

## #2

# JAPANESE NURSING HOME COMMON SPACE SPATIAL LAYOUT CHANGES IN THE PAST 35 YEARS

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### ABSTRACT

This article analyses changes of common space spatial characteristics in Japanese nursing homes in the past 35 years, aims to provide a reference for future nursing home common space design.

The analysis is done by using DepthMap tool. Totally 62 nursing homes from Japanese architecture publications are selected and analysed. The spatial integration metric for community space, physical training room, service station, and dining room is calculated and averaged to depict the transition of common space from classic large scale care nursing homes to modern unit care nursing homes in Japan in the past 35 years.

The findings point out:

(1)Community space has been allocated with increased spatial integration in recent years. This actually reflects a culture of connect to great community in modern Japanese nursing homes, that is, to make community space easily accessed and gathered by nursing home residents and visitors. (2)The integration of physical training room shows a little bit increase, which may indicate the need to design club house, fitness to a place with easier access in modern Japanese nursing homes. (3)Service station was positioned with high spatial integration place in classic nursing homes for the convenient to provide care service to large group of residents, but it has been changed in modern small unit care nursing homes. (4)The spatial layout of dining room is flexible in both classic and modern Japanese nursing homes, though its overall spatial integration in the past 35 years was in downtrend.

### KEYWORDS

DepthMap, Common Space, Nursing Home, Convex Map, Space Syntax

### 1. INTRODUCTION

Along with the development of modern Japanese economy, nursing home in Japan has also been evolved. In 1963 when the 1st welfare law for the elderly was issued, Japan was experiencing high economic growth, urbanization, and women's social advancement. The household functions was remodelling as well at that time, making it difficult for elderly to take care of themselves at home, which led to high market needs of senior facilities. Consequently, lots of large-scale nursing homes with big shared room for more than 10 residents were built up. This solved the problem of senior facility shortage, but the collective living in such a large scale care nursing home also brought residents the difficulty in receiving care service. With the improvement of

living standards, slightly smaller group living type nursing home came out in 1980s. Unlike the big shared room living, a smaller group of 4~6 people sharing living room became the main living style, but the nursing care was still provided collectively although the scale was a little smaller than before. Later, by the influence of realizing home alike living style and having individual care service, nursing home with private living room and unit care living space appeared in 1996, this is so-called modern unit care nursing home. This kind of nursing home was quickly spread out in all country, and is now the main senior facilities in Japan(Murakami, 2003).

By the transition of nursing home from large scale nursing care to unit care, the common space structure has been changed, too, as shown in figure 1. In large scale care nursing home, the common space is mainly concentrated in one location, where eating, recreation, and rehabilitation etc. day activities are taken place. On the other hand, with the conversion to unit care style, the dining room and day activity are gradually separated, a living space is designed and shared by several private rooms for day activities, and it further connects to place with higher publicity.

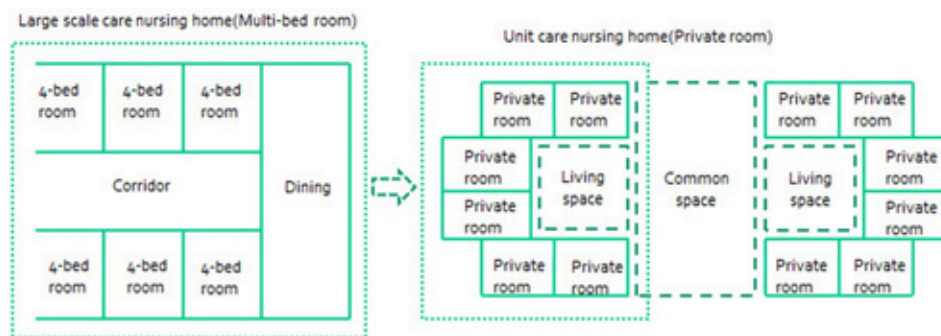


Figure 1 - Large scale care and unit care nursing home

Toyama(2002) investigated the effectiveness of social and care service by introducing private room and small scale care unit in Japanese nursing home, concluded that it brought residents the formation of personalized space, the improvement of QOL(quality of life) and ADL(activities of daily living), the increase in social participation and abundant interpersonal relationship.

On the other hand, what does this transition imply to changes of spatial characteristics for other common facilities, like community space, physical training room, service station, and dining room? In particular, in terms of space syntax metrics, how they were affected by this progression? Figuring out these changes would help the designing of common space in future Japanese nursing homes.

In this paper, 62 nursing homes which were built in the year from 1978 to 2014 are selected from Japanese architecture publications, with which the spatial characteristics of common facilities including community space, physical training room, care service station, and dining room are analysed to develop an understanding of how common space layout has been transformed, and what are the inherent spatial difference between large scale care nursing homes and unit care nursing homes, so as to provide a reference for future common space design in Japanese nursing homes.

## 2. LITERATURE REVIEW

Common space is a study of concern in Japanese nursing homes. So far, there are a number of researches done on the impact of common space on residents' social activity. These studies focus on the effectiveness and importance of deploying common spaces by observing or counting resident's stay time, behaviours, and frequency of use of common space. The typical examples are Kato's research on factors to improve residents living quality based on environmental behaviour observation for over 50 residents in 3 nursing homes(Kato, 2007),

and Mori's study on common space decentralization in nursing home based on the situation that some of the functions which should originally be performed outside the private room were packed into private living room (Mori, 2004). In addition, Kozuma (2015) proposed a living space layout rearrangement in nursing home by observing residents stay and routines of movement in common space, Inoue (1990) put forward the topic of the necessity of having common facilities such as handicraft rooms, lounges, multipurpose rooms, play rooms and heated pool in nursing home by analysing the actual utilization status. Besides, Kan (2012) conducted a spatial analysis on four Japanese elderly facilities by means of space syntax isovist theory, concluded to widen facility hall and front room hall to secure communication within residents.

However, many of these studies focused on the relation with residents' social tie. The comprehensive investigation and analysis about common space characteristics such as spatial integration and accessibility is not seen in the reports. Although Kan applied space syntax theory to develop space visibility in nursing homes, his study itself focused on isovist visibility, no systematic spatial metric data was given on nursing home common space.

### 3. METHODOLOGY

#### 3.1 METHOD AND METRICS

Space syntax theory is applied in this study. As Hillier pointed out "socially and culturally determined patterns are embedded in these configurations and social relations and processes express themselves in space through configurations" (Hillier 1984), the spatial integration is taken as the main metric to describe the space characteristics in this article.

UCL DepthMap tool provides different approaches to devise and analyse the spatial maps (Varoudis, 2013). The convex map approach utilizes vertical boundaries to convert 3-D space to a number of "fattest" or largest 2-D convex polygon (Peponis 2002), and establishes connection based on the availability of direct access (Klarqvist 1993). Due to this "fat" nature of the convex shape, it is said that this method is best suited for defining spaces such as building interiors (Daniel 2013), so this approach is applied in this article for spatial metrics calculation.

Floor plan of each selected nursing homes is scanned and converted to AutoCAD file, which is then imported to DepthMap tool to create convex maps. Based on space functionality, each space unit is presented by one or multiple convex maps but to use least possible number of convex map to cover all the spaces. The wall, any kind of partition which separates spaces is taken as boundary while doors and openings are considered as connection points. For multi-story buildings, according to the layout of common facilities, elevators and staircases are regarded as connection points.

#### 3.2 COMMON SPACE AND EVALUATION

Japanese social welfare act provides general regulation on necessary common facilities in nursing home. In these facilities, community space is primarily designed for nursing home residents and local people gathered for social activities, the service and care station is to provide care services, these two facilities together with dining room and physical training room such as rehabilitee room, fitness and club house are four main facilities. The spatial layout of these four facilities is focused in analysis in this article.

The selection of nursing homes is evaluated in two groups based on the scale of nursing care performed, large scale care group and unit care group. The former is classic nursing home where 2~10 residents share living room while the latter is modern type where nursing care is conducted in small group unit.

## 4. FINDINGS AND DISCUSSION

### 4.1 LARGE SCALE CARE NURSING HOME

#### 4.1.1 Spatial layout characteristics

Usually large scale nursing homes were designed to have a long corridor, along which housing and service facilities were built. In some cases, they were also designed into different functional areas connected by connection corridors. The typical floor plan of this two type large scale care nursing homes, created convex maps and integration result is presented in figure 2. In this figure, the integration is coloured based on its value, high value of well integrated location to poor is represented from red, yellow, to green, and dark blue.

The 1st example in figure 2 is a two-story nursing home of 92 residents built in 1982. There are 27 living rooms in total, of which 21 are four beds, 2 are double beds, and 4 are private. Besides, a dining room and service station are provided in each floor and physical training room is in the 2nd. There is a long corridor passes through each floor and these facilities are distributed on both sides of the corridor. The service station is situated in the middle of corridor, from here nursing staffs provide care service to all residents.

The DepthMap calculation demonstrates it is the long corridor which owns the highest spatial integration as shown in the upper part of figure 2.

The 2nd example is a nursing home for 80 residents built in 1996 with 11 four-bed rooms, 11 double bed rooms and 14 private rooms, all of them are concentrated in living area. The community space, physical training room, and dining room are situated in service area which is slightly away from living area while service station is sited in middle of living area. Again, the DepthMap calculation confirms the long corridor in living area and connection corridor between two areas are the high spatial integration place (figure 2).

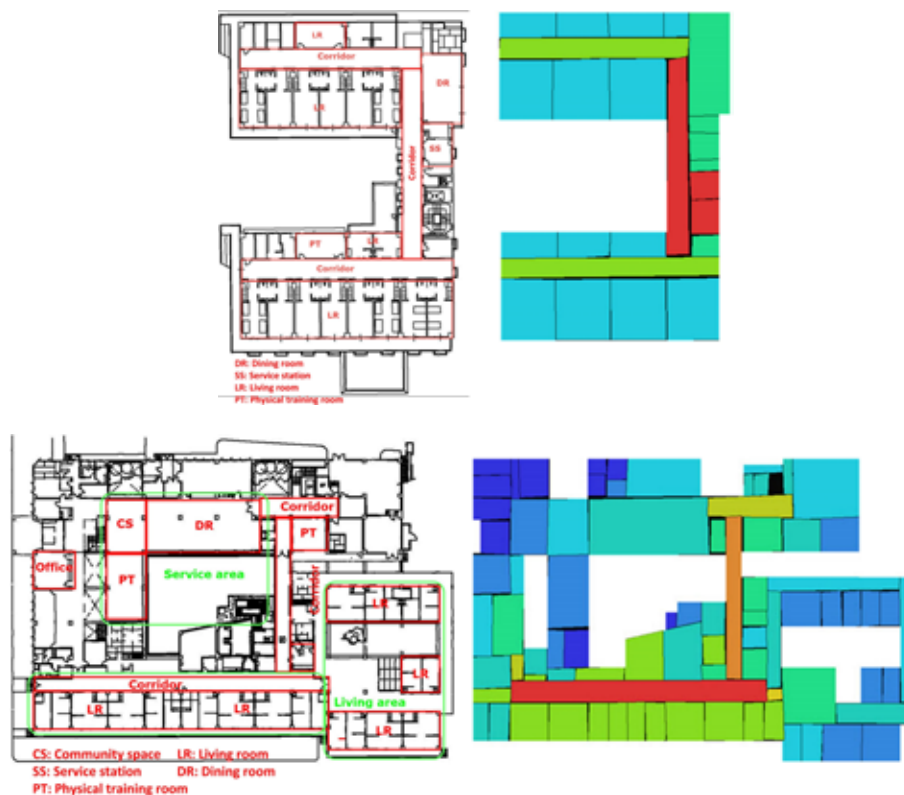


Figure 2 - Typical large scale care nursing home floor plan(left) and integration result(right)

For all nursing homes in this group, the result of most and least integration place is listed in table 1 and table 2. The number in the table is amount of nursing homes where the particular location is the highest or least integration place. Location of others in the table include physical training room, staircase in table 1, laundry, locker room, terrace, dressing room etc. in table 2.

Same results as the two examples, table 1 tells for more than half of the large scale care nursing homes studied, the most integrated place is the main corridor or the connect corridor, which accounts for 22 and 3 in the total of 40 investigated. And, the high average integration value of 1.7219 in long corridor and 2.1805 in connect corridor also discloses the corridor is the most easy place where people to meet and gather together.

On the other hand, table 2 makes it clear that the least integration places in large scale care nursing homes are living room, warehouse and staff rooms. An interesting phenomenon is there are 5 nursing homes where the staff room is the least integration place, this could be a Japanese consideration to have customer oriented facilities be placed in easier access place with priority.

Location	Long corridor	Connect corridor	Lobby	EV hall	Community space	Service station	Others	Total
Number	22	3	8	4	1	0	2	40
Ave. Intgration	1.7219	2.1805	1.5198	1.2993	1.3329		1.1546	

Table 1 - Most integrated place in large scale care nursing home

Location	Living room	Ware-house	Staff room	Bath room	Stairs	Cooking room	Others	Total
Number	8	6	5	3	2	1	15	40
Ave. Intgration	0.5956	0.6502	0.5697	0.4847	0.5415	0.4297	0.6460	

Table 2 - Least integrated place in large scale care nursing home

#### 4.1.2 Common facilities

The integration value for the four common facilities and nursing home all space average is summarized in table 3. The order of integration from high to low is included in the table as well.

##### 4.1.2.1. Service station

As the two examples in figure 2, because the care service was conducted in large scale by limited staffs, the service station was positioned in the middle of living area as much as possible to reduce the moving distance for taking care service. This idea is verified in integration result. In table 3, in 29 of 40 surveyed nursing homes the service station is the highest integration place among the four common facilities. The overall average for all 40 nursing homes also confirms this result, that is, service station is most easily accessed place in the four common facilities.

##### 4.1.2.2. Community space

The provision of community space in early Japanese nursing home was not popular. There were only 17 nursing homes in the total of 40 investigated where the community space was implemented, and in the implemented nursing homes, most of the community spaces were designed in a place away from living or central area as in figure 2, which basically causes its lower spatial integration and hard access. This result is confirmed in table 3 where there are 5

No.	Build year	Nursing Home ave.	Community space	Physical train. room	Service station	Dining room	Order*
1	1978	0.8100		0.9169	1.0195	0.8537	SS>PT>DR>NH
2	1979	1.0772	0.7806		1.0103	1.1366	DR>NH>SS>CS
3	1979	1.0186		0.8265	1.2700	1.1038	SS>DR>NH>PT
4	1980	1.3511		1.5526	1.6018	1.2615	SS>PT>NH>DR
5	1981	1.0607		1.1035	1.2086	1.1280	SS>>DR>PT>NH
6	1982	0.9419	0.8070	0.8646	1.0772	0.8411	SS>NH>PT>DR>CS
7	1982	0.9775		0.8295	1.0318	0.9341	SS>NH>DR>PT
8	1982	0.9731	0.8700		1.1322	0.8522	SS>NH>CS>DR
9	1982	1.3352		1.2774	1.9041	1.3278	SS>NH>DR>PT
10	1983	1.0014			1.3593	1.2113	SS>DR>NH
11	1984	0.8658	0.8497	0.6290	1.3838	1.0305	SS>DR>NH>CS>PT
12	1985	0.9100	0.7841	0.7655	1.1260	0.6967	SS>NH>CS>PT>DR
13	1987	1.0073		0.8815	1.6049	1.5062	SS>DR>NH>PT
14	1987	0.9370	0.9983	1.0193	1.0193	1.0035	SS=PT>DR>CS>NH
15	1987	1.1985		0.8488	1.3092	0.9087	SS>NH>DR>PT
16	1987	0.8996		0.8758	1.1700	0.9388	SS>DR>NH>PT
17	1988	0.9309		0.7810	0.9953	0.8460	SS>NH>DR>PT
18	1989	1.1146	1.1255	0.9413	1.3992	0.9413	SS>CS>NH>PT=DR
19	1990	0.9913	0.9521	1.0266		1.1032	DR>PT>NH>CS
20	1990	0.7862		0.9084	0.7561	0.7886	PT>DR>NH>SS
21	1990	0.7577	0.9920	0.8479	0.7348	0.8479	CS>PT=DR>NH>SS
22	1991	0.9841		0.4297	1.4932	1.5895	DR>SS>NH>PT
23	1992	0.9852		1.2601	0.8995	1.2312	PT>DR>NH>SS
24	1993	1.1548		1.0204	1.5597	1.3399	SS>DR>NH>PT
25	1994	0.7351		0.5661	0.7746	0.6766	SS>NH>DR>PT
26	1994	0.8809		0.9431	1.3970	1.4636	DR>SS>PT>NH
27	1994	0.7210	0.8370	0.7650	0.6578	0.7335	CS>PT>DR>NH>SS
28	1995	1.0933	0.9838	1.2756	1.3498	0.9922	SS>PT>NH>DR>CS
29	1995	0.9021			1.3475	1.0017	SS>DR>NH
30	1995	1.0329		1.0631	1.0631	0.9813	SS=PT>NH>DR
31	1996	0.9383	0.9838	0.9058	0.9492	1.0196	DR>CS>SS>NH>PT
32	1997	0.7098	0.7938	0.7908	0.9249	0.8827	SS>DR>CS=PT>NH
33	1997	0.8417	1.0553	0.7904	0.9059	0.7811	CS>SS>NH>PT>DR
34	1998	0.7737	0.9062		0.6354	0.7274	CS>NH>DR>SS
35	1998	1.4389		1.4690	1.7488	1.8834	DR>SS>PT>NH
36	1999	0.8449	1.3329	1.2012	2.7778	1.2012	SS>CS>PT=DR>NH
37	1999	1.2856	1.1967		1.4286	1.2887	SS>DR>NH>CS
38	2001	1.0590			1.2726	0.9442	SS>NH>DR
39	2001	0.9642			1.2346	0.6838	SS>NH>DR
40	2001	0.6983		0.7199	0.9598	0.7491	SS>DR>PT>NH
Ave.		0.9747	0.9558	0.9405	1.2178	1.0358	SS>DR>NH>CS>PT

\*Note: NH – Nursing home, CS – Community space, PT – Physical training room, SS – Service station, DR – Dining room.

Table 3 - Common facility integration result of large scale care nursing homes



nursing homes within which the community space is the lowest integration place among four common facilities, and its overall average accessibility is worse than service station and dining room.

This result might reflect the consideration in early Japanese nursing home planning to accommodate as more elderly as possible, the planning of a place for social activity did not get sufficient attention.

#### 4.1.2.3. Physical training room

The overall average of spatial integration in table 3 exhibits physical training room is the least integrated place in the four common facilities. And, specific to each nursing home studied, the number of nursing homes where the physical training room is least spatial integration place in the four common facilities is 12, it is more than any other common facilities. Same as community space, this result reflects the planning of physical training room for easy access in early large scale care nursing homes was low priority.

#### 4.1.2.4. Dining room

The dining room in table 3 exhibits dynamic changes in spatial integration, it is the least spatial integrated common facility in 5 nursing homes, and is the most integrated common facility in 8. This result might remind the flexibility in dining room spatial allocation in large scale care nursing homes.

### 4.2 UNIT CARE NURSING HOME

#### 4.2.1 Spatial layout characteristics

Generally the unit care nursing home is constituted by multiple care units, each offers accommodation for about ten residents where nursing care is performed by exclusive staffs in accordance with resident individuality and the rhythm of life. By this concept, a common living space is designed in each unit where the light meal, nursing care and mutual activities are conducted. Besides, dedicated dining room, physical training room, and community space may also be supplied in some of them.

Figure 3 is a typical floor plan of unit care nursing home and spatial integration result.

This example nursing home was built in 2005 in Okinawa for 112 residents, a two-story building with 5~6 care units in each floor. The care units are situated in 3 areas with each contains 1~2 units. In addition, a physical training room, a dedicated dining room are located in service area, and a community space with audio and visual techniques equipped hall is built in adjacent. The different functional areas are linked by connection corridors, and links between care units is done via open space(hall, lobby etc.) or short corridors, as shown in figure 3.

The calculation result demonstrates the connection corridor is the highest spatial integration place(right side of figure 3, number is order from high integration to low).

The detail result for common facilities and living spaces is listed in table 4.

It can be found that living spaces in unit A1(#48), B(#41), C1(#39), C2(#40), and connection space in unit A(#28), C(#49) do not own high spatial integration. The reason might be the living space is spatially distributed across all floor.

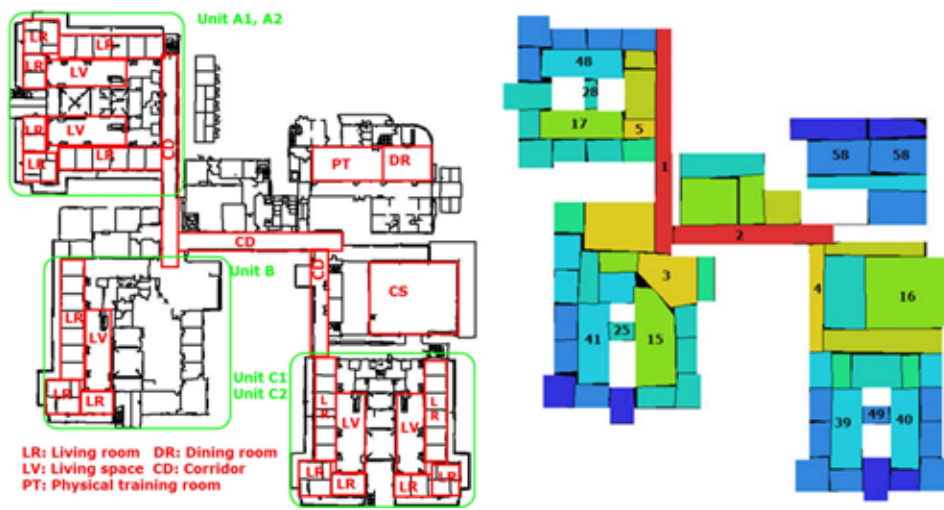


Figure 3 - Typical unit care nursing home floor plan(left) and integration(right).

Order(position #)	Location	Integration	Mean depth
1	Connection corridor	1.2961	3.8611
2	Connection corridor	1.2654	3.9305
3	Entrance hall	1.1079	4.3472
4	Connection corridor	1.0988	4.3750
5	Short corridor	1.0766	4.4444
15	Service station	0.9207	5.0278
16	Community space	0.9144	5.056
58	Dining room	0.5842	7.3472
58	Physical training room	0.5842	7.3472
48	Unit A1 living space	0.6465	6.7361
17	Unit A2 living space	0.9051	5.0972
28	Unit A1,A2 connection space	0.7542	5.9167
41	Unit B living space	0.6881	6.3889
15	Unit B living space	0.9207	5.0278
25	Unit B connection space	0.7830	5.7361
39	Unit C1 living space	0.7064	6.2500
40	Unit C2 living space	0.6953	6.333
49	Unit C1,C2 connection space	0.6109	7.0694
Ave. of N.H.		0.7815	6.0894

Table 4 - Integration result of unit care nursing home example



For all unit care nursing homes surveyed, the most and least integration place is summarized in table 5 and table 6.

In table 5, there are 9 nursing homes where the most integrated place is connection corridor, which accounts for 40% in 22 investigated. Except the example in figure 2, the integration and convex map result of these nursing homes are presented in figure 4. It's clear from figure 4 that connection corridors which link different function areas is the highest integration place in Japanese unit care nursing homes.

Additionally, table 5 tells there are 2 nursing homes where the community space is the highest integration place. This reminds us that community space has been taken as an important place in spatial layout design in modern Japanese unit care nursing homes.

On the other hand, the least integration place is mainly private room(table 6), it accounts for 11 in 22 examined. This result may suggest us the consideration of putting high priority to secure private space for residents in Japanese unit care nursing homes.

Location	Connect corridor	Lobby	EV hall	Community space	Service station	Physical	Others	Total
Count	9	4	4	2	2	1	22	40
Ave. Intgration	1.7285	1.6709	1.6948	1.4314	1.4291	1.3030		

Table 5 - Most integrated place in unit care nursing home

Location	Living room	Ware-house	Staff room	Bath room	Stairs	Cooking room	Others	Total
Count	11	1	1	4	1	2	2	22
Ave. Intgration	0.5141	0.7700	0.5011	0.6358	0.5690	0.5671	0.5960	

Table 6 - Least integrated place in unit care nursing home

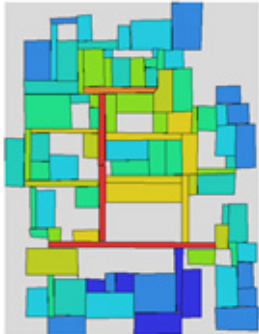
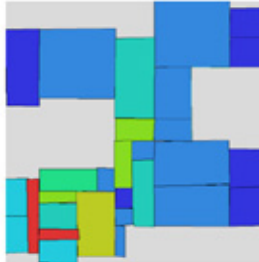


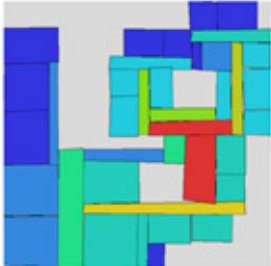

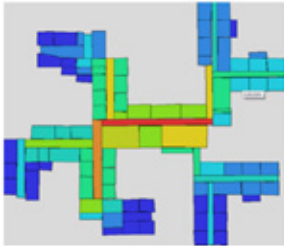

Convex map and integration result	Remark	Convex map and integration result	Remark
	<p>Built year:2003 Capacity:100 Unit number in one floor: 6 Highest integration: the long corridor 1.4766</p>		<p>Built year:2012 Capacity:54 Unit number in one floor: ~4 Highest integration: the connection corridor 1.8958</p>
	<p>Built year:2005 Capacity:100 Unit number in one floor: 3~6 Highest integration: long corridor 1.7216</p>		<p>Built year:2013 Capacity:80 Unit number in one floor: 2 Highest integration: long corridor 1.4807</p>
	<p>Built year:2005 Capacity:80 Unit number in one floor: ~4 Highest integration: connection corridor 1.6667</p>		<p>Built year:2014 Capacity:39 Unit number in one floor: 4 Highest integration: long corridor 1.9778</p>
	<p>Built year:2012 Capacity:96 Unit number in one floor: ~10 Highest integration: long corridor 1.7289</p>		<p>Built year:1997 Capacity:70 Unit number in one floor: ~4 Highest integration: connection corridor 2.3123</p>

Figure 4 - Unit care nursing home with connection corridor is high integration place

#### 4.2.2 Common facilities in unit care nursing home

The result is in table 7. In the table, the number of nursing homes where service station is the highest spatial integration common facility is 10, and it is 7 for community space, 2 for physical training room, 1 for dining room. And the overall average reveals community space is the highest integration place in the four common facilities. Both the results represent the fact that community space has been taken as a high spatial integration with easy access common facility in Japanese modern unit care nursing homes.

No.	Build year	Nursing Home ave.	Community space	Physical train. room	Service station	Dining room	Order*
1	1997	1.0670	1.1008	1.0290	1.1531	0.9314	SS>CS>NH>PT>DR
2	2003	0.8406	1.0769	0.9669	0.8425	0.8745	CS>PT>DR>SS>>NH
3	2003	0.8796	1.1775		1.2007	0.7443	SS>CS>NH>DR
4	2003	0.8530	1.0264	1.2394	1.4236	1.0522	SS>PT>DR>CS>NH
5	2004	0.5767	0.9322	0.5299	0.5822	0.5299	CS>SS>NH>PT=DR
6	2004	0.8668	1.3462	0.7576	1.4345	0.9115	SS>CS>DR>NH>PT
7	2005	1.0172	1.1785		1.3902	1.1325	SS>CS>DR>NH
8	2005	0.9310		0.9767	1.1543	0.9862	SS>DR>PT>NH
9	2005	1.2381	1.4175	0.9596	1.0942	1.1340	CS>NH>DR>SS>PT
10	2005	1.0230	0.9026	0.8910	1.4787	0.7165	SS>NH>CS>PT>DR
11	2005	0.9475	1.050	0.8077	0.9633	0.8077	CS>SS>NH>PT=DR
12	2005	0.7443	0.9144	0.5842	0.9207	0.5842	SS>CS>NH>PT=DR
13	2006	0.7959		1.3029		0.9049	PT>DR>NH
14	2010	0.9797	1.0316	1.0869	1.0867	0.8281	PT>SS>CS>NH>DR
15	2012	0.9332	0.9324	0.9241	0.8811	0.9001	NH>CS>PT>DR>SS
16	2012	0.8924		1.3796	0.9366	0.6695	PT>SS>NH>DR
17	2012	0.9185		0.7682	0.7014	1.4745	DR>NH>PT>SS
18	2012	0.7455	0.8289	0.6780	0.7469	0.6360	CS>SS>NH>PT>DR
19	2012	1.3503	1.4156	0.9957	1.9582	0.9957	SS>CS>NH>PT=DR
20	2013	0.7811		0.665434	0.7544	0.6272	NH>SS>PT>DR
21	2013	1.0216	1.3374	1.3374	0.90123	1.0237	CS=PT>DR>NH>SS
22	2014	1.0327	1.0269	1.3350	1.4751	1.2899	SS>PT>DR>NH>CS
Ave		0.9289	1.0998	0.9608	1.0990	0.8979	CS>SS>PT>NH>DR

\*Note: NH – Nursing home, CS – Community space, PT – Physical training room, SS – Service station, DR – Dining room.

Table 7 - Common facility integration result of unit care nursing homes

### 4.3 COMPARISON BETWEEN LARGE SCALE AND UNIT CARE NURSING HOME

The average integration for four common facilities in large scale care nursing home and unit care nursing home is presented in figure 5.

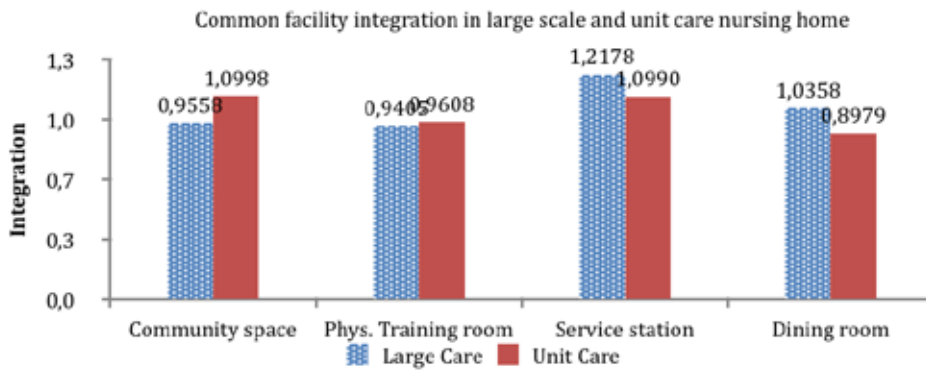


Figure 5 - Unit care nursing home with connection corridor as most integrated

It can be seen from this figure that compared with large scale care nursing home, integration of community space is increased by about 15% from 0.9558 to 1.0998, physical training room is increased slightly, about 2% from 0.9405 to 0.9608. On the other hand, service station and dining room are reduced about 10% and 13%, from 1.2178 to 1.0990 and 1.0358 to 0.8979 respectively.

Once more, in large scale care nursing home, limited staffs provide nursing care to large group of residents, the service station was placed to central living area as far as possible to reduce staffs moving distance, which led its higher spatial integration. On the other hand, by the influence of paying more attention to social activity, and providing nursing care in small distributed unit, the community space has been allocated to place with easy access and easy for people to gather together in modern Japanese unit care nursing homes.

### 4.4 OVERALL CHANGES OF COMMON SPACE IN PAST 35 YEARS

The overall transition of community space, physical training room, service station, and dining room in past 35 years is presented in figure 6. The result for large scale care nursing home is expressed in blue diamond shape, and red square is for unit care nursing home, the red line is trend line for past 35 years.

Again, the community space shows uptrend in spatial integration in the whole period.

The trend line of physical training room is slightly in uptrend, this result is in accordance with average comparison between large scale and unit care nursing homes. The result itself may indicate alteration has occurred to allocate physical training room includes rehabilitee room, club house, fitness room to a place of easier access in modern Japanese nursing homes.

On the other hand, the trend lines for both service station and dining room are in down tendency in the past 35 years. The decline in service station reflects the layout transformation from centralization in large scale care nursing home to diversity in unit care nursing home.

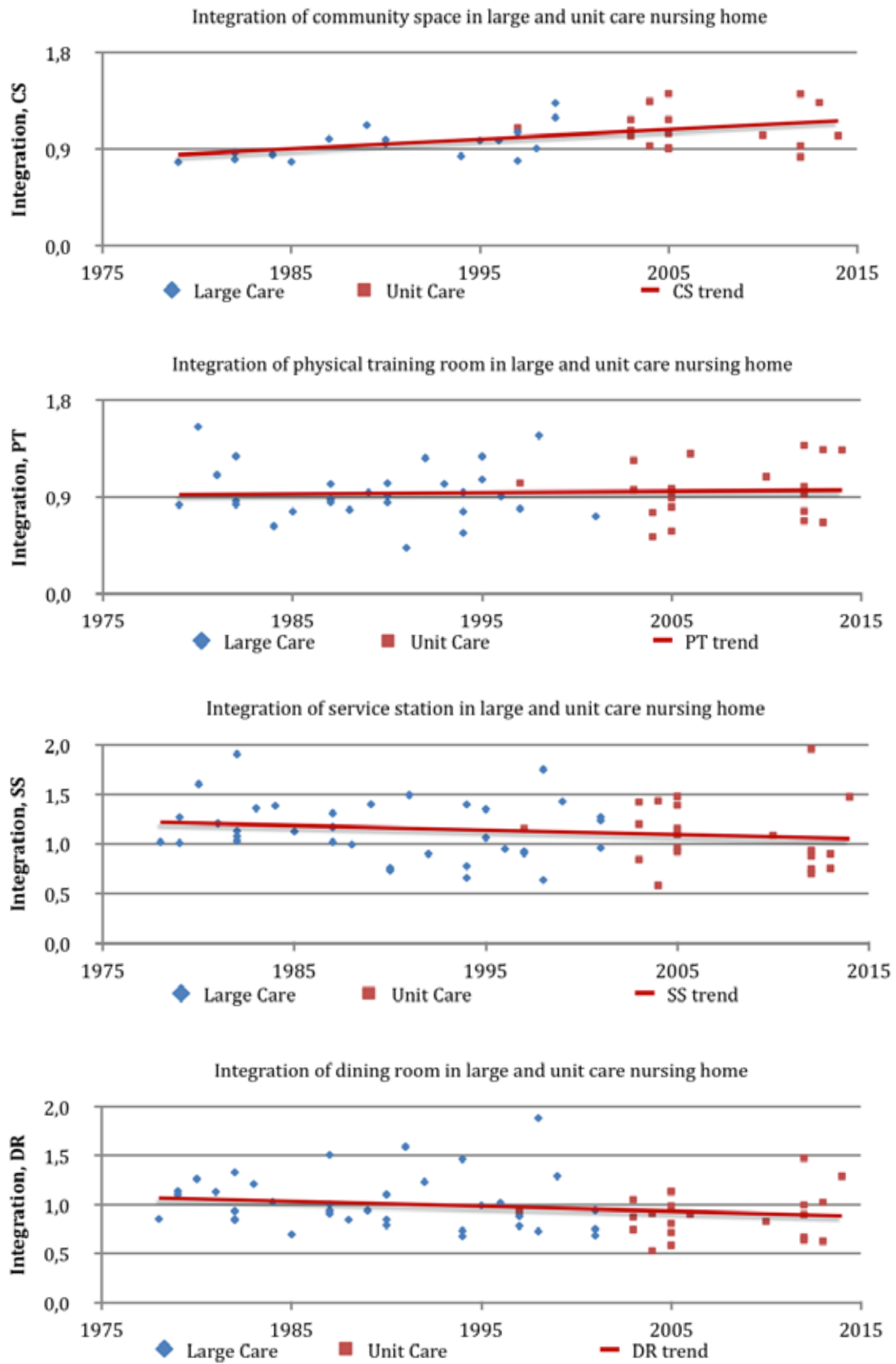


Figure 6 - Common space integration overall changes in past 35 years (CS: community space, PT: physical training room, SS: service station, DR: dining room)

## 5. CONCLUSIONS

The spatial characteristics and common space in particular for 62 Japanese nursing homes built in the year from 1978 to 2014 are analysed by using of DepthMap tool. The result tells in classic large scale care nursing homes, the corridor along which living rooms and service facilities are distributed is the highest spatial integration place. Besides, service station in general is also located in high spatial integration place in this type of nursing homes. Moreover, in modern unit care nursing homes, the corridors link different functional areas usually is the highest integration place, and community space appears to be situated in high spatial integration place as well.

The comparison between large scale care and unit care nursing homes reveals that the spatial integration of community space is increased about 15%, but service station and dining room are reduced about 10% and 13%, this indicates the changes has happened in allocating community space to higher spatial integration place with easy access and easy for people to gather together in modern Japanese unit care nursing homes.

The overall transition of common space in Japanese nursing homes in the past 35 years also confirms the uptrend of community space in spatial integration, and downtrend of service station and dining rooms. This transition may reflect a culture of connect to great community in modern Japanese nursing home design, that is, to make community space easily accessed and gathered by nursing home residents and local people.

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