Architecture as a Syntax for Elderly Rejuvenation Design Proposal for Tropical Climate Country

Grace Novita Silalahi[1], FX. Teddy Badai Samodra[1]

Abstract*—In an urban environment, the growing number of elderly population increases because of the increase in life quality. In order to face the increasing amount of elderly, the elderly needs to be empowered so they can still productive in their aging phase. This design research aims to upgrade the quality of Small Office/Home Office (SOHO) for the elderly through behavior setting of elderly by using Space Syntax. Field measurement and interview were conducted to obtain data for simulation using Depth Map analysis to predict room connection and integrity. The result highlighted that resilience design conducted through respect to the relation between the room that can lead elderly rejuvenation in tropical climate country.

***Keywords*—Behavior Setting, Elderly, Rejuvenation, Space Syntax.**

I. Introduction

Aging as one of the phases of human life cycle makes every year there was an additional number of elderly. According to Republic of Indonesia Law Number 13 about Elderly Welfare, Elderly is someone who has reached the age of 60 years old and above. Based on age, there are four types of elderly: Elderly (65 – 70 years old), Young Old (70 – 75 years old), Old (75 – 80 years old), Very Old (above 80 years old). The increase of quality of life expectancy causes an increase number of elderly people who will be far more than the number of productive age population [1].

The increase amount of age population in Indonesia becomes a serious problem to give a better aging for elderly, not only provide healthcare facilities but also to empower the elderly so they still in the community to maintain their physical and psychological health. By Empowering the elderly, they can live productively and give their contribution to society and to make an interaction between elderly and younger generation. The elderly can share experiences and information to his fellow elderly and younger generation [2]. This study offers the design concept of SOHO (Small Office/Home Office) for elderly which respond to elderly physical and psychological needs. In addition, this research aims to upgrade architecture design that can trigger elderly movement to force them to be productive both physically and psychologically in their aging phase by creating relationship between elderly and natural environment.

According to Figure 1, the proposed design activity program for productive elderly is to make a healthy environment where elderly for a healthy aging in a community that can empowered them. By empowered elderly they can give a contribution to society and change society stigma about elderly.

II. Design Method

The process of making this design is Biomimetic which is also known as Biomimicry is one of design method where biology or nature inspired design [3] Successful biomimetic mimic from nature process that apply into building technology. Nature process that inspired this project mimetic from beehive ecosystem level based on elderly need to trigger their movement and create a productive atmosphere for elderly to work. Beehive is chosen because of its function as a sustain model of home and workplace. By combining domain to domain transfer biomimetic is used to create productive behavior for elderly.

In order to create a setting of behavior we need to arise user motivations. Biomimetic analogical transfer system is being used to resolve my design problem by using structure mapping as domain transfer through analogy and metaphor transfer. According to Figure 2 Domain to Domain transfer is being used to find design concept.

III. Research and Surveys.

In order to achieve the objective on this research is going to use qualitative and quantitative method. Mixed methods are being used for this research study to create an environment that suitable with elderly comfort and to change their behavior setting.

According to Table 1 based on field study is held at Griya Usia Lanjut St. Yosef Surabaya and the participants for this research are productive elderly (independent elderly) shows that the participants feel comfortable with the environment of Griya Usia Lanjut St. Yosef Surabaya.

According to Figure 3 based on Ecotect analyze the best orientation at the south side (facing artery street). From the field study the noise level in front of site is 82.1 dB therefore the south side is for building entrance and for public zoning activity. From Figure 3 site is located in low terrain roughness area so it is possible to design passive cooling for building thermal comfort by considering its environment noise level to place its opening, material that deals with thermal and noise control, and environment wind direction and speed [4].

[1]Grace Novita Silalahi and FX. Teddy Badai Samodra is with Department of Architecture, Institut Teknologi Sepuluh Nopember, Surabaya, 60111, Indonesia. E-mail: gracenovitasilalahi@gmail.com; fxteddybs@arch.its.ac.id.

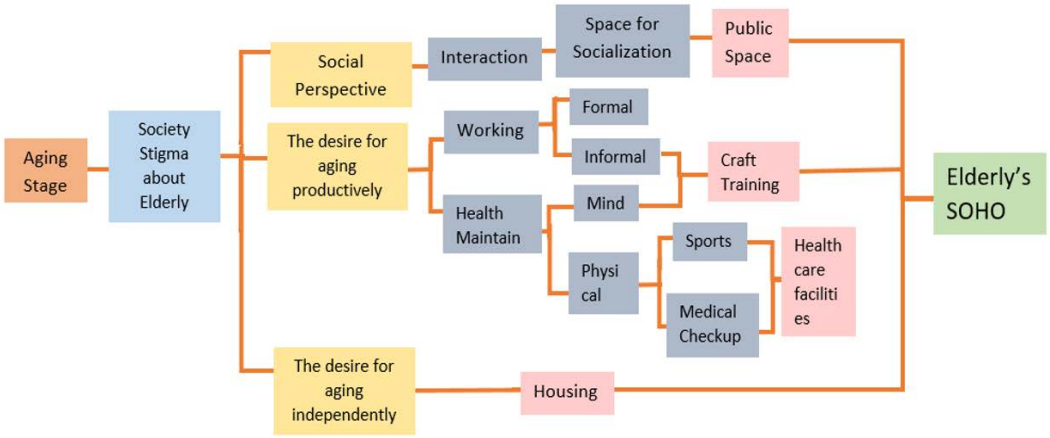

Figure 1. Proposed Design Activity Program Diagram

Figure 2. Domain to Domain Transfer System from Beehive to Design Concept

TABLE 1.
ELDERLY COMFORT LEVEL

Aspect	Scale (low to high)						
Temperature	-3	-2	-1	0	1	2	3
Humidity							
Air Flow							
Daylight							
Noise Level							

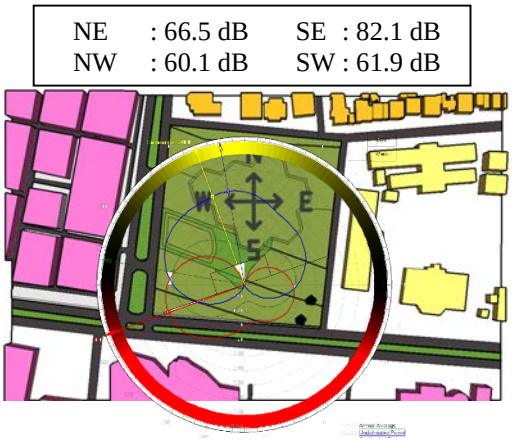

Figure 3. Site Solar Radiation and Noise Level

IV. RESULTS AND DISCUSSION

The integration between biomimetic and behavior setting can be used for elderly rejuvenation design problem. Behavior setting is going to play a major role in the approaching process in this design research. Three principles are implemented to the design: Perception(P), Cognition and Affect, Spatial Behavior(S).

All are analyzed by using Depthmap software. From Table 1 elderly behavior setting goal is to stay productive both physically and psychologically. Elderly behavior setting goal can be directed towards perception, cognition, and spatial behavior.

A. Site

Based on site analysis and site design concept to make elderly behavior setting goal that is suitable with elderly needs the site is divided based on its zoning and activity. In order to create public open space between elderly and surrounding communities the site have a welcome image to invite society. According to figure 3 building mass programming is based on its terrain level and tree arrangement. Parking area is located at basement to make elderly easier to explore the site area. At the center of building mass is placed an open courtyard as horizontal circulation and vertical ventilation. In line with Samodra (2017), vertical ventilation is one of passive cooling strategy that suitable for urban density by considering site environment noise level [4].

B. Building.

Proposed design for building form concept is dynamic with the circulation is radial circulation to make elderly more easily to access and explore building room. Open courtyard as the collecting space for elderly to socialize. The building room programming is mixed use between entertainment facilities area, healthcare facilities, co - working space and housing. From Figure 5 the building structure system is affected with building circulation pattern. According to figure 5 and 6 Building structure system is Rigid space frame structure with its column arrangement following its circulation radial shape.

TABLE 1.
DESIGN CRITERIA

SCOPE	CONCEPT		P	C&A	S
Site	Formal and Spatial	Sense of Place	o	o	o
		Natural Environment			o
	Accessibility	Open Public Space	o	o	
		Pedestrian Pathway	o		o
Building	Formal and Spatial	Easily recognizable visual patterns and relationship	o	o	o
		Open Courtyard		o	o
		Natural environment	o	o	
		Spirit of Place			o
	Room Comfort	Physical Comfort	o	o	
		Psychological Comfort	o	o	o
		Social Interaction		o	o
	Accessibility	Wide Corridor for Circulation		o	
		Territory Hierarchy		o	
		Barrier Free		o	
		Movement efficiency		o	
		Signage		o	

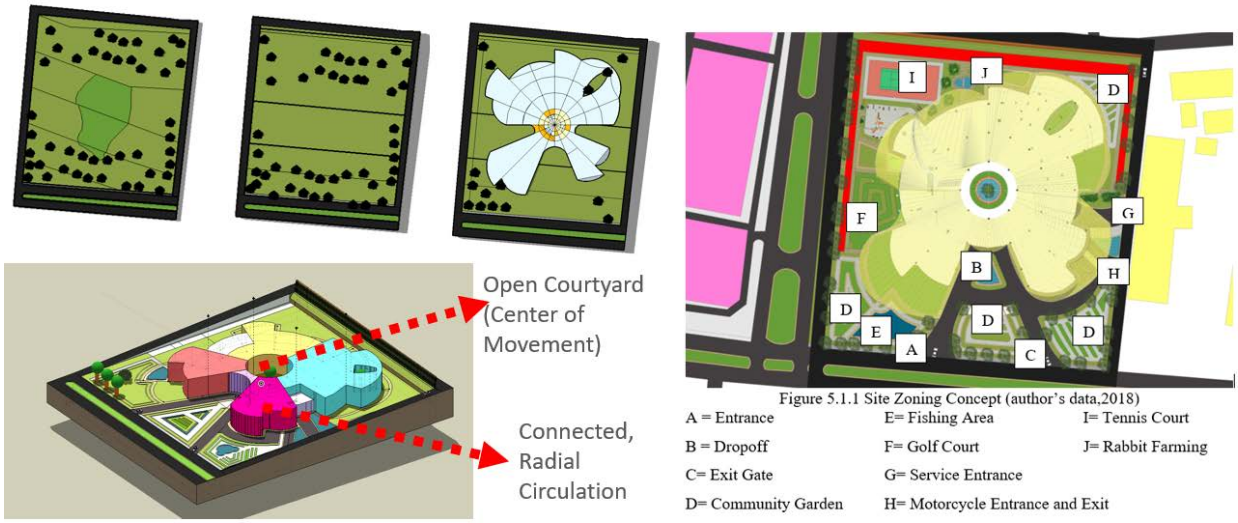

Figure 4. Site Planning.

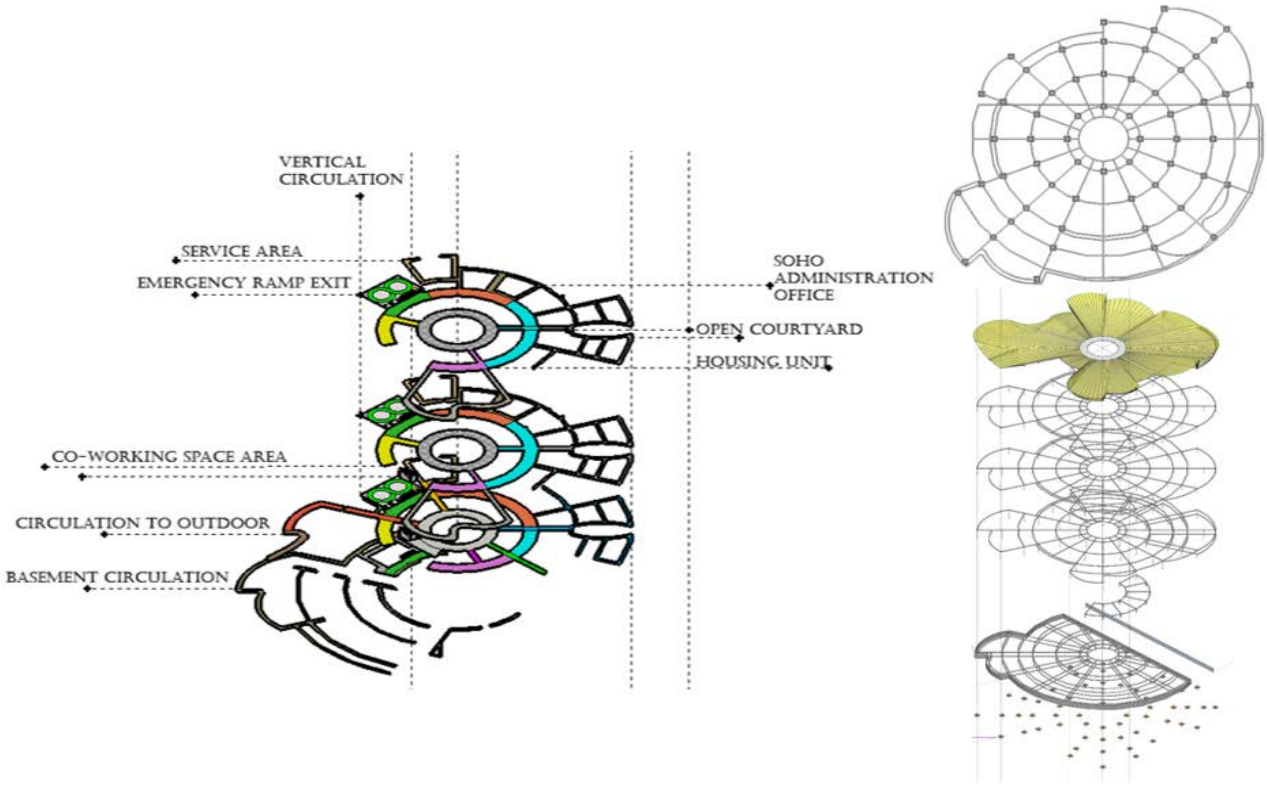

Figure 5. Building Room Circulation and Organization Concept.

C. Integrated Design.

The proposed design concept for elderly SOHO must be integrated to get the design goal. The integration output affects elderly behavior setting from building circulation, aperture, furniture placement, and outdoor natural environment. Depthmap is being used to analyze building space integrity and connectivity to achieve the performance requirement goal for this research. According to Figure 7 and Figure 8 space/area with warmth color have a high integrity and connectivity and space/area with cold color have a low integrity and connectivity. In line with *Yung et al* Elderly tend to walk in natural environment [5]. From Figure 8 space/area with high integrity is located at the center of building (open courtyard), space with radial shape has a role as collecting space/ assembly point where elderly tend to socialize. Then space integrity and connectivity can be split into different sections according to its collecting radial size.

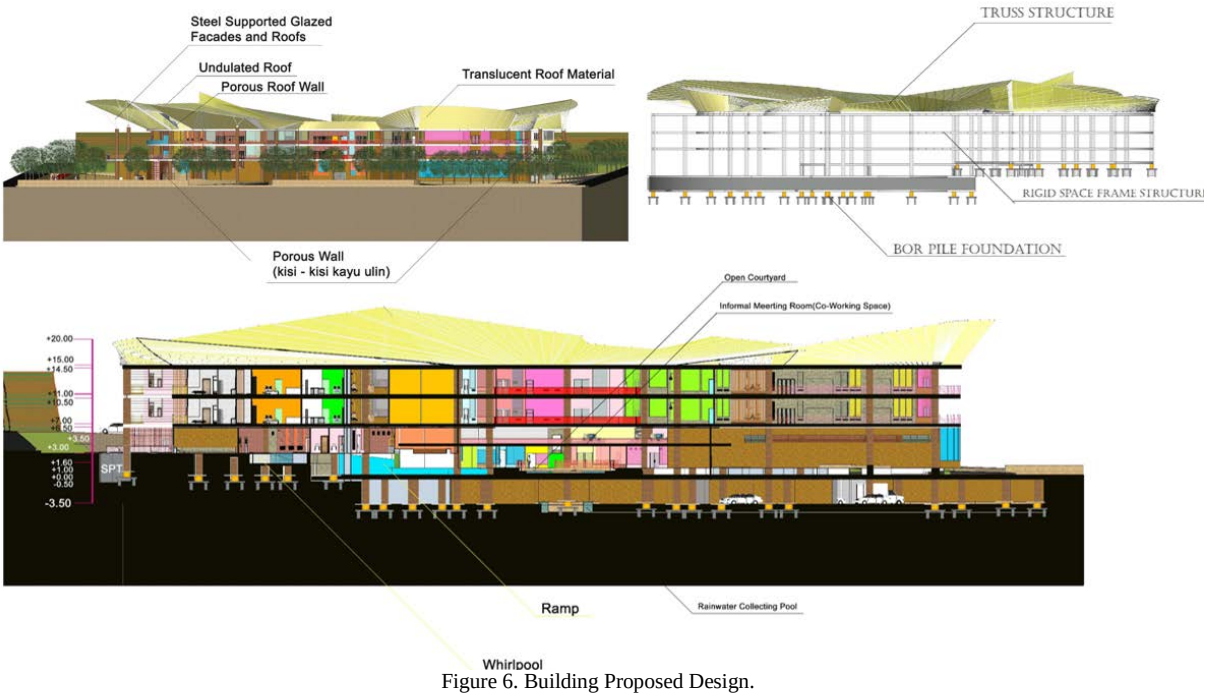

Figure 6. Building Proposed Design.

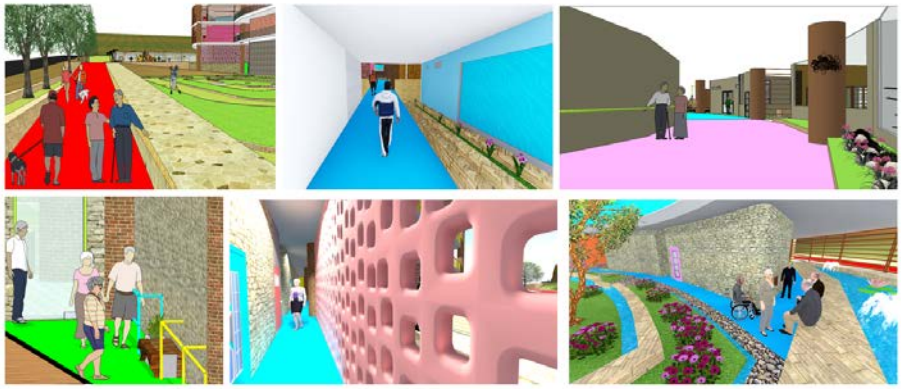

Figure 7. Building Pathway Circulation

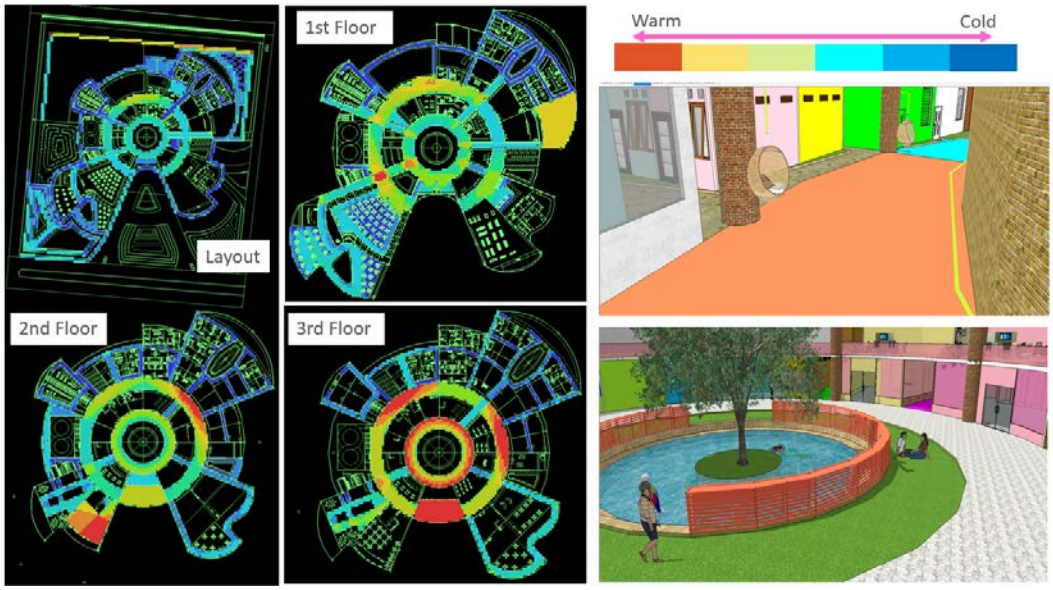

Figure 8. Room Integration and Connectivity Analysis

V. SUMMARY

The proposed building design is to create interaction between elderly and natural environment in order to trigger elderly movement to stay productive in their aging phase physically and psychologically. This proposed design has capability to show how elderly behavioral responses by analyzing the influence of spatial configuration on spatial behavior and responses of elderly in built environment that digitized by using Space Syntax parameters to create room configuration that can provide elderly needs to socialize and move more efficiently. Elderly tend to walk in natural environment. In addition, this research tries to bring natural environment into built environment to trigger elderly movement.

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REFERENCES

[1] WHO, "Global Health and Aging," 2011.
[2] Wijayanti and et al, "Places where the elderly meet friends at Banyumanik Public Housing, Semarang, Indonesia Spaces of the elderly based on the living arrangement (case study: Banyumanik Public Housing)," *J. Soc. Behav. Sci.*, vol. 50, pp. 405–417, 2012.
[3] Y. H. Cohen and Y. Reich, *Biomimetic Design Method for Innovation and Sustainability*. Switzerland: Springer International Publishing, 2016.
[4] F. Samodra and T. Badai, "Analysis of Resilient Design by Thermoacoustic Adaptation of Tropical Urban Model," *J. Archit. Urban.*, vol. 41, no. 4, pp. 305–315, 2017.
[5] Yung and et al, "Social needs of the elderly and active aging in public open spaces in urban renewal," *J. Cities*, vol. 52, pp. 114–122, 2016.