ISSN: 2633-4828 Vol. 5 No.4, December, 2023

International Journal of Applied Engineering & Technology

APPLICATION OF SPACE SYNTAX TO ASSESS WALKABILITY AND PEDESTRIAN NETWORK POTENTIAL ON UNIVERSITY CAMPUSES: A CASE STUDY

Dr. Sagar T S[1] and **Dushyanth DM**[2]
[1]Associate Professor, School of Architecture, Siddaganga School of Architecture, Tumkur
[2]Undergraduate Student, School of Architecture, Siddaganga School of Architecture, Tumkur
[1]sagarts@sit.ac.in and [2]1si19at005@sit.ac.in

ABSTRACT
The imperative for pedestrianizing educational campuses stems from the desire to create healthier, more sustainable, and economically viable environments that promote active transportation and enhance the overall campus experience for students, faculty, and staff. A conducive walking experience is contingent upon factors such as safety, comfort, and enjoyment, which are directly influenced by the quality of pedestrian paths and the surrounding built environment, encompassing micro-scale elements like vegetation and street lighting. This study investigates the efficacy of space syntax as a methodological framework for evaluating campus walkability and the inherent potential of its pedestrian network to enhance user satisfaction. Drawing upon a comprehensive analysis of spatial configurational attributes, including connectivity, integration, and choice, this research aims to identify key design principles that promote active transportation and foster a positive pedestrian experience within the academic environment. Furthermore, the research explores how varying levels of spatial integration within the campus layout influence the perception of safety, aesthetic appeal, and overall comfort for pedestrians, thereby contributing to a holistic understanding of walkability. The findings of this study will provide actionable insights for urban planners and campus designers seeking to optimize pedestrian infrastructure, ultimately leading to more sustainable and human-centered campus environments. The case study presents analysis of an educational campus highlighting the nuances of wayfinding within complex campus topologies, leveraging space syntax to understand how spatial hierarchy impacts navigation and reduces cognitive load for users, particularly newcomers.

Keywords: *space syntax, walkability, network potential, DepthmapX*

INTRODUCTION
Morphologically, walking serves the needs of any community, where factors such as pedestrian space, accessibility, and affordability in terms of time and distance are crucial. Socially, it is associated with health aspects, including mental and physical well-being, as well as economic considerations. Moreover, safety considerations and spatial coherence are paramount, ensuring a varied yet navigable space between destinations. The imperative for pedestrianizing educational campuses stems from the desire to create healthier, more sustainable, and economically viable environments that promote active transportation and enhance the overall campus experience for students, faculty, and staff. A conducive walking experience is contingent upon factors such as safety, comfort, and enjoyment, which are directly influenced by the quality of pedestrian paths and the surrounding built environment, encompassing micro-scale elements like vegetation and street lighting. Consequently, the systematic evaluation of pedestrian infrastructure quality, particularly within university campuses, becomes crucial for fostering sustainable mobility and enhancing user satisfaction. This paper presents a case study examining the application of Space Syntax, a methodology widely recognized for its ability to analyze the topological configuration of physical networks, to evaluate walkability and pedestrian satisfaction within a university campus (Nag et al., 2022) (Bafna, 2003). The primary objective is to demonstrate how spatial legibility, as quantifiable through Space Syntax metrics, directly influences user perception and encourages increased pedestrian activity within complex campus environments (Askarizad & He, 2022). This study contributes to the ongoing discourse on creating pedestrian-friendly environments by offering an empirical framework for assessing campus walkability and identifying areas for network optimization (Pires et al., 2022) (Jabbari et al., 2023). Furthermore, this study has devised a comprehensive framework, employing visual,

graphical, and syntax analyses, alongside urban design and planning theories, with a particular emphasis on enhancing walkability. By prioritizing pedestrian-centric design, campuses can foster a vibrant academic and social atmosphere, encouraging incidental interactions and supporting the holistic well-being of their communities.

LITERATURE REVIEW

The current urban planning paradigm has historically prioritized motorized transportation, leading to infrastructure that often neglects pedestrian needs, despite the established benefits of walking for health, cost reduction, environmental impact, and equitable access (Souza & Magagnin, 2022). This oversight has prompted a re-evaluation of urban design principles, shifting focus towards creating more walkable and bikeable environments to enhance livability and promote active transportation (Rodríguez-Valencia et al., 2021). Furthermore, comprehensive methodologies are required to assess and enhance walkability, encompassing both quantitative and qualitative measures of pedestrian satisfaction, infrastructure quality, and user perception (Apritasari, 2020) (Marangão et al., 2022). While traditional assessments often rely on two-dimensional mapping, advanced methodologies now incorporate three-dimensional models and human-centered perspectives to provide more nuanced feedback on the built environment and its impact on walking behavior (Zhu et al., 2019). This necessitates a deeper understanding of what factors influence pedestrian route choice, including aspects of safety, security, and attractiveness (Basu et al., 2023). In this regard, integrating diverse data sources and analytical techniques becomes paramount for developing robust walkability indices that capture the multifaceted nature of pedestrian experiences (Vlugt et al., 2023) (Deng et al., 2020).

The unique characteristics of university campuses, such as their concentrated populations, defined boundaries, and often pedestrian-oriented design, make them ideal subjects for detailed walkability assessments, differing significantly from general urban environments (Arellana et al., 2019). However, many campuses still face challenges in achieving optimal pedestrian satisfaction due to issues such as inadequate infrastructure, poor network connectivity, or lack of amenities (Belaroussi, 2025). This highlights the imperative for robust analytical frameworks, such as Space Syntax, to systematically evaluate the existing pedestrian infrastructure and identify specific areas for intervention within these constrained yet highly utilized environments. This detailed analysis can inform targeted improvements that enhance both the functionality and experiential quality of campus pedestrian networks, ultimately fostering a more vibrant and accessible academic community.

Space Syntax is a highly influential methodology for analysing spatial configurations and their impact on human behaviour and movement patterns (Zhang & Chiaradia, 2020). Developed by Bill Hillier and Julienne Hanson at University College London, it provides a set of theories and techniques to describe, quantify, and interpret the spatial relationships within built environments (Lo et al., 2015). At its core, Space Syntax posits that the topological and geometric properties of urban layouts directly influence accessibility and pedestrian flow, offering a less data-intensive alternative to location-based methods while providing valuable insights into urban accessibility (Morales et al., 2017). Its application spans various fields, including urban planning, architecture, and transportation studies, to understand how spatial design affects social interaction, land use, and movement patterns (Yamu et al., 2021). Specifically, it employs concepts such as integration, choice, and connectivity to quantify the potential for movement and encounter within a network, thereby offering insights into the functional performance of urban spaces (Dogan et al., 2020). This allows for a nuanced assessment of how various spatial configurations facilitate or impede pedestrian movement, thereby identifying areas for strategic intervention to optimize walkability. Therefore, this method is particularly relevant for evaluating university campuses, where understanding pedestrian movement and network efficiency is crucial for enhancing the overall campus experience. This research employs Space Syntax to analyze the pedestrian network of a selected university campus, aiming to identify key areas for improvement in terms of connectivity, accessibility, and pedestrian satisfaction.

METHODOLOGY

The methodology for this study is sequential, progressing from theoretical exploration to empirical documentation and analysis. It combines qualitative field surveys with quantitative spatial analysis to examine mobility patterns and the street environment of the selected area.

5.1 **Literature Review -** This initial phase involved a comprehensive review of existing literature on walkability, campus planning, and Space Syntax, establishing a robust theoretical foundation for the subsequent empirical investigation. The study commences with a thorough review of literature pertaining to mobility networks, urban transport planning, and spatial analysis. This stage establishes the research's theoretical foundation, identifies current practice gaps, and frames study objectives. The review also offers insights into analyzing street hierarchies, traffic volumes, parking, pedestrian and bicycle infrastructure, and the overall urban street environment.

5.2 **Selection of Study Area -** The selection of the study area, a university campus, was predicated on its characteristic as a contained environment with a high density of pedestrian activity and a clear network of pathways and buildings, allowing for a focused analysis of walkability within a well-defined boundary. For the present study, Siddaganga Institute of Technology (SIT) campus situated in Tumakuru city in Karnataka is chosen. This campus serves as an ideal case study due to its diverse functional zones, ranging from academic blocks and administrative offices to residential dormitories and recreational facilities, which collectively generate complex pedestrian movement patterns. The campus also serves a large population of students, faculty, and staff, necessitating efficient and satisfying pedestrian networks for daily commuting and social interaction.

5.3 **Documentation and Data Collection -** Field surveys and photographic documentation are converted into drawings and maps representing current physical conditions, including street plans, traffic flow, pedestrian paths, and land-use interactions. The surveyed plan of the campus was obtained from the institute and mapping of pedestrain and vehicle routes was done as shown in figure 1.

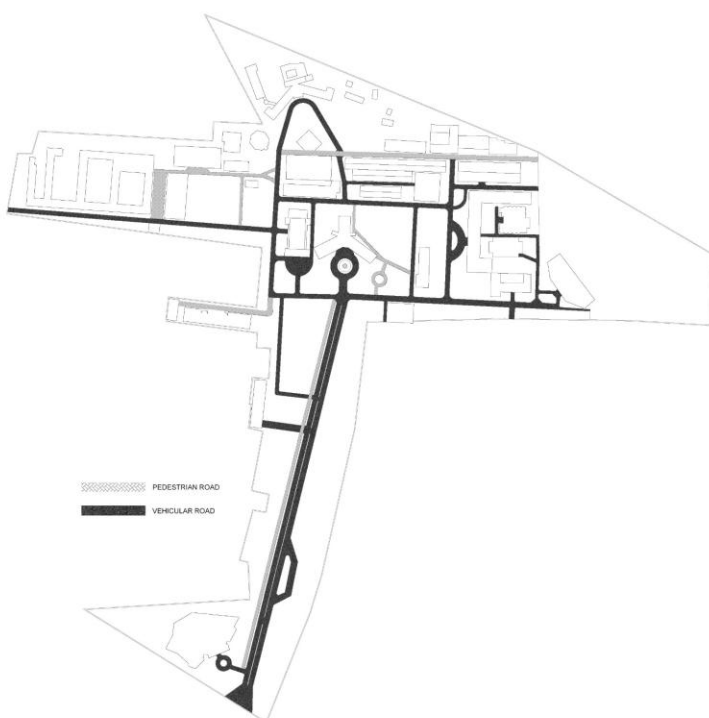


Figure 1: Map showing the campus plan with pedestrian and vehicle routes

These drawings provide a baseline for subsequent analysis. Detailed plan sections are prepared for selected street segments to identify and analyze site-specific problems. A sample street section is shown in figure 2. These sections illustrate issues such as inadequate pedestrian space, lack of continuous cycling infrastructure, traffic bottlenecks, and encroachments that affect street functionality and safety.

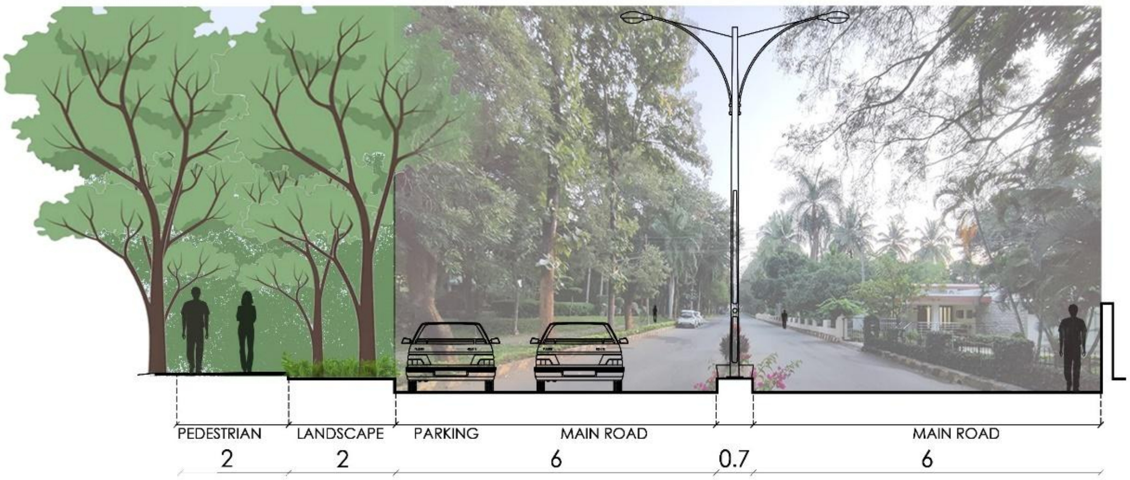


Figure 2: Street section of the campus

Furthermore, direct observations of pedestrian behavior and interactions with the built environment, supplemented by user evaluation surveys, will provide qualitative data on satisfaction levels and perceived challenges within the network (Kaur et al., 2021) (Anapakula & Eranki, 2021). A detailed photographic survey was conducted to capture existing infrastructure conditions, points of interest, and areas requiring intervention, complementing the quantitative spatial analysis by providing visual evidence of the campus environment. The integration of these diverse data types, ranging from precise spatial measurements to subjective user experiences, enables a holistic assessment of the campus walkability.

5.6 **Space Syntax Analysis -** To examine the study area's spatial configuration, Space Syntax analysis is employed utilizing DepthmapX software. This enables a quantitative evaluation of street connectivity and accessibility. Three key indices are calculated:

Connectivity Index: Measures the direct connections each street segment possesses with its immediate neighbors.

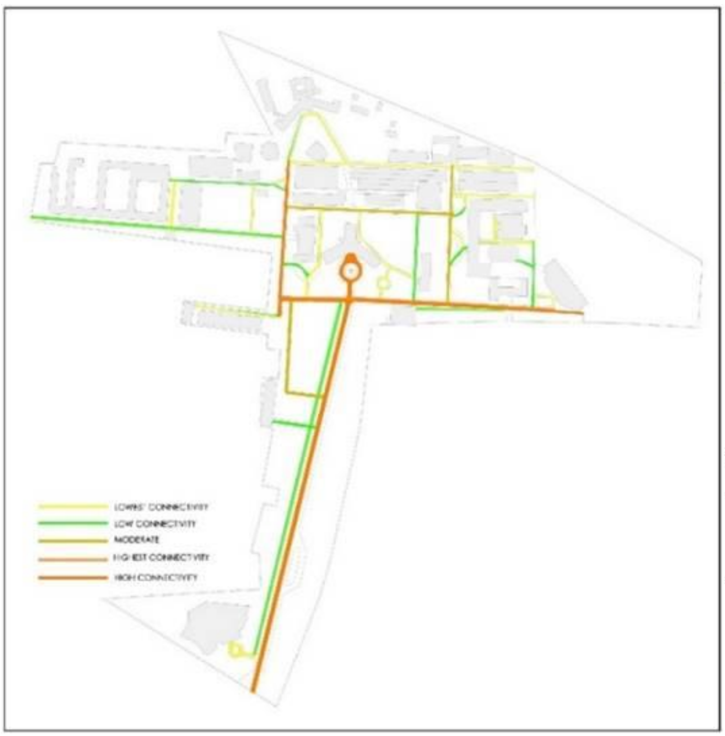
Local Integration Index: Assesses the relative accessibility of each street within a defined local radius, reflecting neighborhood movement patterns.

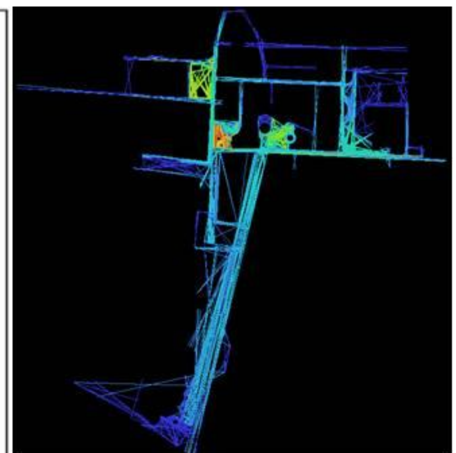
Global Integration Index: Evaluates street accessibility at a broader, city-wide scale, indicating their role in structuring urban movement.This analysis reveals how the street network's physical form influences mobility, accessibility, and land-use interaction.

This provides a robust quantitative basis for understanding the campus's current pedestrian network performance and identifying areas where infrastructural enhancements could significantly improve walkability and user satisfaction. Beyond these quantitative measures, the analysis also considers qualitative aspects of pedestrian experience, such as the presence of iconic elements, comfortable waiting areas, and clear wayfinding, which are crucial for overall satisfaction (Kurniawan & Yulianto, 2021).

RESULTS

Figure 3 presents the connectivity index map of the study area. The average degree of street connectivity inside the campus, it shows the extent of the alterations from one line to another and the availability of sidewalk. This metric is crucial for understanding the ease with which pedestrians can navigate the campus, as higher connectivity often correlates with more intuitive and efficient movement through the environment . Higher connectivity values indicate a greater number of direct connections and thus potentially more permeable pedestrian routes, facilitating movement across the campus. (Fenghour et al., 2022) Conversely, areas with lower connectivity may present barriers to pedestrian flow, necessitating detours or limiting access to certain destinations (Scoppa & Anabtawi, 2021). The spatial distribution of connectivity within the campus highlights key nodes and corridors that serve as primary pedestrian thoroughfares, as well as less integrated zones that might benefit from infrastructural interventions to enhance accessibility. The variance the minimum and maximum values indicate that the campus exhibits a heterogeneous network structure, with some segments demonstrating high permeability while others present significant impediments to continuous pedestrian movement, which is critical for assessing network efficiency (Khanal et al., 2023).

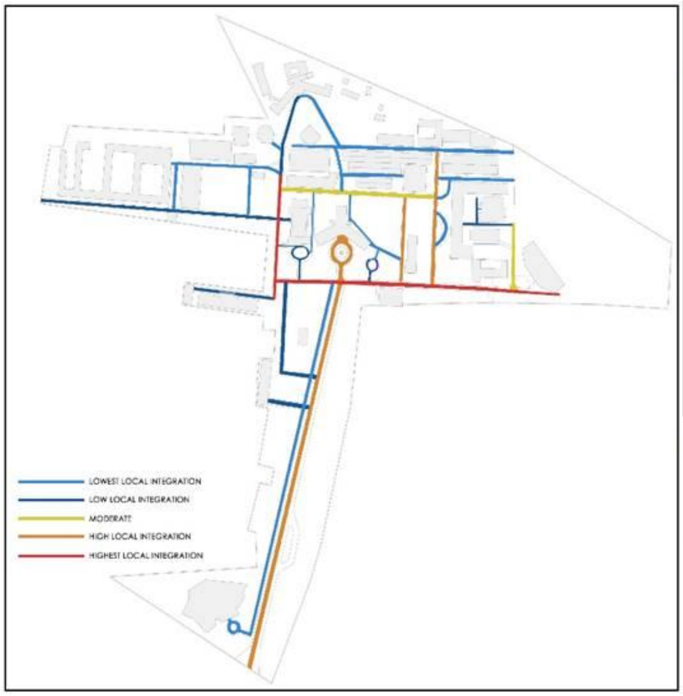


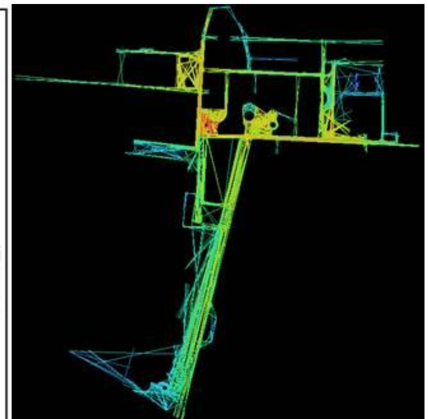


Parameter	value	depthmapX
	Minimum	0
	Maximum	14
	Mean	4.13

Figure 3: Connectivity index

The overall network continuity, as reflected by the connectivity index, directly impacts pedestrian satisfaction, as fragmented or discontinuous paths can lead to frustration and reduced walkability. Local Integration Index range (1.91–6.86), as shown in figure 4, indicates a hierarchy of accessibility in the study area: from isolated, inward-looking streets to highly integrated, movement-rich corridors. This index is particularly valuable for identifying areas where localized interventions, such as improved pedestrian crossings or widened sidewalks, could significantly enhance the pedestrian experience and satisfaction (Wang et al., 2011). (Quijada-Alarcón et al., 2025)

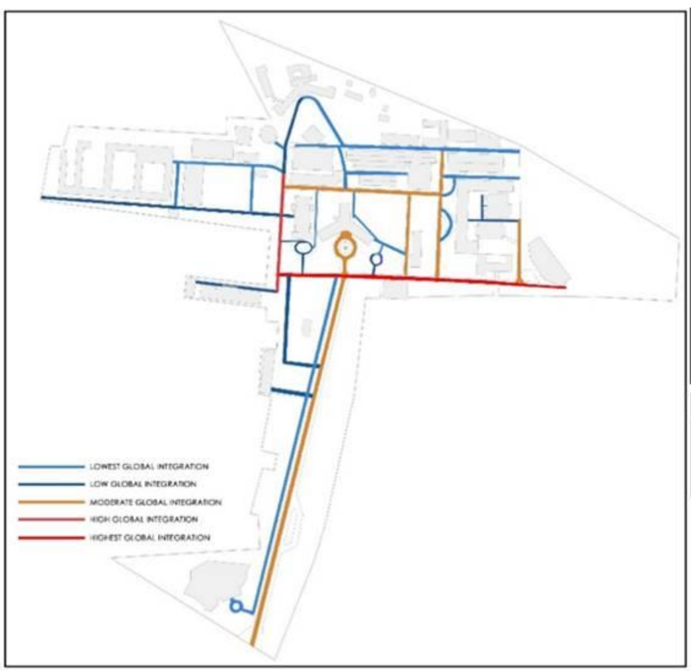


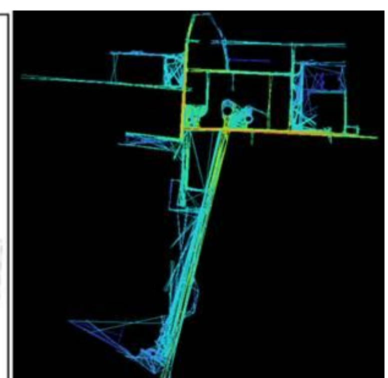


Parameter	value	depthmapX
	Minimum	1.91
	Maximum	6.86
	Mean	3.47

Figure 4: Local integration Index

Global integration index showed that the highest values for depthmapX is 3.1 and the lowest value is 0.99. Global Integration Index (figure 5) indicates that some streets in your study area act as global connectors (arterials, hubs), while others are segregated pockets, reflecting the spatial structure and movement potential of the network. This analysis, therefore, highlights critical pathways that function as primary arteries for pedestrian flow, revealing their significant contribution to the overall network's navigability and efficiency.

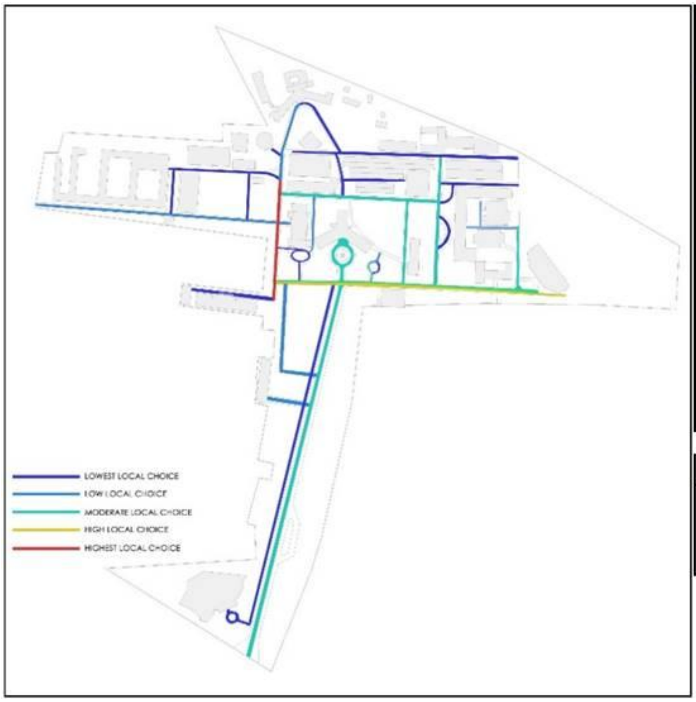


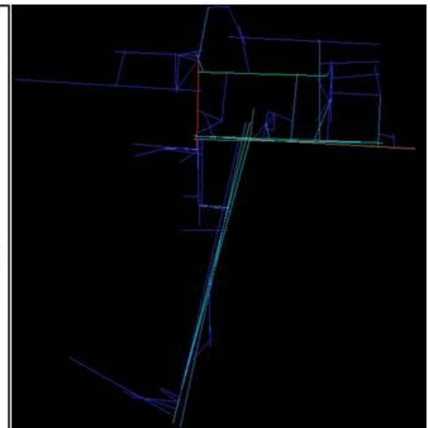


Parameter	value	depthmapX
	Minimum	0.99
	Maximum	3.01
	Mean	1.32

Figure 5: Global integration Index

Further, choice analysis in DepthmapX, depicted in Figure 6, reveals the pedestrian movement potential through the campus network, identifying paths that are most frequently chosen by pedestrians due to their topological advantages. Global Choice (0–1887) shows which streets are critical for long-distance connectivity across the entire study area. Local Choice (0–454) highlights local connectors within neighborhoods. Streets scoring 0 in both are purely isolated, local-use spaces.





Parameter	value	depthmapX
	Minimum	0
	Maximum	454
	Mean	38

These preferred routes often align with areas of high integration and connectivity, reinforcing their importance in facilitating efficient and satisfactory pedestrian movement across the campus (Quijada-Alarcón et al., 2025). The identification of such critical pathways provides actionable insights for urban planners and campus administrators to prioritize improvements, such as enhanced wayfinding, lighting, or seating, to further optimize pedestrian flow and comfort (Forciniti & Eboli, 2023). Conversely, areas with low choice values may represent underutilized or poorly connected segments that could benefit from design interventions to enhance their appeal and integration within the overall pedestrian network (Thombre & Kapshe, 2020) (Delso et al., 2017). This comprehensive spatial analysis, combined with insights into pedestrian injury risk factors (Baek & Lim, 2023), forms a robust foundation for developing targeted strategies to enhance campus walkability and overall pedestrian satisfaction.

DISCUSSION

The spatial configuration of the SIT campus was examined using DepthmapX, focusing on local and global integration indices as well as choice values. The results provide insights into the structure of the campus street network, its movement potential, and the degree of accessibility of different spaces. Specifically, areas with higher integration values represent more accessible and frequently used pedestrian routes, highlighting their functional significance within the campus's circulatory system.

The Local Integration values indicate that within the campus, some streets are highly accessible at the neighborhood level, with maximum values reaching 6.86. These streets are likely to coincide with primary internal circulation routes, connecting key academic buildings, hostels, and communal facilities. In contrast, streets with values closer to the minimum of 1.91 represent spatially segregated areas, such as peripheral walkways or service lanes, which are less frequently used for everyday pedestrian movement. This distribution highlights the presence of a clear local hierarchy in the campus street network, with certain corridors naturally attracting higher pedestrian flows.The Global Integration values show that the most integrated street in the entire campus network has a value of 3.1, while the least integrated space records a value of 0.99. This suggests that although some routes are central to the overall campus accessibility, others are significantly segregated from the global movement structure. The higher integrated corridors correspond to spinal routes that link the campus to its external context (such as main gates or arterial approach roads), reinforcing their role as primary connectors between the campus and the city of Tumkur. Conversely, the lower values point to internal lanes or cul-de-sacs, which remain disconnected from the larger circulation system.

Choice values further reveal the potential flow of movement through the campus network. Global Choice (0–1887) indicates that streets with high global choice values emerge as critical long-distance connectors across the entire campus. These are the routes most likely to be used as shortcuts or natural pathways, making them important for structuring pedestrian and vehicular circulation at a strategic level. Local Choice (0–454) indicates that at the neighborhood scale, streets with higher local choice values serve as local connectors, facilitating movement between hostels, academic blocks, and common facilities. Streets with a choice value of zero in both global and local analysis are functionally isolated, catering exclusively to localized access needs such as service entries, parking lots, or internal courtyards.

The results illustrate a hierarchical and asymmetrical movement structure within the SIT campus. A few globally integrated corridors function as the backbone of campus circulation, anchoring long-distance accessibility. Several locally integrated and high-choice pathways provide neighborhood-level connectivity, encouraging pedestrian flows around academic and residential clusters. Peripheral or dead-end spaces remain segregated, reinforcing their role as secondary or restricted-use areas.

CONCLUSION

The Space Syntax analysis of SIT Campus, Tumkur, demonstrates a clear hierarchy of spatial accessibility and movement potential. Overall, the results point to a spatially asymmetrical network, where a few corridors dominate circulation patterns, while others remain marginal or underutilized. This unevenness has direct implications for pedestrian comfort, safety, and accessibility within the campus. Based on the Space Syntax analysis, planning interventions for SIT Campus should prioritize enhancing pedestrian comfort and safety along high-integration and high-choice corridors through improved pavements, shading, and crossings. Segregated and low-integration areas should be better connected with pedestrian shortcuts and bicycle links, while isolated streets with zero choice values can be activated through landscaping or social functions. High-choice routes should be supported with lighting, security, and amenities, ensuring safe and continuous use. Overall, mobility planning must align with the spatial logic of the campus to create an inclusive, well-connected, and sustainable movement network.

The adopted methodology, which included detailed spatial mapping and the application of Space Syntax, allowed for a comprehensive quantitative assessment of the campus's walkability and the potential for enhancing pedestrian satisfaction by identifying areas that influence safety and walkability. Furthermore, this research demonstrates that integrating Space Syntax with direct observational methods can provide a more holistic understanding of pedestrian behavior and passive contact formation in complex environments, addressing the limitations of relying solely on spatial configuration analysis. The further scope of study includes exploring the correlation between spatial metrics and reported pedestrian satisfaction, potentially employing surveys to gauge user experience, and investigating how proposed interventions influence actual movement patterns and perceptions of safety.

REFERENCES

Anapakula, K. B., & Eranki, G. A. (2021). Developing an index to evaluate the quality of pedestrian environment: Case study application in an Indian metro. *Transportation Research Interdisciplinary Perspectives*, *11*, 100406. https://doi.org/10.1016/j.trip.2021.100406

Apritasari, Y. D. (2020). EVALUATION FOR USER'S SATISFACTION ON PATHWAY AND STREET FURNITURE FACILITIES IN THAMRIN-SUDIRMAN AREA. *International Journal of Built Environment and Scientific Research*, *4*(1), 61. https://doi.org/10.24853/ijbesr.4.1.61-72

Arellana, J., Saltarín, M., Larrañaga, A. M., Alvarez, V., & Henao, C. A. (2019). Urban walkability considering pedestrians' perceptions of the built environment: a 10-year review and a case study in a medium-sized city in Latin America [Review of *Urban walkability considering pedestrians' perceptions of the built environment: a 10-year review and a case study in a medium-sized city in Latin America*]. *Transport Reviews*, *40*(2), 183. Taylor & Francis. https://doi.org/10.1080/01441647.2019.1703842

Askarizad, R., & He, J. (2022). Perception of Spatial Legibility and Its Association with Human Mobility Patterns: An Empirical Assessment of the Historical Districts in Rasht, Iran. *International Journal of Environmental Research and Public Health*, *19*(22), 15258. https://doi.org/10.3390/ijerph192215258

Baek, J., & Lim, L. (2023). Unveiling pedestrian injury risk factors through integration of urban contexts using multimodal deep learning. *Sustainable Cities and Society*, *101*, 105168. https://doi.org/10.1016/j.scs.2023.105168

Bafna, S. (2003). Space Syntax. *Environment and Behavior*, *35*(1), 17. https://doi.org/10.1177/0013916502238863

Basu, N., Oviedo-Trespalacios, Ó., King, M., Kamruzzaman, Md., & Haque, Md. M. (2023). What do pedestrians consider when choosing a route? The role of safety, security, and attractiveness perceptions and the built environment during day and night walking. *Cities*, *143*, 104551. https://doi.org/10.1016/j.cities.2023.104551

Belaroussi, R. (2025). Subjective Assessment of a Built Environment by ChatGPT, Gemini and Grok: Comparison with Architecture, Engineering and Construction Expert Perception. *Big Data and Cognitive Computing*, *9*(4), 100. https://doi.org/10.3390/bdcc9040100

Chen, X., Shi, Z., & Hu, Y. (2025). The Walkability Evaluation and Optimization Strategies of Metro Station Areas Taking Shanghai as an Example. *Buildings*, *15*(10), 1746. https://doi.org/10.3390/buildings15101746

Dalmat, R. R., Mooney, S. J., Hurvitz, P. M., Zhou, C., Moudon, A. V., & Saelens, B. E. (2021). Walkability measures to predict the likelihood of walking in a place: A classification and regression tree analysis. *Health & Place*, *72*, 102700. https://doi.org/10.1016/j.healthplace.2021.102700

Delso, J., Martín, B., Ortega, E., & Otero, I. D. (2017). A Model for Assessing Pedestrian Corridors. Application to Vitoria-Gasteiz City (Spain). *Sustainability*, *9*(3), 434. https://doi.org/10.3390/su9030434

Deng, C., Xiao-yu, D., Wang, H., Lin, W., Wen, H., Frazier, J. W., Ho, H. C., & Holmes, L. M. (2020). A Data-Driven Framework for Walkability Measurement with Open Data: A Case Study of Triple Cities, New York. *ISPRS International Journal of Geo-Information*, *9*(1), 36. https://doi.org/10.3390/ijgi9010036

Distefano, N., & Leonardi, S. (2023). Fostering Urban Walking: Strategies Focused on Pedestrian Satisfaction. *Sustainability*, *15*(24), 16649. https://doi.org/10.3390/su152416649

Dogan, T., Yang, Y., Samaranayake, S., & Saraf, N. (2020). Urbano: A Tool to Promote Active Mobility Modeling and Amenity Analysis in Urban Design. *Technology|Architecture + Design*, *4*(1), 92. https://doi.org/10.1080/24751448.2020.1705716

Fenghour, A., Hamouda, A., & Benyahia, L. (2022). ENCLOSURE OF OUTDOOR SPACES IN A RESIDENTIAL ENVIRONMENT BETWEEN VISIBILITY AND ACCESSIBILITY. *Arquitetura Revista*, *18*(1), 99. https://doi.org/10.4013/arq.2022.181.06

Fonseca, F. P. da, Ribeiro, P., Conticelli, E., Jabbari, M., Papageorgiou, G., Tondelli, S., & Ramos, R. A. R. (2021). Built environment attributes and their influence on walkability. *International Journal of Sustainable Transportation*, *16*(7), 660. https://doi.org/10.1080/15568318.2021.1914793

Forciniti, C., & Eboli, L. (2023). What Makes a Pedestrian Path Pleasant? Analysis of Young Pedestrians' Perceptions. *Urban Science*, *7*(2), 44. https://doi.org/10.3390/urbansci7020044

Froehlich, J. E., Saugstad, M., Saha, M., & Johnson, M. S. (2022). Towards Mapping and Assessing Sidewalk Accessibility Across Sociocultural and Geographic Contexts. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.2207.13626

Goyes, J. F. R., Lowry, M., Zapata, N. G., & Ospina, J. P. (2025). *Street network sub-patterns and travel mode*. https://doi.org/10.48550/ARXIV.2507.19648

Hahm, Y., Yoon, H., & Choi, Y. (2019). The effect of built environments on the walking and shopping behaviors of pedestrians; A study with GPS experiment in Sinchon retail district in Seoul, South Korea. *Cities*, *89*, 1. https://doi.org/10.1016/j.cities.2019.01.020

Jabbari, M., Fonseca, F. P. da, Smith, G., Conticelli, E., Tondelli, S., Ribeiro, P., Ahmadi, Z., Papageorgiou, G., & Ramos, R. A. R. (2023). The Pedestrian Network Concept: A Systematic Literature Review. *Journal of Urban Mobility*, *3*, 100051. https://doi.org/10.1016/j.urbmob.2023.100051

Kaur, H., Singh, P., Bivina, G. R., & Nawani, A. (2021). Qualitative Evaluation of Pedestrian Facilities using the PLOS Model. *IOP Conference Series Earth and Environmental Science*, *775*(1), 12004. https://doi.org/10.1088/1755-1315/775/1/012004

Khanal, A., Abdelfattah, R. S., Alawadi, K., & Nguyen, N. H. (2023). Beyond streets: The role of alleys in Abu Dhabi's and Dubai's network systems. *Journal of Urban Management*, *13*(1), 33. https://doi.org/10.1016/j.jum.2023.10.002

Kurniawan, D., & Yulianto, A. (2021). The Sidewalk Structuring Strategy As Iconic Pedestrian Case Study: Pedestrian's Budi Luhur University - Jakarta. *IOP Conference Series Materials Science and Engineering*, *1071*(1), 12007. https://doi.org/10.1088/1757-899x/1071/1/012007

Lo, C.-H., Ko, Y.-C., & Ko, Y.-T. (2015). Application of space syntax theory to the sustainable development of Tunghai university campus environment. *Journal of Interdisciplinary Mathematics*, *18*(6), 883. https://doi.org/10.1080/09720502.2015.1108105

Marangão, G. H. de F., Magagnin, R. C., Fontes, M. S. G. de C., & Azambuja, M. dos A. (2022). Methodologies for measuring the quality of urban infrastructure for pedestrian mobility: A systematic literature review. *Revista Nacional de Gerenciamento de Cidades*, *10*(78). https://doi.org/10.17271/23188472107820223284

Mehta, V. (2008). Walkable streets: pedestrian behavior, perceptions and attitudes. *Journal of Urbanism International Research on Placemaking and Urban Sustainability*, *1*(3), 217. https://doi.org/10.1080/17549170802529480

Morales, J., Flacke, J., Morales, J., & Zevenbergen, J. A. (2017). Mapping Urban Accessibility in Data Scarce Contexts Using Space Syntax and Location-Based Methods. *Applied Spatial Analysis and Policy*, *12*(2), 205. https://doi.org/10.1007/s12061-017-9239-1

Nag, D., Sen, J., & Goswami, A. K. (2022). Measuring Connectivity of Pedestrian Street Networks in the Built Environment for Walking: A Space-Syntax Approach. *Transportation in Developing Economies*, *8*(2). https://doi.org/10.1007/s40890-022-00170-7

Pires, B. C., Magagnin, R. C., Fontes, M. S. G. de C., & Azambuja, M. dos A. (2022). Methodologies to evaluate the quality of pedestrian infrastructure on the University campus: Systematic Review. *Revista Nacional de Gerenciamento de Cidades*, *10*(79). https://doi.org/10.17271/23188472107920223287

Quijada-Alarcón, J., Rodríguez-Rodríguez, R., Maylin, A., Adames, M., Zeballos, J., Icaza, A., & Harris, A. (2025). Assessing Pedestrian Network Continuity: Insights from Panama City's Context. *Urban Science*, *9*(3), 58. https://doi.org/10.3390/urbansci9030058

Rodríguez-Valencia, Á., Vallejo-Borda, J. A., Barrero, G. A., & Ortiz-Ramirez, H. A. (2021). Towards an enriched framework of service evaluation for pedestrian and bicyclist infrastructure: acknowledging the power of users' perceptions. *Transportation*, *49*(3), 791. https://doi.org/10.1007/s11116-021-10194-4

Scoppa, M., & Anabtawi, R. (2021). Connectivity in Superblock Street Networks: Measuring Distance, Directness, and the Diversity of Pedestrian Paths. *Sustainability*, *13*(24), 13862. https://doi.org/10.3390/su132413862

Souza, Y. E. da S., & Magagnin, R. C. (2022). Factors that may impair the walkability of students on the route between the Alencastro urban public transport station and the Federal Institute of Mato Grosso (Cuiabá Campus). *Revista Nacional de Gerenciamento de Cidades*, *10*(79). https://doi.org/10.17271/23188472107920223293

Thombre, L., & Kapshe, C. (2020). Understanding Contribution of Physical Accessibility in Perceptual Conviviality of Public Open Spaces using Analytical Hierarchy Process. *International Journal of Innovative Technology and Exploring Engineering*, *9*(4), 2798. https://doi.org/10.35940/ijitee.d1671.029420

Vlugt, A.-L. van der, Gerten, C., & Scheiner, J. (2023). Integrating Perceptions, Physical Features and the Quality of the Walking Route into an Existing Accessibility Tool: The Perceived Environment Walking Index (PEWI). *Active Travel Studies*, *4*(1). https://doi.org/10.16997/ats.1391

Wang, W., Li, P., Wang, W., & Namgung, M. (2011). Exploring Determinants of Pedestrians' Satisfaction with Sidewalk Environments: Case Study in Korea. *Journal of Urban Planning and Development*, *138*(2), 166. https://doi.org/10.1061/(asce)up.1943-5444.0000105

Yamu, C., Nes, A. van, & Garau, C. (2021). Bill Hillier's Legacy: Space Syntax—A Synopsis of Basic Concepts, Measures, and Empirical Application. *Sustainability*, *13*(6), 3394. https://doi.org/10.3390/su13063394

Zhang, L., & Chiaradia, A. (2020). Urban volumetrics: spatial complexity and wayfinding, extending space syntax to three dimensional space. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.2012.14419

Zhang, L., Ye, Y., Zeng, W., & Chiaradia, A. (2019). A Systematic Measurement of Street Quality through Multi-Sourced Urban Data: A Human-Oriented Analysis. *International Journal of Environmental Research and Public Health*, *16*(10), 1782. https://doi.org/10.3390/ijerph16101782

Zhu, W., Hua, Y., & Dogan, T. (2019). Evaluating Street Quality for Walkability from 3D Models. *IOP Conference Series Earth and Environmental Science*, *294*(1), 12025. https://doi.org/10.1088/1755-1315/294/1/012025