous undulating. Basic gable roofs are the most common roof types, positioned in various orientations, emphasizing a more conventional style to the area, while sloped roof and dome are taken as accentuation. Thus, the general façade of the buildings introduces a traditional atmosphere to the area, providing a more casual, natural, and human-oriented building proportioned as an informal settlement.



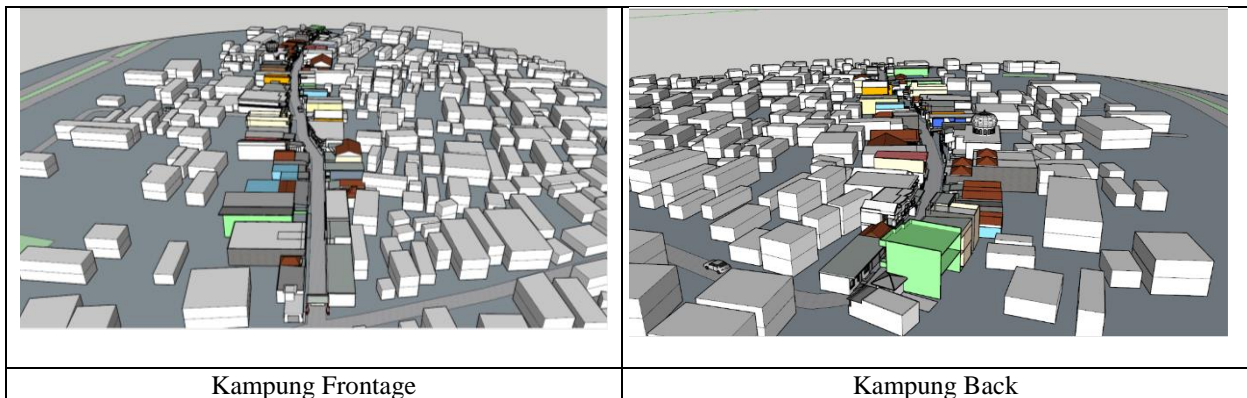
Section A – A’



Section B – B’

Figure 6. Random sections nearby mosque, showing various geometric shapes, sizes, and building heights  
Source: Redrawn by Tri Putra Bhakti (2024)

The axonometry visualizes the aerial view of the kampung perspective, showing the organic infrastructure and semi-parametric configuration. The general overview shows various patches and dispersed urban grains of the surrounding on contrast to Kampung Gebang Wetan’s compact aggregate. The mosque acts as the landmark as being the tallest and presenting a noticeable onion-shape dome roof. A long the corridor, the configuration of the house demonstrates a strong variation between longitudinal and transversal gesture to the three-dimensional fabrics of the kampung, filling the gaps between layers while forming a dialectic relationship in various directions. A contrast combination between the gable, and slope roof shows an asymmetrical balance from top perspective, highlighting the mosque as an anomaly in the midst of its informal fabric. The corridor of the kampung plays a role the backbone of the area, acting as the main network and becoming the guidance for the house orientations. In this sense, the building tends to be placed towards the main circulation, while the entrance faces the front side. Hence the bird's eye vista displays a typical quasi-patch type pattern of the general Gebang Putih fabric while Kampung Gebang Wetan acts specifically as the core, stitching its surrounding by presenting a denser and centralized configuration to unify a loosely bounded aggregate located at its nearby area.



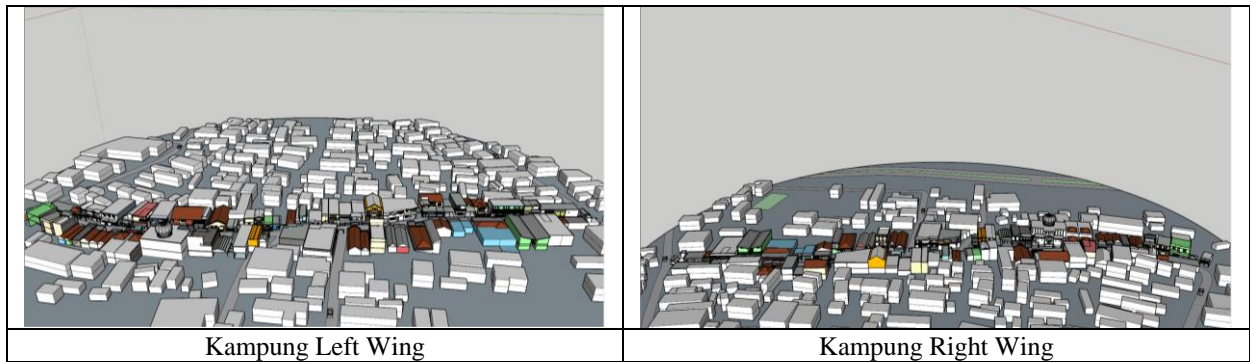


Figure 7. Kampung Gebang Wetan axonometry

Source: Redrawn by Tri Putra Bhakti (2024)

The itinerary displays an opened-meander type of corridor, packed with a various building shape can be found along the corridor. The perspective shows non-uniformity, with less predominant mode between the start to the end of the itinerary, though the general perspective suggests a similar asymmetrical, irregular, and geometrical gesture. One can easily differentiate the location of the mosque as the kampung landmark, albeit generally displays a variation of geometric shapes along the corridor. Colour, texture, and orientation of the house assist viewers in differentiating from one house to the other houses, while material accentuations and highlights are beneficial as a memorable feature. With variations in length, width and height, some may perceive dissimilarity is intended to present comparison and contrast while others may appreciate variation as a kampung's dynamic. Even if the kampung is commonly constructed by generic Indonesian traditional house structures, the itinerary opens up various interpretation and perspective based on the dialectic between kampung's semi-organic network and its irregular geometric material schemes.

The rhythm analysis in the genomic architecture sequence suggests the length of Gebang Wetan Street as 263.84 meters, with width of 49.16 meters. There are 60 houses with 1-3 floors height and 5 building gaps, situated in random locations. On the left side, the row exhibits a variation of 400-1600 cm house width and of 500-2000 cm length, while on the right side, the row illustrates a variation of 300-2100 cm house width and 400-2400 cm length. As a result, while one row is dominated by length, the other row is governed by the width of the house. Nevertheless, both display similar variations of mixed-type domination, such as square, rectangle, trapezoid, L-type, and similar variation of unit types, varied from 20-530 sqm.

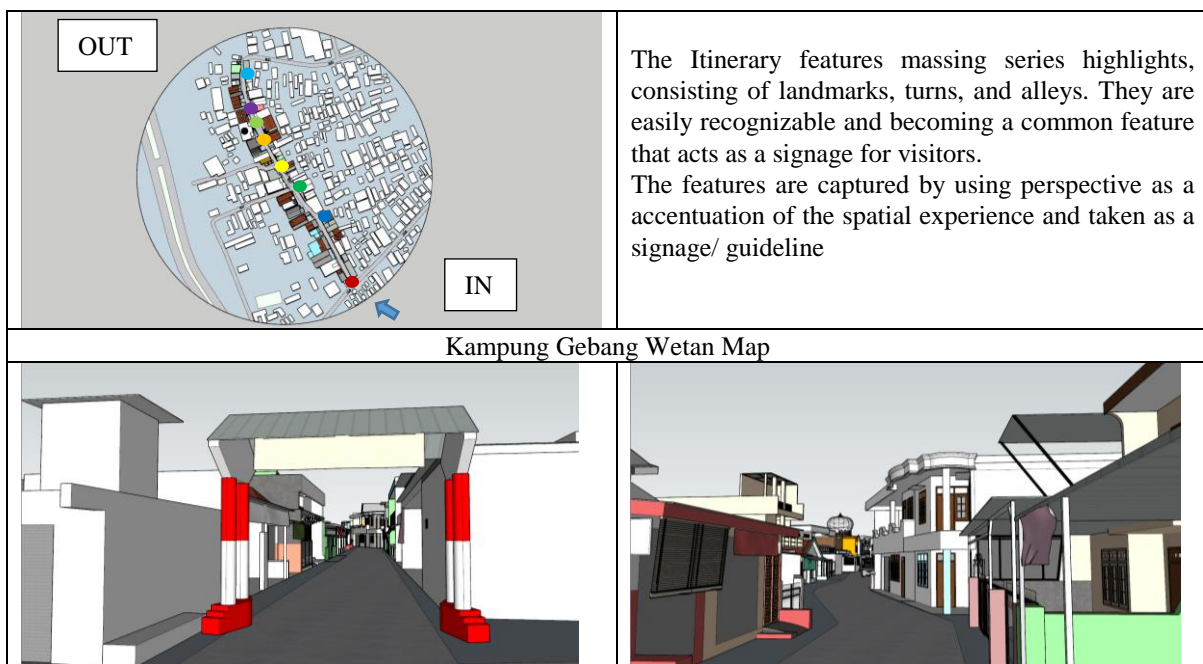




Figure 8. Kampung spatial experience, captured perspective from mapping 3D reconstruction  
 Source: Redrawn by Tri Putra Bhakti (2024)

The most dominant type found in this network is a combination between rectangular and trapezoid as much as 50 houses in total. The height of the massing series is dominated by 1 and 2 floors as much as 14 and 15 houses respectively. The most common unit type detected in the massing series are 60 sqm as much as 9 buildings, the rest is 20 to 100 sqm with less than 6 numbers. The most repeated modules extracted via genomic architecture are 300, 400, 500, and 700 cm while the rest is considered as minor. Thus, the rhythm analysis recommends strong prime numbers as the basic structural modules resulting in the implementation of associative principles throughout the network, of commutative principles between the rows, reflected in a generic distributive law of expressions. That is why, visually the kampung fabric illustrates a reflective, fluctuated, organic, mirrored and anti-image between rows while presenting a balance though consisting of variative distribution of types.

## V. CONCLUSION

The rhythm analysis of Kampung Gerbang Wetan highlights the prime number as an algorithm series based on the genomic architecture method. The kampung's modules reveals strong figures of 3, 4, 5, and 7 meters as a consistent dimensional pattern, reflected throughout its massing series. The modules contribute to the production of 20 sqm unit as a prototype and the development of 60 sqm as the archetype, based on domination and recession in this particular context. Although Gebang Wetan is the most strategic location for a pilot project in this area, different sides of Gebang Putih may offer divergent perspectives, thus offering a possible comparison or variation for supporting the dynamic of the research.



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## REFERENCES

- [1] Elviana, E., & Lesmana, D. (2021, Januari 31). Wujud keberlanjutan kampung kota Surabaya pada masa pandemi Covid 19. *Jurnal Arsitektur*, 11(1), 1-8. doi:10.36448/ja.v11i1.1603
- [2] Perwitasari, D. S., Fauziyah, N. A., & Mas'udah, K. W. (2021, Agustus). Pemberdayaan masyarakat Kelurahan Gebang Putih-Surabaya dalam mengelola sampah rumah tangga menggunakan komposter sederhana. *Selaparang*, 581-585.
- [3] Muwifanindhita, M. B., & Idajati, H. (2018). Identifikasi faktor yang memengaruhi partisipasi masyarakat Kampung Ketandan sebagai kampung wisata di Surabaya. *Jurnal Teknik ITS*, 7(2), C216-C222.
- [4] Sucipto. (2023). Mengukur tingkat kesesuaian kampung wisata di Kota Surabaya berdasarkan prinsip pariwisata berkelanjutan. *Jurnal Waktu*, 21(1), 1-9. doi: <https://doi.org/10.36456/waktu.v21i01.6175>.
- [5] Djunaidy, A., Anggraeni, W., Mahananto, F., & Vinarti, R. A. (2021). Pengembangan website Kelurahan Gebang Putih Sukolilo sebagai penunjang sarana komunikasi berbasis teknologi informasi. *Segawati*, 5(2), 164-169.
- [6] Tucunan, K. P., Ridwan, Y. H., Putri, A. S., & Soedjono, E. S. (2018). Sustainable kampong model in Kelurahan Keputih, Kejawen Putih Tambak and Gebang Putih of Surabaya City. *CITIES 2017: IOP Conf. Series: Earth and Environmental Science*. 202, pp. 1-8. Wales: IOP Publishing. doi:10.1088/1755-1315/202/1/012075.
- [7] Alwi, A. S., & Wijayaputri, C. (2021, Juli). Studi kualitas sinematik dalam bioskop Metropole. *Jurnal Riset Arsitektur*, 5(3), 223-240.
- [8] Aziz, G. Z., Nadeem, S. I., & Munshi, M. B. (2022). Fantastic architecture in cinema. *Civil Engineering and Architecture*, 10(3A), 102-107. doi:10.13189/cea.2022.101313
- [9] Setijanti, P., Sumartinah, H., Krisdianto, J., & Firmaningtyas, S. (2017, May). Does low income rental flat contribute to the sustainability of Surabaya. *International Journal of Environmental Science and Development*, 8(5), 389-392. doi:10.18178/ijesd.2017.8.5.983.
- [10] Rathi, e. a. (Augustus 2017). Self sustainable portable structure. *International Journal of Engineering Science and Computing Vol.7 Issue.8*, 14718-14720.
- [11] Pramudito, S., & Kurnialohi, B. T. (2020). Identifikasi pola aktivitas pada ruang terbuka publik di Kampung Gampingan Kota Yogyakarta. *Nature: National Academic Journal of Architecture*, 7(2), 205-219. doi:<https://doi.org/10.24252/nature.v7i2a6>.
- [12] Romadhani, F., Muhammad, Amalia, F., Firstianto, V., Angganarsati, K., Rokhmawati, D. R., Aswin W., W. (2015). Gambaran umum wilayah Kelurahan Gebang Putih, Kecamatan Sukolilo, Surabaya. *Pengantar PWK*. Surabaya: Jurusan Perencanaan Wilayah dan Kota Institut Teknologi Sepuluh Nopember. Retrieved Januari 25, 2024, from [https://www.academia.edu/19814380/Gambaran\\_Umum\\_Wilayah\\_Kelurahan\\_Gebang\\_Putih\\_Kecamatan\\_Sukolilo\\_Surabaya](https://www.academia.edu/19814380/Gambaran_Umum_Wilayah_Kelurahan_Gebang_Putih_Kecamatan_Sukolilo_Surabaya)
- [13] Rolalisasi, A., & Soemarwanto, D. (2020, Januari 1). Gang sebagai tempat aktivitas di permukiman perkotaan referensi kampung di Kota Surabaya. *Jurnal Arsitektur NALARs*, 19(1), 19-28.
- [14] Setiawati, S. W., Adji, T. S., Nugroho, W., Darmawan, I., Susanto, M. R., & Yandi, A. (2019, May). The conservation of cultural heritage areas of film city in Kota Lama of Semarang. *International Journal of Recent Technology and Engineering*, 8(1C2), 646-651.

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