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SPACE SYNTAX ANALYSIS ON EDU-TOURISM ACCESSIBILITY (CASE STUDY: PLANETARIUM UIN WALISONGO AREA)

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ABSTRACT

Planetarium UIN Walisongo is an educational facility that not only accommodates academic needs but is also projected to become a tourism destination in Semarang. The density of activity is the main focus that must be considered. The building's existence in the middle of the campus also demands that it has good visual access. The study focused on configuration and visibility analysis by looking at their effect on accessibility around the building. The research was conducted using quantitative methods with a descriptive and simulation framework. The simulation process is carried out using a space syntax approach with Depthmap software. Macroanalysis shows that the building is located in the central area with a relatively high integration value. The high intelligence value shows that the spatial configuration is relatively easy to recognize. The wide and integrated road makes this area have relatively high visibility. Microanalysis shows that the pedestrian around the Planetarium is not well connected. Space engineering by connecting pedestrians is carried out to provide better accessibility. Achievement efficiency is the main consideration to produce a high value of integration and visibility around the building. Therefore, the area quality will be better with an accessible space on macro and micro scales.

KEYWORDS: accessibility, depthmap, space configuration, space syntax, visibility

PRELIMINARY

The status change of IAIN Walisongo to UIN Walisongo encourages the integration of Islamic studies with general scientific disciplines for the advancement of humanity and civilization. The science disciplines at UIN Walisongo are progressing and developing with the addition of programs and fields of study. Of the several facilities that have been built, one that has become an icon is Planetarium UIN Walisongo Semarang.

The Planetarium building is one of the educational facilities at UIN Walisongo which functions as a research center and study development for Astronomy. The building has several functions such as a planetarium, observatory, library, and information technology infrastructure. The facilities offered are expected to optimize the development of astronomy studies by experts, lecturers, and students (Nurhasan et al., 2015). This Planetarium is not only intended as a research center but is also projected to become one of the tourism destinations. The plan is a long-term program at UIN Walisongo which will integrate the campus as an educational facility with a tourism function so that it is expected to become one of the qualified Edu-tourism destinations in Semarang City.

Figure 1. Planetarium UIN Walisongo
(Source: Author Documentation, 2022)

As one of the educational and tourist destinations in the university environment, pedestrian circulation is the main thing that must be considered in its development later. Circulation or human movement is very influential on activities in space. Circulation relates to the layout and configuration of the space. Circulation as a path of human movement is an element that connects the space in a building or a series of outdoor and indoor spaces (Ching, 2007).

Currently, the planetarium-building functions are still limited to academic activities. From a spatial perspective, the planetarium building is in the middle of the campus environment so it has close proximity to other buildings. For the academic community who are familiar with the layout of their campus, this may not be a problem. However, visitors from outside the campus may not necessarily be able to find or access the Planetarium building easily. This building is not directly related to the campus entrance gate access. Visitors need to go through several turns and pass several buildings before arriving at the Planetarium. Several pedestrian sections around the Planetarium building are also not fully connected to each other. It can also cause confusion for people who will visit the Planetarium. In addition, buildings or other elements of space can also potentially reduce the visibility aspect of the Planetarium building for outside visitors.

Figure 2. Several pedestrians that are not connected to each other
(Source: Author Documentation, 2022)

In its goal to become an Edu-tourism facility, the planetarium of UIN Walisongo needs to be supported by a good spatial planning concept. The circulation of many people in the area requires an optimal pattern of spatial configuration to improve the quality of the area both from the aspect of human activity, buildings, and other necessary facilities (Yudhanta, 2018). In addition, the planetarium as an icon needs to be a visible space to attract more people to come in. Studies on spatial configuration patterns need to be carried out in an area to evaluate or look for more qualified and optimal configuration models in a plan (Permana et al., 2020). The Space Syntax approach is the right method to analyze the relationship between behavior and space based on behavioral perspectives from macro to micro contexts (Bafna, 2003).

This study focuses on configuration and visibility analysis to see the accessibility of space around the planetarium UIN Walisongo Semarang. The influence of visitor circulation patterns on the spatial configuration pattern and its visibility is studied to evaluate or find a better and more appropriate configuration model. A comparative study is carried out with the existing conditions so that it is expected to improve the quality of the area on both macro and micro scales.

LITERATURE REVIEW

Space Configuration and Relationships

Spatial configuration is related to the pattern of spatial relationships in a built environment system (Yudhanta, 2018). Configuration is a more complex concept of arrangement and binds all elements that influence a built environment (Hillier, 2007). In the same book, Hillier explains that the configuration of space can be influenced or influenced by human configuration. The pattern of human movement from one point to another needs to be observed and measured to able to assess the relationship between the configuration of space humans in it.

A method for showing the characteristic of configuration by Hillier (2007) is called syntax. Space syntax research can clearly describe the relationship between social society and the form of space from a general perspective on the structure of inhabited spaces in all forms such as buildings, settlements, cities, or landscapes (Bafna, 2003). This form of configuration will create an intervening variable between architecture and behavior in a built environment (Yudhanta, 2018). The results of axial analysis on certain spatial configurations can be considered in the evaluation or engineering of a space that is more attractive to visitors (Andi et al., 2021).

Space Visibility

Analysis of visibility related to the differences in spatial and functional spaces in a spatial organization (Bafna, 2003). The level of visibility that appears in a certain spatial organization can be used as the basis for quantitative and statistical analysis later. Bafna explained that in the study of space syntax, visible spaces are referred to as isovists. The aspect of space visibility has an important meaning because it will make it easier for people to recognize space in a spatial organization in a built environment.

In analyzing the level of space visibility, the Visual Graphic Analysis or VGA method can be used because of its ability to investigate the configuration relationship between spaces in a built environment system (Turner & Penn, 1999). The results of studies related to space visibility can be useful for seeing how a space is used or affects human movement in it (Yudhanta, 2018). In addition, it can also be used to determine the relationship between open spaces in a spatial configuration to buildings or to access roads around them. Setting a location with an isovist area at a certain point can determine the presence of space users that allow activities and interactions to occur in it (Turner et al., 2001). Visibility can also be a priority aspect in the area development because it affects visual comfort and can minimize dead spaces in a spatial configuration (Romdhoni et al., 2018).

Accessibility

Accessibility in space is measured by how people use and access the space and the facilities in it (Yudhanta, 2018). Analysis related to accessibility in a space system has relevance to the scope of architectural and behavioral studies. Rapoport in Sholahuddin (2007) explains that the study of environmental architecture and behavior is related to the ability of the built environment to shape human behavior in it. A spatial arrangement has good accessibility if there is the ease of use for users in moving through the environment that is formed and can take advantage of the facilities in it (Sholahuddin, 2007).

Sholahuddin (2007) further explained that the ease with which users can move in a space organization is related to circulation and visuals. Circulation is related to the path of human movement as a sensory connecting element that connects spaces in a spatial organization (Ching, 2007). Circulation on pedestrian paths must be able to ensure the safety of space users from accidents by taking into account the clarity of space boundaries and room size (Hidayati & Rifani, 2021). A space with high connectivity and well-integrated allows a road segment to have a high accessibility value (Sherlia et al., 2021).

Space Syntax

Space syntax is an approach to analyzing space or spatial arrangement, calculating it, and describing the configuration of the space in a diagrammatic manner. Configuration relates to a set of interrelated elements in a spatial structure (Hillier, 2007). It is further explained that the pattern of activity and movement of space users is strongly influenced by the configuration of space or the structure of space. To perform calculations related to the relationship between space and the activities in it, space syntax uses several parameters that are measured based on the concept of topological distance called depth (Firdausi, 2017).

The space syntax approach was created to help architects simulate the possible impact of their designs on the people they accommodate and move in. The scope of this approach can be very broad such as urban planning to narrow scope such as interior design. The diagrammatic configuration calculated using space syntax describes the connectivity and integration of spaces based on three basic concepts of space, namely isovist, convex space, and axial space (Behbahani et al., 2014). Convex maps and axial maps from the simulation results are used to measure three main indicators in space syntax, namely connectivity, integration, and intelligence. The purpose of this connectivity measurement is to analyze the level of relationship or interaction between one space and another in a spatial configuration (Puspitasari, 2020).

Integrity analysis focuses on measuring the global property of the relative position between spaces in a configuration. Integration analysis in the space syntax approach is very important because it can help in analyzing the configuration of space as a system (Siregar, 2014). A well-connected space from the observation room is a space that has a high integration value. These spaces are usually spaces that are directly connected to the observation room.

Intelligence analysis is the highest measurement stage in space syntax which describes the relationship between local scale measurements (connectivity) and global scale (integration). If the measurement of connectivity and integration becomes a property on a spatial scale, then the measurement of intelligence is a property of a spatial system as a whole. A high intelligence value indicates that connectivity on a local scale can make it easier for space users to access other spaces (Hillier, 2007).

RESEARCH METHODS

This study uses quantitative methods using a descriptive and simulation research framework. The descriptive analysis here aims to explain numerical data accurately and systematically. The simulation process will use a space syntax approach with the help of Depthmap software whose results will be analyzed descriptively. Depthmap is the official Space Syntax platform developed by the Space Syntax Laboratory. This application is used to analyze human movement in space and circulation according to analysis needs (Sa'diyah et al., 2019).

Technically, the Depthmap application will be used to analyze the space configuration and space visibility. In the configuration analysis, convex maps and axial maps which are seen from the simulation process of the built environment conditions are used to see several indicators of space syntax including connectivity, integration, and intelligence. (Ulvianti & Anindita, 2018). In spatial visibility analysis, visibility graph tools in the Depthmap application are used to observe the level of spatial visibility and permeability. This analysis is important to see how space users experience their activities in a certain space configuration (Karimi, 2012).

The research was conducted by taking the case of the Planetarium building of UIN Walisongo Semarang. Analysis with a space syntax approach will see how the relationship between the configuration of the planetarium space and its surroundings with the movement of humans as users of space in it. The planetarium, which is projected as an Edu-tourism complex, will certainly relate to various user segments, from the academic community on campus to the general public from outside the campus. Human movements from various sources need to be controlled in a good spatial configuration system so that it is hoped that the Planetarium complex in the future can become a living area and can be enjoyed by users.

RESULTS AND DISCUSSION

The Planetarium building is located on Campus 3 of UIN Walisongo. This complex is a center for higher education institutions because there is a rectorate building and several main sectors of the institution in it. When viewed from its position, the Planetarium building is in the middle of the area (Figure 3). From the direction of the main gate, there are the Language Development Center building, Campus Mosque, ICT Center building, Library building, Walisongo Center building, Auditorium building, Faculty of Islamic Economics and Business (FEBI), and the Faculty of Sharia and Law (FSH) before arriving at the Planetarium. Opposite the Planetarium or on the south side is the Faculty of Da'wah and Communication (FDK). Meanwhile, after the Planetarium building or on the west side, there is the Rectorate building, the new FSH building, the Social Sciences and Humanities lecture building, and the new Faculty of Science and Technology (FST).

Figure 3. Existing map of campus 3 UIN Walisongo
(Source: Author Analysis, 2022)

Besides being in the middle of the area, the Planetarium is also on the main road of Campus 3 UIN Walisongo Semarang. The circulation of pedestrians and vehicular traffic passes through the Planetarium building, either towards the rectorate building, the FSH building, the Social Sciences and Humanities lecture building, the FST building, or vice versa. In addition to moving from the main campus 3 roads, pedestrians, or vehicles around the Planetarium building also circulate quite densely, especially the Faculty of Economics and Islamic Business (FEBI) building complex in the east or the Faculty of Da'wah and Communications (FDK) building complex opposite (Figure 4).

Figure 4. Vehicles and pedestrians circulating around the Planetarium
(Source: Author Documentation, 2022)

Existing Space Configuration Analysis

The first axial analysis is to look at the macro map or campus area of UIN Walisongo 3. The purpose of the analysis at this stage is to see the general pattern of space behavior and observe how it relates to the Planetarium building as the focus of the object in this study. Figure 5 is the result of the Space Syntax simulation in the form of an axial map for connectivity values in the UIN Walisongo 3 campus area. High connectivity values are represented by red lines, while low connectivity values are represented by blue lines. The highest value is located to the east of the FEBI building with a connectivity value of 8, or it can be interpreted that the road is connected to 8 other roads. As the main access in the campus area of UIN Walisongo 3, this road connects several other roads around it from various directions.

Figure 5. Axial line for the value of campus area connectivity 3 UIN Walisongo
(Source: Author Analysis, 2022)

The road section in front or south of the Planetarium building is represented by a green line or has a moderate connectivity value. The connectivity value of this road segment ranges from 4 to 5. There are several other connected roads, namely from the FDK direction to the south and from the FEBI direction to the east of the Planetarium building. The connecting road to the east of the Planetarium building has a connectivity value ranging from 2 to 3 because it only connects the roads within the FEBI complex and the main road south of the Planetarium building. From the simulation results above, it can be said that the roads around the Planetarium building have a good level of interaction because they are connected to the spaces around them.

The next indicator of axial analysis is integration. This dimension measures the global position of space relative to other spaces in a spatial configuration. Figure 6 shows the results of the Space Syntax simulation in the form of an axial map for the integration value of the UIN Walisongo 3 campus area. It can be seen from the axial line analysis that the integration value (HH) has the highest value of 1,55 and the lowest value of 0,59. The high integration value is located on the road to the east of the FEBI building which is represented by a red line. While the low integration value is located on the detour section to the north of the Rectorate building, the road to campus 2, or the road around the multipurpose building which is represented by a blue line. Spaces with red lines indicate that the space has a high interaction relative to other spaces in a spatial configuration, or in other words, many spaces are directly connected. The spaces with blue lines indicate that the space is relatively separate from the organization of space.

Figure 6. The axial line for the value of campus area integration 3 UIN Walisongo
(Source: Author Analysis, 2022)

The road sections around the Planetarium building have a fairly good integration value, which is represented by orange to green lines. The left side of the road from the entrance gate in front of the Planetarium building has an integration value (HH) of 1,58 while the right side of the road from the rectorate direction has an integration value (HH) of 1,39. This fairly high integration value is directly related to the main road from the east of FEBI which has the highest integration value in the region. This area becomes the central point of the area that binds the surrounding spaces. While the connecting road from the FEBI direction to the east of the Planetarium building which is represented by the green line has an integration value (HH) of 1,24 to 0,90. This smaller integration value is because this road segment only connects the side room of the Planetarium building and the space inside the FEBI complex.

Figure 7. The road in the East of FEBI with the highest connectivity and integration value
(Source: Author Analysis, 2022)

The relationship between the value of connectivity and integration will result in the value of intelligence. A high intelligence value describes a strong relationship between the two variables. A high value can also illustrate that a space configuration will be easier to identify. Conversely, if the intelligence value is low, it indicates that the relationship between spaces in a spatial configuration is weak. Axial map simulation for connectivity and integration values in the UIN Walisongo 3 campus area shows an intelligence value (R2) of 0,72 (Figure 8). This value indicates a fairly good relationship between connectivity and regional integration. This also illustrates that the spatial configuration of the Campus 3 area of UIN Walisongo is relatively easy to recognize by visitors from outside the campus.

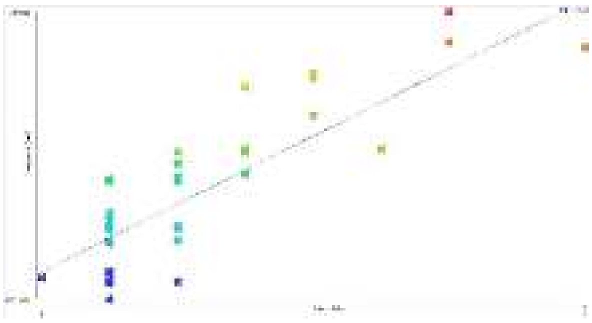

Figure 8. Scatter diagram of connectivity and integration of the Campus 3 area of UIN Walisongo
(Source: Author Analysis, 2022)

The value of regional intelligence which is quite good actually gives an advantage to the Planetarium building. This value illustrates that the campus area of UIN Walisongo is relatively easy to recognize in general. As is known, the Planetarium building is located in the middle of the Campus 3 area of UIN Walisongo. In addition, the position of the building which is located on one of the main roads of campus 3 makes the Planetarium building relatively easy to access from the main access area.

Existing Space Visibility Analysis

Graphical analysis of visibility or visibility graph analysis on the Campus 3 environment of UIN Walisongo is carried out to get an idea of the movement, perception, or use of space in this area. The visual representation that appears from the simulation results will later describe the level of ease of space users in using the space. In addition, the description is to provide an assessment of whether a space is friendly enough to visitors who come or vice versa (Karimi, 2012).

The visual representation of the visibility graphical analysis (VGA) is indicated by red-green-blue color gradations in the simulation results of the Space Syntax area map. Based on the simulation results, high visibility values are found on the main roads to the east, south of FEBI, and south of the Planetarium building which is represented in yellow (Figure 9). The visualization shows that the area has a high degree of visibility, or it can also be interpreted that the area has the highest direct relationship to the surrounding spaces. On the other hand, the spaces represented in blue color show a small VGA value, or the spaces have a relatively small degree of visibility. These spaces also have less connection with other spaces.

Figure 9. VGA simulation results in the Campus 3 area of UIN Walisongo
(Source: Author Analysis, 2022)

The results of the VGA calculation are also in harmony with the calculation of the integration value where the roads around the Planetarium building have a relatively high value in the Campus 3 area of UIN Walisongo. If viewed from the perspective of the value of integration, it can be interpreted that areas with high values have the highest level of human activity relative to other spaces. Meanwhile, when viewed from a VGA perspective, areas with high values or yellow to red colors indicate that this area is relatively easy to see, easy to reach, and easily recognized by regional visitors.

Figure 10. Optimal visibility on the Planetarium from the East and South directions of the building
(Source: Author Analysis, 2022)

The Planetarium building is one of the buildings located in an area with relatively high integration values and regional VGA. This cannot be separated from its position which is on one of the main roads within the Campus 3 area of UIN Walisongo. If observed directly, the wide main road segment makes the area along this route relatively spacious so as to provide quite comfortable visual access for space users who pass through it. Morning visitors from the entrance to the area, the Planetarium building can be seen quite clearly starting from the southeastern intersection of FEBI. This is because the Planetarium building is relatively not covered by other buildings. In addition, there is a small turn before the Planetarium building which makes the position of the building more visible protruding towards the South so that it can be seen clearly, especially from the East. Meanwhile, from the direction of the Rectorate building, the Planetarium building can also be seen quite clearly because of the open space in front of it. The tapered shape of the Planetarium building mass at the front presents sufficient open space on the west side which is useful for visual access to space users from the west.

Micro Analysis

The simulation results from the axial and visibility analysis that have been carried out on the existing area have provided a general description of the quality of the existing spatial configuration. In general, the area around the Planetarium Building is relatively easy to access and has good visual access. In the context of future regional development, the Planetarium building by location has the potential to become an important point in the area that accommodates educational activities as the initial concept of building this building.

In order to optimize the potential of the area, especially in the Planetarium building and its surroundings, it is deemed necessary to conduct a micro-configuration and space visibility analysis. If in the macro analysis, the main road sections and connecting roads are the focus of observation, then the micro-analysis looks at pedestrian sections as the main access media for pedestrians. Axial analysis and visibility of road sections in the macro analysis are still limited to space users who use two-wheeled or four-wheeled vehicles. The value of integration and high visibility cannot really guarantee the connectivity or visibility of pedestrians circulating through the pedestrian path around the Planetarium building.

The scope of microanalysis is limited to pedestrian sections around the Planetarium building. Pedestrian sections include those that are directly or indirectly connected to the Planetarium building but there is still an element of proximity (Figure 11). The eastern boundary of the microanalysis mapping is to the road to the east of FEBI. This is done by considering the relatively high values in the axial and VGA analysis along the East FEBI road section to the road in front of the Planetarium building. However, the main roads or connecting roads for motorized vehicles are not the focus of the analysis at this stage because they have been simulated in the macro analysis of the existing area in the previous stage.

Figure 11. Mapping on the microanalysis of the pedestrian area around the Planetarium building
(Source: Author Analysis, 2022)

Based on field observations, there are several pedestrian sections that are not connected to each other. The existence of the main road also separates the pedestrian segments that are opposite each other. Even so, there are roads that do not yet have pedestrian sections so they are mixed with motorized vehicle access. This condition must be of special concern because the accessibility space around the Planetarium has a fairly high intensity of human movement. Even the macro analysis in the previous stage illustrates that this area has a fairly high level of regional integration. Therefore, further efforts are needed to optimize the pedestrian area around the Planetarium so that it can be in line with global accessibility which has shown good value.

Advanced Analysis of Planetarium Surrounding Space Configuration

As an effort to optimize accessibility in the area around the Planetarium building, pedestrian segments are considered necessary to be connected to each other. It is intended that pedestrians have clearer access spaces and are more oriented in their activities in space. In the context of configuration and visibility analysis, a well-connected pedestrian space is also expected to improve space quality and better accessibility, especially in the Planetarium building and the surrounding environment.

Based on the results of field observations, there are several factors that make the pedestrian paths around the Planetarium building not connected. Some of them are intersections or road turns, the presence of the main road in the area, open space around the FEBI building, and the absence of pedestrians on the north and east sides of the Planetarium building.

Figure 12. Recommendations for pedestrian sections around the Planetarium building
(Source: Author Analysis, 2022)

Design recommendations are made to connect pedestrian sections around the Planetarium building (Figure 12). To connect roads that are cut by intersections or road turns, the recommendation given is to use the concept of continuous footways. To connect opposite roads along the main road, the concept of continuous crossing is used. The addition of new pedestrian sections is carried out to the east and north of the Planetarium building, as well as to the north of FEBI.

Figure 13. Visualization of continuous footways (top) and continuous crossing (down)
(Source: Author Analysis, 2022)

The results of the Space Syntax simulation show that the applied design recommendations can connect pedestrian sections around the Planetarium building that were previously unconnected (Figure 14). The results of the axial analysis show that the highest connectivity value is found on the pedestrian segment on the east side of the Planetarium building which is indicated by a red line. In addition, the pedestrian link connecting the main road east of FEBI to the west also has a high connectivity value. These pedestrian sections play an important role in connecting spaces from the east side of the area to the Planetarium building on the west side of the area.

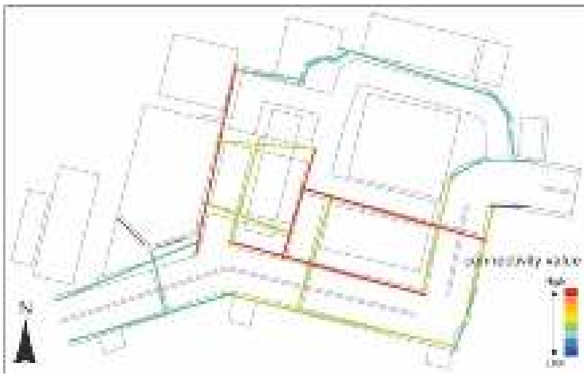

Figure 14. The axial line for the connectivity value of the pedestrian segment around the Planetarium building
(Source: Author Analysis, 2022)

The results of the analysis of the integration of pedestrian segments around the Planetarium building also show results that are not much different from the calculation of connectivity. The connecting pedestrian section from the east to the Planetarium building has a relatively high value indicated by red and yellow lines (Figure 15). In the proposed recommendation, pedestrians from the main road on the East side of the area have direct access to the Planetarium building. This is also an alternative to the pedestrian sections on the North and South sides which are relatively further away from the Planetarium building.

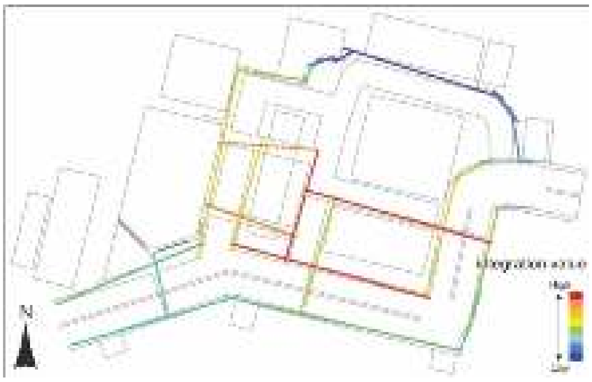

Figure 15. The axial line for the integration value of pedestrian sections around the Planetarium building
(Source: Author Analysis, 2022)

The engineering of the pedestrian sections around the Planetarium building pays attention to aspects of circulation effectiveness and efficiency while still considering the existing pedestrian conditions. This is done so that there is no total modification but instead optimizes the existing pedestrian sections so that they are better utilized by space users. The axial map simulation for the connectivity and integration values of pedestrian sections around the Planetarium building shows an intelligence value (R2) of 0,72 (Figure 16). This value indicates a good relationship between connectivity and integration of the recommended pedestrian. In other words, the configuration of the micro-space around the Planetarium based on the engineering results of the pedestrian segment is relatively easy to recognize by visitors from outside the campus.

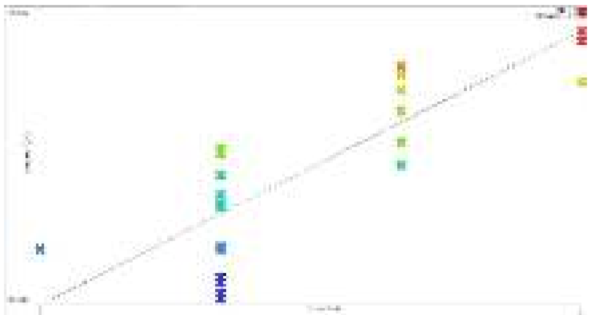

Figure 16. Scatter diagram of connectivity and integration of pedestrian sections around the Planetarium
(Source: Author Analysis, 2022)

Advanced Analysis of the Visibility of the Space Around the Planetarium

The high intelligence value on the pedestrian section around the Planetarium building shows that in terms of spatial configuration, the area around the Planetarium building is relatively easy to reach and recognize by visitors from outside the area. It is also aligned when viewed from the perspective of visibility. The results of Visual Graphic Analysis (VGA) with

Depthmap software show that the pedestrian segment from the access coming or east side of the Planetarium building shows a relatively high value indicated by the yellow-orange-red color (Figure 17). This condition illustrates that the pedestrian segment to the Planetarium has a high degree of visibility so as to provide good visual access from the east side of the area. Two aisles in the building to the east of the Planetarium also play an important role in providing circulation access and visual access to visitors from the east of FEBI.

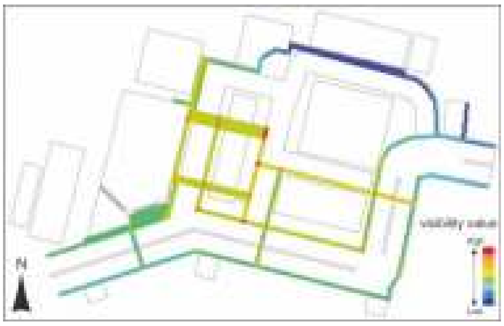

Figure 17. VGA simulation results on pedestrian sections around the Planetarium building
(Source: Author Analysis, 2022)

Accessibility Analysis

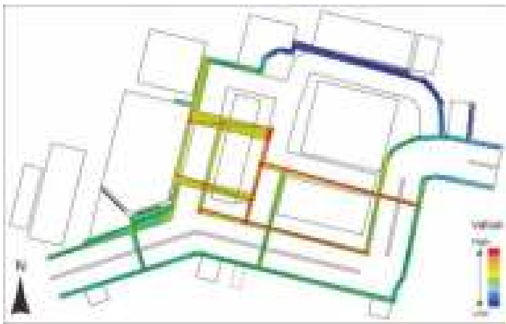

Figure 18. Overlay map of integration values and VGA for pedestrian sections around the Planetarium building
(Source: Author Analysis, 2022)

Space Syntax analysis of spatial configuration based on axial maps has results that synergize with the results of the VGA simulation although from a different perspective. Axial maps describe the quality of a spatial configuration based on connectivity, integration, and intelligence values. While VGA is based on the degree of visibility in space. The results of the macro analysis show that the east and south sides of FEBI to the front of the Planetarium building have a high level of integration and visibility. This illustrates that this area has the highest level of activity and circulation in the area. This condition also makes the Planetarium building relatively easy to access from the main roads in the UIN Walisongo 3 campus area, both from the perspective of space configuration and space visibility.

Microanalysis of the area around the Planetarium building also shows the results of axial and VGA analyses that are synergistic with each other. This can be shown by an overlay map between the integration measurement and the VGA of the roads around the Planetarium building (Figure 18). Connectivity engineering makes pedestrian connected and even has a good intelligence value. The concept of continuous footways, continuous crossing, and the addition of new pedestrian sections increase the accessibility between spaces around the Planetarium building. The connectivity of the pedestrian segment, which is supported by the value of good visibility, provides efficient and visually comfortable accessibility for visitors who come.

CONCLUSION

This research provides a clear and measurable visualization of how the spaces in an Edu-tourism area are used by many people. The space syntax approach used can describe the quality of the spatial configuration and area visibility around the Planetarium building as the main destination for visitors. Areas with high, medium or low levels of integration and visibility can be used as guidelines in the process of developing and optimizing the existing environment in order to become a higher-quality Edu-tourism area in the future.

The concept of Edu-tourism that is carried out in the construction of the Planetarium building must be supported by the development of an environment inside that is "friendly" and comfortable for space users. The area of the Planetarium building and its surroundings which is so dense with activity and traffic is evident from the results of the Space Syntax analysis which shows that this area has a relatively high integration value. This good potential should be responded to by optimizing the accessibility space on a more micro scale, namely the pedestrian section around the Planetarium building.

The area around the Planetarium building which has a relatively high integration value and regional VGA is not yet friendly for pedestrians passing by. This can be seen from several pedestrian sections that are not connected around the Planetarium building. Space engineering with the concept of continuous footways, continuous crossing, and the addition of new pedestrian sections are tried to be applied to provide better accessibility. This has a good impact on pedestrian sections that are interconnected and well-integrated. Pedestrian sections that are interconnected and well visible in general can improve the quality of the Planetarium area and its surroundings to be better, friendly, and comfortable for visitors who come.

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