APPLICATION OF SHAPE GRAMMAR METHOD
ON THE LAYOUT OF UNS STUDENT DORMITORY

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Abstract

Sebelas Maret University with the second highest number of SNBT applicants in Indonesia has made its mark as one of the most popular study destinations. However, the growth in student numbers has not been accompanied by an increase in accommodation options for students, mainly because the area around UNS is already overpopulated. This is due to the large number of boarding houses with high land area but low student uptake. 'Designing Student Dormitory with Shape Grammar Method' comes as a versatile design recommendation for the many residential preferences of students in terms of economy and comfort. By integrating data on student preferences and occupancy comfort standards, shape grammar can help create a space scheme. The final result of the research includes a layout of the UNS Student Dormitory living area that is flexible to suit student preferences.

Keywords: *Shape Grammar, Dorm Layout, UNS Students*

INTRODUCTION

The variety of student preferences for housing during the study period, students often find it difficult to find housing. This is because the number of applicants in 2024 reached 101,449 applicants (UNS, 2024) and continues to grow every year. There are students who need wider space, some like narrower space, some want housing with cheaper monthly fees to choose housing with the most expensive rates every month.

Based on research by Rahmadyani (2022), students on the ITB campus have preferences for rental housing based on 7 factors: completeness of facilities, price, security, distance of rental housing from campus, accessibility of rental housing to campus, environmental conditions around rental housing, and room area of rental housing.

Table 1. Order of Preference Table for Student Rental Housing Facilities

Facilities	Total Rank	Ranking
Dedicated Toilet	*247*	*2*

Parking Area	424	5
Kitchen	313	3
Wifi	156	1
Laundry Room	383	4
Living room	430	6

Source: Rahmadyani, 2022

The data collected also shows the kinds of facilities that are taken into account when choosing rental housing in general. Wi-Fi facilities rank first while Common Gathering Space ranks last in the order of preference for rental housing facilities.
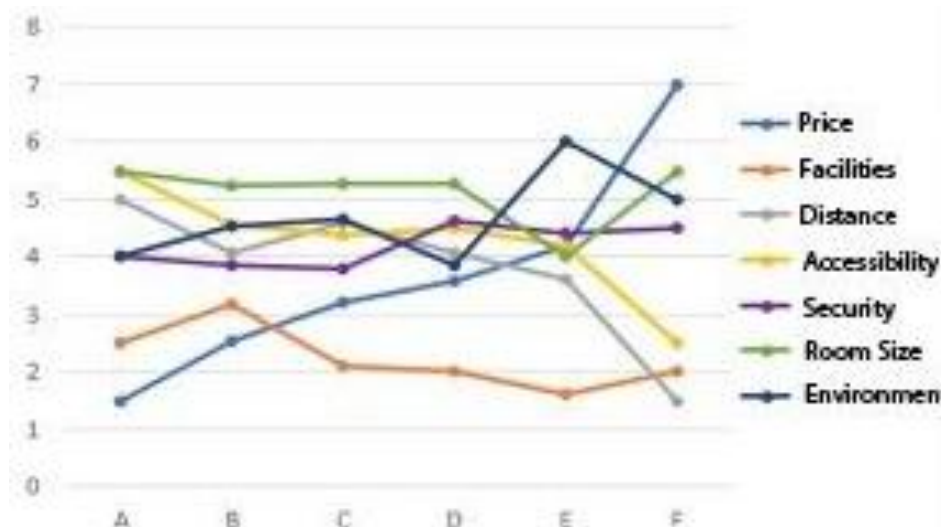

Figure 1. Graph of Price Relation with Facility Preference
Source: Rahmadyani, 2022

The research also shows that there is a relation between the price of housing and the facilities owned by housing. The research also shows that there is a relation between the price of rental housing and the preference tendencies of the student tenants who live in it. Rental housing with price category A/low (<Rp500,000) is generally occupied by student tenants with the first priority lies on the price factor and the last priority on the room space factor. Meanwhile, rental housing with price category F/high (>Rp2,500,000) is generally occupied by student tenants with the distance factor as the main priority and the price factor as the last priority. This data shows that there is a diversification of housing by adjusting the price that can be reached by students.

This large number of preferences has led to many residences being built based on student preferences. However, these residences end up being fragmented in various locations, causing the area around the campus to become more crowded with less residential uptake per meter of land. In fact, the area around the campus can be used for other functions such as public spaces, green spaces, and so on.

The purpose of this research is to find a layout of UNS Student Dormitory that is effective in space usage and intuitive to students' occupancy preferences. This research is expected to be a design suggestion for student living facilities in the future.

METHODS

The research uses a qualitative method to provide variations in making room layouts using the shape grammar method. This method is used as a basis in designing the layout of UNS student dormitories to solve the problem of effective use of space.

The stage continued with primary and secondary data collection. Primary data contains facts of student occupancy around UNS, especially aspects of land use to determine the comparison of occupancy capacity with the land used while secondary data includes student occupancy preferences such as aspects of the desired facilities, space area, and room type. This stage will produce prerequisites that will be used for methods in the next stage.

The last stage focuses on processing the data that has been collected. Student preference data is converted into prerequisites for using the shape grammar method. The prerequisites contain references to the use of the method so that the results of the room layout can adjust student preferences and the effectiveness of using space.

The final result of the research is a student dormitory room layout that can adjust student requests. This final result is expected to be a reference for the design of the UNS Student Dormitory as a whole by considering the effectiveness of land use and student occupancy preferences.

RESULT AND DISCUSSION

The layout design of the UNS Student Dormitory refers to data on student residential preferences and dormitory comfort standards. According to Neufert (1996), student dormitories are not classified as residential buildings, but rather places of activity. Design requirements for dormitories include:
- Living area, with a minimum size of 8 sqm, recommended 12 sqm, with ventilation, lighting, and disability access.
- Communal areas, such as kitchens and working areas, with ideal sizes according to residential buildings.

In addition, to accommodate more students, dormitories usually have shared facilities. According to Neufert (1996), the types of living space division in dormitories:

- **Single Room**, a bedroom with a separate bathroom and kitchen area outside the room. Ideally, this room type has an area of 12 sqm. The bedroom is also home to a study area as well as a dressing room.
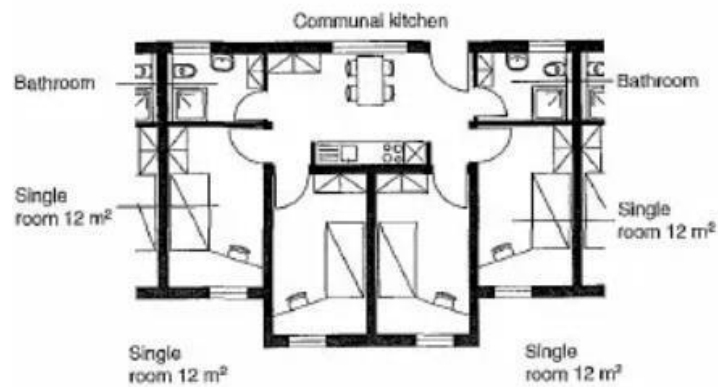
Figure 2. Sample Single Room Plan
Source: Neufert, 1996

● **Flat**, a room type where the sleeping area, bathroom, and kitchen are all contained in one living space. Ideally, this room type has an area of 16 sqm.
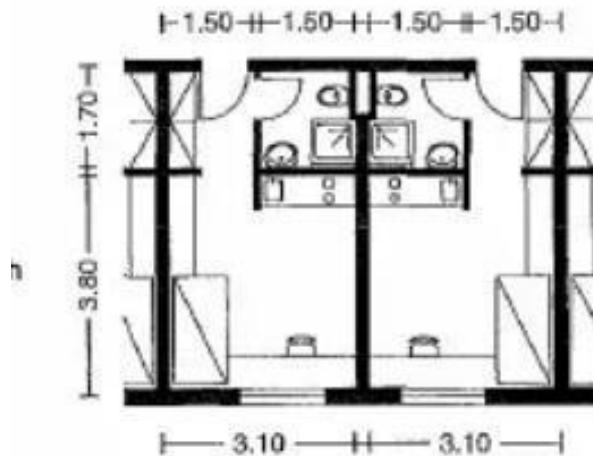

Figure 3. Sample Flat Plan
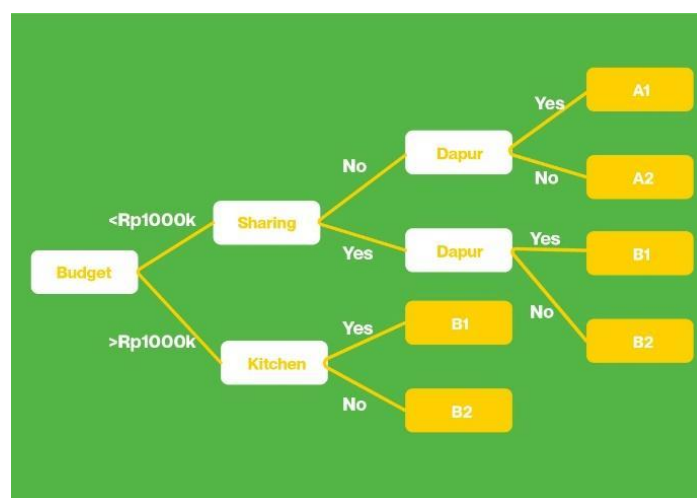Source: Neufert, 1996

Figure 4. Concept of Space

By combining the standard of residential comfort with data on student housing preferences, a conceptual scheme of rooms with codes A1, A2, B1 and B2 is produced. If elaborated, the rooms with these codes each have their own architectural criteria according to table 2.

Table 2. Architectural Criteria Table

A1	A2	B1	B2
Smaller Room (8sqm)	*Smaller Room (8sqm)*	*Bigger Room (16sqm)*	*Bigger Room (16sqm)*
Connected to Kitchen	*Not Connected to Kitchen*	*Connected to Kitchen*	*Not Connected to Kitchen*
Connected to Bathroom	*Connected to Bathroom*	*Connected to Bathroom*	*Connected to Bathroom*

According to Stiny (2006), to start using the shape grammar method, an initial rule 01 is needed to determine the initial shape. Based on the data of ITB students' rental housing preferences by Rahmadyani (2022), the suite bathroom facility ranks second after wi-fi which shows the importance of the facility in addition to the price of the rental housing. By utilizing the data, the initial rule can be treated according to Figure 5.
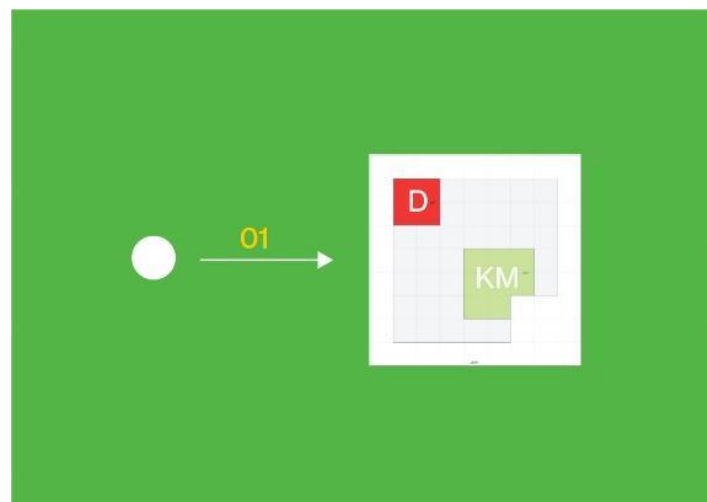

Figure 5. Initial Rule 01 Application

Initial Rule 01 is operated to determine the initial shape of the layout by considering the mandatory bathroom facilities as well as the optional kitchen facilities. Furthermore, to connect room areas with letter codes A and B with bathrooms and room areas with number code 2 with kitchens, rule 02 is applied to create the shape of connecting kitchens and bathrooms with rooms.
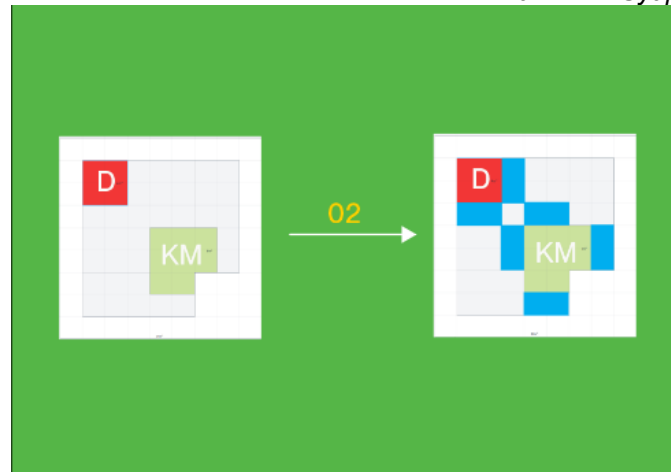
Figure 6. Rule 02 Application

With the 02 application, the boundaries between the rooms and the living space are visible, so the last type of rule is useful for delimiting the room area with the bathroom and kitchen.
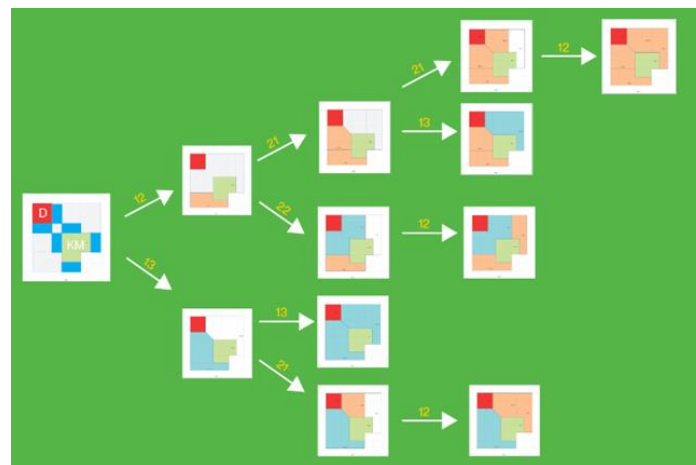

Figure 7. Habitable Space Addition Rule Application

With the application of the rule type in Figure 7, a variety of rooms can be created with different areas, shapes, and facilities obtained by each room. This is in accordance with the architectural criteria listed in table 2.

Table 3. Table of Rules Used

01	Addition of Permanent Elements (Kitchen and Bathroom)
02	Addition of Connecting Elements to Permanent Elements
12	Addition of Room Code A1
13	Addition of Room Code A2
21	Addition of Room Code B1

22	Addition of Room Code B2

Briefly, by applying the rules in Table 3, a variation of room layouts with codes A and B can be generated according to Figure 8.

Figure 8. Plan Layout Variations

By applying a variety of floor plan layouts, the student dormitory can adjust to the preferences of incoming students. This is useful so that one dormitory building can have different types of rooms without having to add new buildings.

CONCLUSION

The application of the shape grammar method in the design of the layout of the UNS Student Dormitory space is based on the urgency to accommodate student occupancy preferences by paying attention to the effectiveness of land use. Data shows that there are too many residential facilities around UNS with low capacity and high land use. Thus, the step of designing student residence areas using the shape grammar method is a strategic step to support the improvement of land use effectiveness.

The design process begins with data processing of student housing preferences as a prerequisite for applying the shape grammar method. This includes preferences for kitchen facilities, room size, and room capacity. The next stage is the application of the shape grammar method by changing the shape of the layout using various geometric shapes so that an effective layout is obtained and can accommodate student demand. In addition, a circulation area is also added to the layout as a complement to the plan.

In addition to the many shapes that can be generated with this method, the results show a promising product for the layout of living areas. By using the shape grammar

method, the resulting layout can not only accommodate student preferences, but can also consider aspects of building comfort.

A suggestion for further development is the exploration of shapes for more complex buildings. The current research is only limited to the square shape which is the most flexible shape for residential areas. In addition, the shape grammar method can be used in other aspects of the building such as exterior treatment and site treatment. Integration of the shape grammar method with the use of appropriate computer programs can also be considered to produce more layout variations in less time.

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