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### Principles of Collective Form in Campus Planning

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## Principles of Collective Form in Campus Planning

### Scale in Recognition

Collective form refers to a set of scattered independent architectural groups and other elements that create a city or part of a city based on a common factor, which Maki (1964) referred to as linkage. Linkage is not only limited to static order, which refers to the physical order, such as axes and unified design, but also includes an unpredictable and complex dynamic order, which includes human activities, such as the flow and assemblies of people. Therefore, linkage has spatial and temporal aspects. Charles and Ray Eames' *Powers of Ten* (1977) shows the continuous and infinite scaling of objects from the gigantic, such as space, to the minuscule, such as molecules, through human eyes. However, every scene is an abstract moment constructed by the subject. Even one-to-one-scale real objects are only for the subject's recognition. The large or small scale is the objective hierarchy of physical scale in a static order; however, the more profound dimension is the connections of subjective experiences of viewers who perceive and act upon it (Latour, 2014). Linkage exists in such objective scales, as well as in non-scale dynamic orders.

In urban design, Congrès International d'Architecture Moderne (CIAM) Modernism was founded on ideological and abstract concepts, while Team X and Metabolism introduced empirical and concrete concepts, including urban and dynamic phenomena such as street life and mobility (Yatsuka, 2022). In addition to this change, the question regarding how to assemble multiple buildings and still maintain order while allowing growth and freedom was investigated in the 1960s by those architects. Although they realized their theory of collective form in their design works and proposals that presented a profound potential for organic spatial organization, enthusiasm to explore collective form decreased as the urban population growth slowed. However, the concept of linkage and how it can be achieved, can still be expanded to understand and improve the spatial structure of contemporary cities, some of which are conversely shrinking. This study examined university campuses in Saitama Prefecture in Japan, and analyzed the relationship between architectural groups and their constituent elements to clarify the spatial characteristics and structural principles that comprise collective form in various scale and non-scale orders. Therefore, this study aimed to illustrate that the objective physical order, which can be scaled, is reinforced by the intervention of another layer: the empirical dimension that is created by human perception and movements, and which mediates between collections of buildings and other elements to achieve united identities.

## Typology of Campus Components

As a case study of collective form, we selected university campuses because, similar to a city, they are composed of multiple buildings focused on a single identity (master plan); however, its expansion and change may occur over time. In particular, we selected 24 out of 45 campuses in Saitama Prefecture, which contain more than 10 buildings, but did not include other functions, such as hospitals. They are examples of suburban and relatively new (mostly founded in the latter half of the 20th century) campuses. We first analyzed the physical aspects of the campuses from a birds-eye view, such as campus boundaries, open spaces, main axes, topography, and grains by making diagrams to clarify their structure at urban and neighborhood scale and campus scale. We also made diagrams to show the years when each building was built and the transition by which the campuses were formed to examine how order of collective form developed over time.

### *Urban and neighborhood scale*

We analyzed how the campus area distinguished itself from its surroundings on urban and neighborhood scales. We focused on the relationship between topography, campus boundaries, and open spaces. Based on their characteristics, campuses were categorized as the island type (13 campuses) and urban tissue type (10 campuses). Rissyo University campus did not fall into either category.

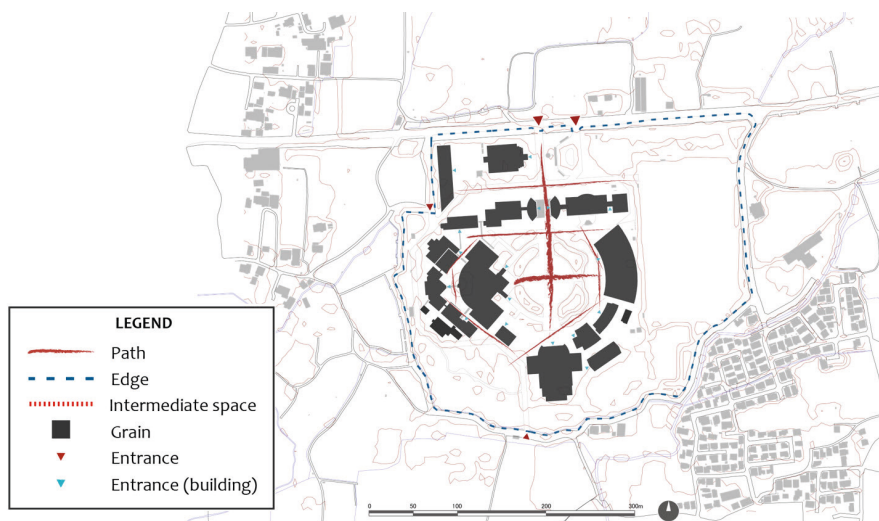


Fig. 01. Island-type campus and its evolution: Shobi Gakuen University

Source: Author

The island type (Fig. 01) was introverted and isolated from its surroundings, similar to medieval walled cities. In most cases, they were located in the middle of a field, and the campus boundary was defined according to topography and had an indefinite shape. Several campuses studied did not have a physical edge, such as a fence. Many campuses of this type had a centripetal square in the middle of campus. As these campuses often float in less dense regions, they may require strong symbolic centers to retain their identity.



Fig. 02. City-type campus and its evolution: Jyoshi Eiyu University  
Source: Author

The spatial structure of the urban tissue type (Fig. 02) was in harmony with that of the neighboring area, which was mostly residential. The axes on the campus were often drawn in the same direction as the surrounding streets and blocks. The boundary between the campus and the neighboring area was in accordance with the city grid, and the domain of the campus was only made clear by a physical fence.

The average size of the grain of campus buildings for the island and urban tissue types was 1,215 sqm and 980 sqm, respectively. The suburban context of the former required a larger contrast from the surroundings to establish an identity as a university campus. The principle of the latter was integration with the surrounding residential area; therefore, the contrast of the grain with the neighboring buildings was smaller.

**Campus scale and its dominant frame**

Next, we studied closer-up campus scale in order to analyze the relationship between the main axes and assemblages of buildings. Most campuses had a clear main axis, which started perpendicular to the existing main street, forming a T shape. The main axis direction could be categorized into focus (13 campuses) and passage (7 campuses).

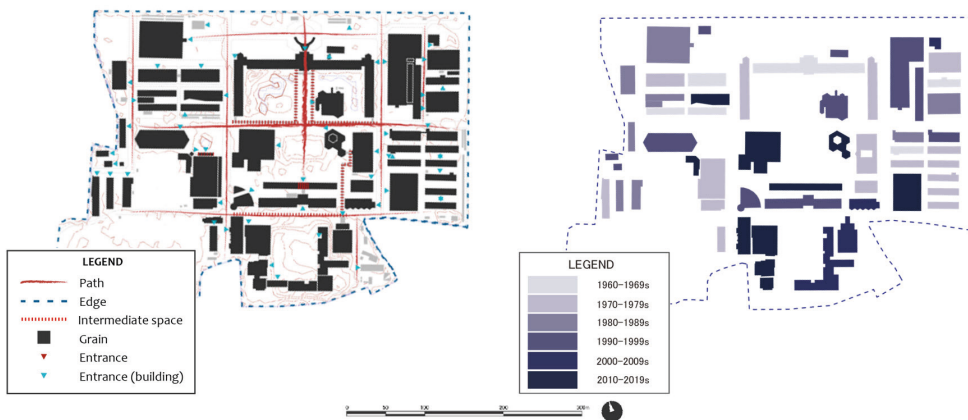


Fig. 03. Focus-type campus: Nihon Kogyo University  
Source: Author

The focus type (Fig. 03) had a symbolic element at the end of the axis. This was a composition with a landmark. This symbolic element could be a physical building or plaza (void), both of which were distinct from the other buildings by their size. Most campuses of this type had a classic spatial composition of buildings symmetrically placed on both sides of the main axis. The symbolic voids were either semi-open or closed courtyards. New buildings were often added around a semi-open courtyard during campus expansion, closing it, and reinforcing the static composition of the campus.

The passage type had no symbol at the end of the axis, and was a composition on procession. Some axes of this type were interiorized or arcades. When the axis was merely void without a goal, the static order was less stable than the focus type.

### Non-Scale Dynamic Order: Mediation

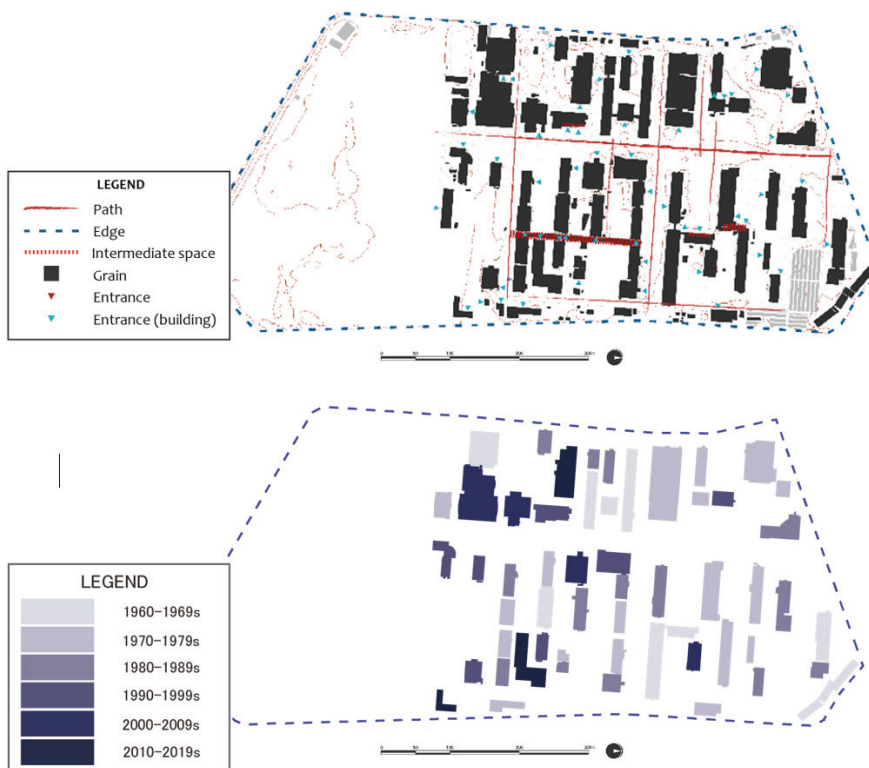


Fig. 04. Repetition-type campus: Saitama University

Source: Author

We analyzed the physical and strong spatial order on two objective scales above, and found that most island-type campuses had a composition of focus type, with a symbolic element and symmetrical positioning of buildings. This classic composition caused campus buildings to form a united entity, distinct from its surroundings, with a hierarchical order. However, the spatial characteristics with landmark may evoke strong images, but they were not necessarily positive (Ewing, 2013, p.19). They tended to be static and introverted, which was against the current demand of opening

up the university campus to society. We formulated a hypothesis that the collective form can be made more flexible and organic with the non-hierarchical dynamic order of linkage.

***Non-compositional type***

We found that many urban tissue type campuses on the urban and neighborhood scales had a different order from the focus type. Rather than having a distinctly large symbolic building or plaza, these campuses had grains and open spaces of similar sizes along gridded passages. We referred to this as the non-compositional pattern repetition type (Fig. 04). This type consisted of blocks and streets, similar to a city. The spatial structure was more flexible to accommodating changes while maintaining the campus identity. However, it was rather homogeneous, and spatial experiences and sequences tended to be repetitive.

While most campuses consist of collective forms with objective elements, Rissyo University (1968), originally designed by Maki, had an exceptional composition that did not fall into these categories on the urban and campus scales. Prior to the design of Rissyo University, Maki (1964) presented approaches to collective form into three categories: compositional form, megastructure, and group form. In compositional form, the relationship between individual elements is preconceived on a two-dimensional and formal master plan, which often coincides with what we observed in the focus type. The megastructure is a large frame that physically connects constitutes elements. These two types are easily understood but have a more rigid collective form. Originally inspired by historical and local settlements, group form has no hierarchical order or master framework; however, the relationships between elements “have their own built-in link” (Maki, 1964, p. 8). It is a flexible and organic collective entity similar to the repetition type; however, the elements are more heterogeneous, and their allocation is seemingly arbitrary. The elements are united not only by physical linkages, such as walls or small open spaces, but also by the sequential experience of the subjects.

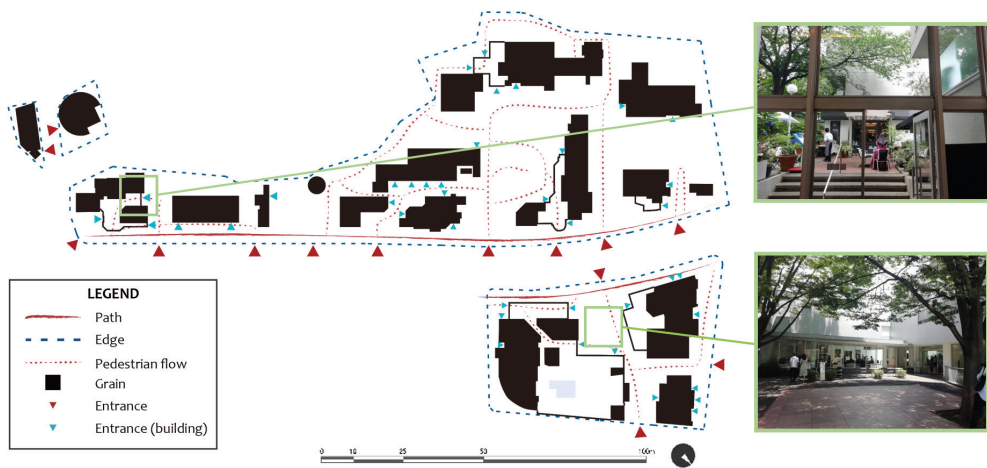


Fig. 05 Group form in modern architecture: Hillside Terrace

Source: Author

One of the best examples of group form in modern architecture is Hillside Terrace (1969–1992), a residential and commercial complex in Tokyo designed by Maki. Sequentially developed over 25 years, it comprises 14 buildings of similar scale, forming a united identity cluster (Fig. 05). By making the diagram to indicate the circulation and assemblages of buildings, we analyzed that Hillside Terrace has no single symbolic axis or landmark. As observed from eye-level, although the forms and exterior finishes of the buildings differ, common physical factors are subtly embedded in architectural and landscape design, such as corner entrances, the height of eaves, and the integrated use of existing trees and historical elements.

However, the empirical layers orchestrated by these physical linkages make this collective form unique. Carefully designed pedestrian circulation lanes and small courtyards give visitors various experiences of inside and outside, up and down, wide and narrow, light and dark. These open spaces and physical linkages instigate empirical order that mediate buildings—constructed in different years—spatially and temporally. Moving from one building to another through these visible and invisible mediators feels like traveling to a different period.

Group form in Hillside Terrace was made possible by its relatively small and dense site of approximately 12,000 sqm. For university campuses, which are 20–30 times larger than Hillside Terrace, one cannot simply apply the same principles by merely enlarging them. As there are absolute limits to scale transformation in the physical world owing to the nature of materials, human senses also have a limited functional range in the degree of distance reception (Gehl, 2011). The question is how we can employ this dynamic order, which relies on human behavior at a more expansive scale.

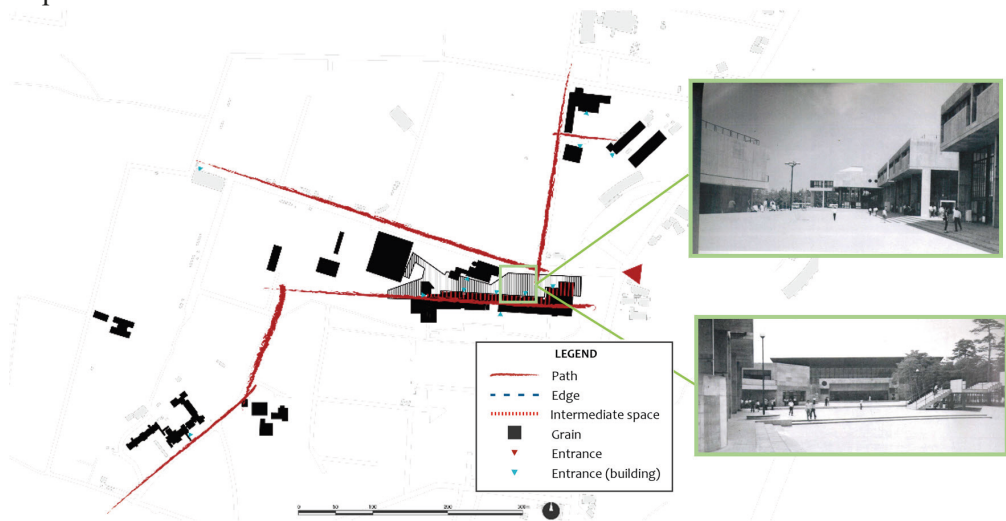


Fig. 06. Compositional form with a clear focus: Rissyo University (1968)

Source: Author

Maki argued that the three approaches to collective form are not exclusive, but can be combined. In the master design of Rissyo University, whose site area was 360,000 sqm, he integrated compositional and group forms to unite the university buildings as a town. Located in the middle of the thicket in suburban Kumagaya,

Saitama, Rissyo University has a boundary of indefinite shape following the island type, but does not have a centripetal or symmetrical composition as the focus type. Moreover, it was originally composed of two sets of L-shaped axes and a triangular plaza between them (Fig. 06). The university exhibits a variation of compositional form with a clear focus and main axes, which gives a master frame for this vast campus, as well as open-ended axes, suggesting possibilities for the future expansion.

Over the layer of the static order of campus buildings, dynamic linkage of group form was embedded at various scales. The form of each building on campus was heterogeneous and derived from its function. However, the common design at the micro-scale, such as the usage of handrails and light fixtures, gave them a united identity. Small hangout spots were placed at the intersections of students' circulation lanes inside and outside of buildings to slow the traffic down, encouraging interaction among students. The changes in floor levels facing the plaza provided students with various experiences of seeing and being seen. The accumulation of these spatial manipulations activated the connectivity of the buildings. Rissyo University's design successfully took advantage of the clarity of compositional form and dynamics of group form.

***Time mediation failed***

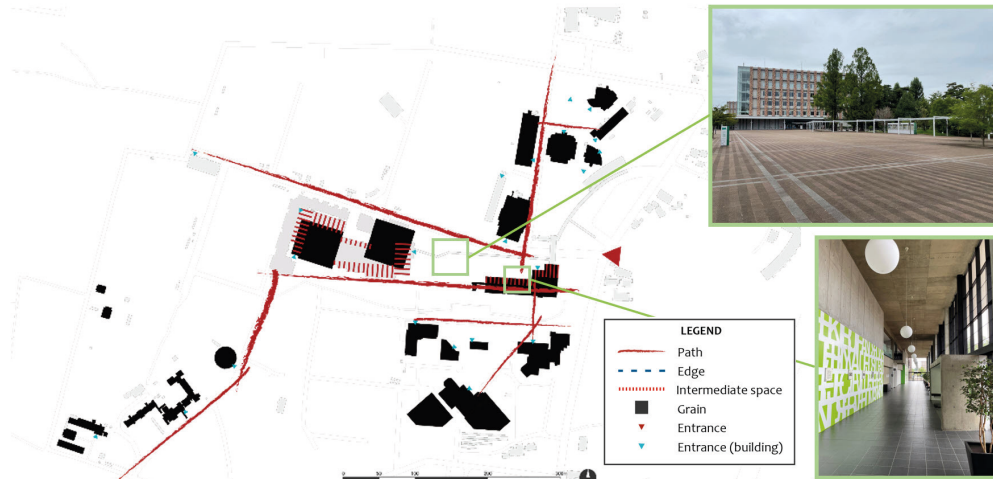


Fig. 07. Rissyo University after renovation (2007)

Source: Author

The disadvantage of group form is that the rules for assemblage are only implied and invisible. When Rissyo University administrators decided to reorganize and expand the campus in 2007, it did not follow the subtle structure of the original design – they demolished most of Maki's buildings, and replaced the gymnasium with a massive 6-story classroom building (Fig. 07). The original axes, part of which were interiorized, faded, and the boundary of the intimate triangular plaza was erased by the demolition of the original buildings. Even if the original buildings needed to be demolished owing to a demand for increased campus facilities, the master design of group form would have been flexible enough to adapt to campus transformation if certain rules, such as common factors and time mediating elements, were maintained.



However, Rissyo University, after renovation, has no clear objective composition as the focus type, and it lost the layer of time mediation of group form.

## Conclusion

We examined 24 university campuses from the objective and physical orders of urban and campus scales, and illustrated the importance of the empirical layer for constructing the collective form. In many campuses, dominant and totalizing scales with the physical linkage of clear axes and symbolic elements were used to unite buildings, indicating the focus type. They have strong but introverted identities, and their static character does not easily allow changes.

Conversely, some campuses had empirical layers that supplemented geometric compositions to reinforce the connectivity of campus life. This non-scale dynamic order indicated group form. This order does not strongly organize people's spatial experiences, but invisible linkage mediates their space and time and could be considered a weak order owing to its subtleness. As the latest concept out of linkage, Maki (2015) emphasized the potential of open spaces for spontaneous public interactions. An open space can be a large formal plaza, which takes a clear physical scale used in a compositional form; it can also create latent linkage, which facilitates people's activities and movements, embedded in group form. Given that it exists in people's subjective experiences, intangible and weak order of linkage in group form could hold a sense of unity in cities with thinning density as the population decreases. Therefore, group form, combined with other approaches with an objective hierarchy of physical scale, can create a sustainable and open collective form.

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