

# Developing a digital support system for gardening on the basis of the design technique

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In recent years, many application software related to the gardening was proposed, and sold. However, they are simulations and games of the gardening, mostly. There is little attention to develop original software, which assists practical gardening while learning the garden design. We have developed original software "Rakuniwa1.0" to support garden planning and design. We will discuss characteristic details and utility of "Rakuniwa", and then we will discuss the evaluation of "Rakuniwa" from the garden design viewpoint in this paper. And we also develop the method especially for designing veranda garden. We introduce specifications of new software for veranda garden design, "Veranda Garden Support System" (VGSS).

**Key words :** gardening, garden design, software, technique, veranda gardening

## 1. Introduction

A five-day workweek brings an increase in leisure time, and people who enjoy the gardening have been increased. Because of this background, and development of information technology, in recent years, many application software related to the gardening was proposed, and sold. However, they are simulations and games of the gardening, mostly. There is little attention to develop original software, which assists practical gardening while learning a method of garden design.

In the preview study, we developed a "Digital Garden System"<sup>[1]</sup> (DGS). Users can design their garden by a sense of easy drawing, and check the information of plants while designing a garden by using "DGS". Moreover user can confirm a finished rough sketch of the garden with three-dimensional (3D) space. The 3D space is generated automatically by "DGS". The rough sketch helped us to enjoy garden planning, however, no practical method to support gardening was proposed.

In this study, we developed original software "Rakuniwa" to support garden planning from the aspect of the design technique. On the basis of modern design technique we tried to propose a fundamental and concrete method to create the garden. Characteristic details and utility of "Rakuniwa" will be discussed in this paper. And we also develop the method especially for designing veranda garden. We introduce specifications of new software for veranda garden design, "Veranda

Garden Support System" (VGSS).

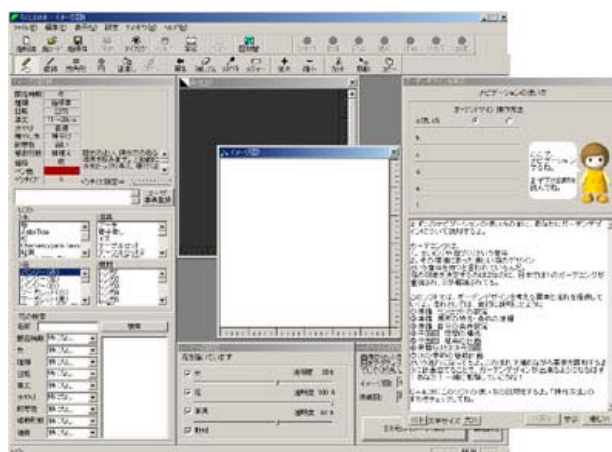


Fig1. The gardening support system "Rakuniwa"

## 2. Characteristics of "Rakuniwa"

"Rakuniwa" is application software based on Microsoft Windows (see Fig.1). It supports gardening beginners to design their gardens. The "Rakuniwa 1.0" has the following characteristics:

- 1) A virtual character shows users operation method of the software and design technique of the gardening.
- 2) Everyone is able to design garden by a sense of easy drawing in a 2D plane.
- 3) It can generate a rough sketch of the garden with 3D space automatically. Users can walk though in the virtual space, and confirm the garden you designed.
- 4) Users can confirm the information of plants while

designing the garden.

- 5) Users can confirm a total cost to realize the garden from the list of items and the number of plants used in the design plan.
- 6) Users can accumulate their own know-how and information of flowers in "Rakuniwa".
- 7) Users can learn the method of garden design by following the instruction of "Rakuniwa".

### 3. Verification of "Rakuniwa" from the garden design viewpoint

In this chapter, we show a method of gardening on the basis of design technique, which is proposed in "Rakuniwa". We also show an experiment of garden design works by using "Rakuniwa" and "DGS".

#### 3.1 The technique of garden design

Figure 2 shows a comparison between a process of ordinary design and that of garden design proposed here. According to the process, the prepared design method is explained as follows.

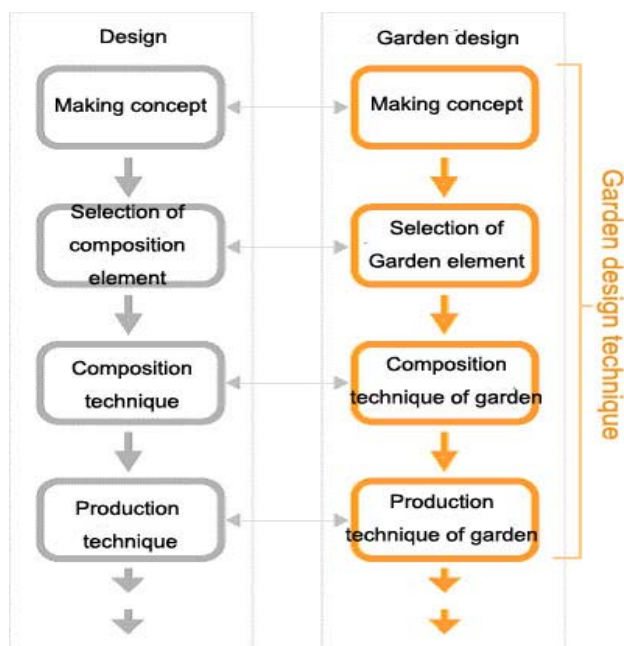


Fig.2 Comparison of design process between ordinary design and the garden design proposed here.

#### ①Preparation1-Setting concept of the garden-

First, garden design has to arrange "Setting purpose" and "Image of the garden" to make the concept clear. The purpose of garden is like looking, rest, play and the environmental adjustment.

Next, it is necessary to have the image of the garden. To take the image firmly, it is useful to think about the garden elements.

#### ②Preparation2-Grasp of condition and characteristic of the place -

The design of the garden changes by environmental condition. It is effective to make a plan to design garden with both beauty and function.

First, it is better to measure the extent of the field of your garden. Next, it is better to think about the condition of sunshine. Sunshine condition changes on the direction and height also in one garden. The condition relates greatly also to the planting plan. Similarly, it is better to think about the wind-swept. The wind-swept also vary from place to place.

Next, it is better to think about the climate of the place. The climate is different depending on the land where you live, and the climate relates greatly to "Design of the space" and "Planting plan". It is easy to guess suitable plants of your garden by seeing the growth of the plants around your garden. Then try to plant the plants and confirm that the plants strike their roots in your garden or not.

It is better to think about soil condition of the garden. The growth of plants relate greatly to the soil. The soils that clear the following points are good soils.

- When you dig the soil, the thickness of the surface soil is 30cm or more.
- The color of the soil is from black to puce.
- Let the soil contain water, it will collapse after it hardens once.

Last, it is better to think about the surrounding condition of your garden. An individual garden also becomes one design element of your towns. A condition surrounding the garden relates greatly to planting. It seems better to think about the following points.

- Influence of pollution and vehicle exhaust emission,
- Circumferences of the house and the road,
- Influence of sea breeze,
- Design style of your town,
- Design style of your house.

#### ③Preparation3- Setting conditions -

First, it is better to set budget. Then, it is better to think about management. To keep the garden beautiful, it is important to manage the garden. It is better to consider the management components as shown in Table1.

Table1 Management components of gardening

|                     |                                    |
|---------------------|------------------------------------|
| • Watering          | • Extermination of harmful insects |
| • Fertilization     | • Substitution                     |
| • Pull out the weed | • Soil improvement                 |

#### ④ Making plan1-Composition of space-

First, confirm the height of current grand. To think about the design by making the best use of the height of current grand, you can see a different expression of the garden.

Next, it is better to think about the one that becomes a main item in the garden. Thinking about the entire balance in the garden is important for garden design. The main is like a symbol tree or a table.

After arrange the main, it is better to think about the flow plan of the garden. Flow planning is a range of path where the person walks. It would be a soft image by using curved pathway. And it would be a tight image by using straight line one.

After the flow planning, the next is arranging the several items of gardening. It is better to think about the layout by using a rough sketch. Then we have to arrange trees, paved material and furniture of the garden.

#### ⑤ Making plan2-Planting plan-

First, we have to make a plan of colors. The impression of the garden is different according to the colors. And, the image changes according to the combined colors. Fixing a theme color to design the garden, impression of the garden could be satisfying. Second, making a height plan by thinking about the stature of the plants. Then, it is better to choose plants by thinking about the color plan, the height plan and the setting of other conditions. Finally, you can arrange the plants and items for gardening in the plan.

### 3.2 An evaluation experiment of the software

#### 3.2.1 Purpose and method of the experiment

To verify the usability and effectiveness of the software, we carried out an experiment in which observers design a garden by using “Rakuniwa” within an hour. The experiment was implemented on a personal computer of VAIO RA (Sony). The operating system is Windows XP. CPU of the computer is Pentium 4 (3.40GHz), and RAM is 512MB.

Subjects are seven students of Yamaguchi University aged 22~24 years old. Five of them have used “Hakoniwa” and two of them have no experience.

#### 3.2.2 Result of the experiment

First, in the usability evaluation, we got good evaluations in the following points.

- The software was friendly and gave good impression.
- All observers could design the garden to the last stage according to the instruction of the software.

- The operation of the software was comprehensible.
- 3D visualization by the VRML was good enough.
- All observers understood what they were doing in the designing process.

Observer’s evaluations to our questionnaire were rated on a scale of 1 to 5. (Level 1 is “I don’t think so very much”. Level 5 is “I think so very much”). The evaluation of the usability was all three or more. The following results came out as an effectiveness of the software by considering the garden design technique.

- An interest into the garden design has increased by about two points.
- Many people want to learn the design method in detail.
- The method of garden design seems to be useful for the gardening in the future. (Fig3)

Thus, the effectiveness of the proposed software was confirmed.

Several works created by an author are shown in Fig.4, Fig.5 and Fig.6. Figure 4 was made by use of preliminary software DGS. The work seems too simple and rather halfhearted. Figure 6 shows a work created by “Rakuniwa 1.0”. Plane designs of “location of items” and “height map” are represented in Fig.5 (a) and (b), respectively.

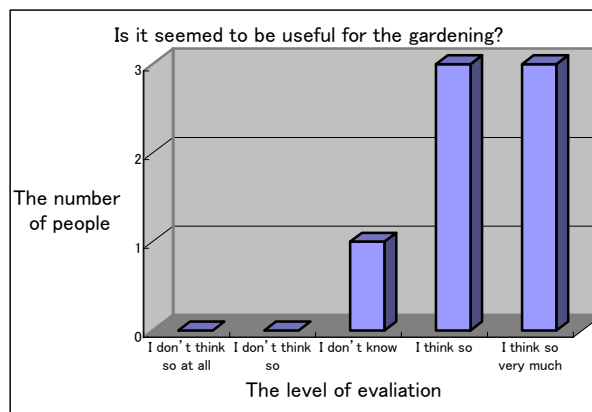


Fig3. Evaluation of the proposed software



Fig4. A design work of garden created by DGS

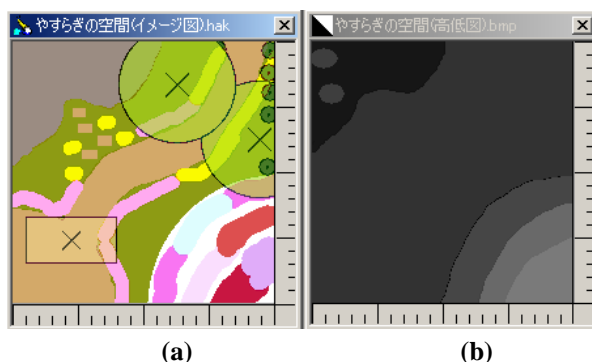


Fig5. 2D-plane designs by use of "Rakuniwa 1.0"



Fig6. 3D sketch of the designed garden created automatically by use of "Rakuniwa 1.0" and VRML (virtual reality making language) viewer.

## 4. Specification of "VGSS"

### 4.1 Outline of VGSS

Now in Japan, there are a lot of houses having veranda. It goes up to 82% in the house. The families that enjoy gardening in veranda is about 76%<sup>[2]</sup>. Moreover, in China, the people of 95%<sup>[3]</sup> or more live in the apartment and the housing complex. Therefore, many people want to enjoy gardening in a small space of veranda. Thus we are trying to develop a veranda version of "Rakuniwa": Veranda Garden Support System (hereafter abbreviated as VGSS). Users can enable to plant the virtual plants into a container directly in the virtual space by 3D computer graphics (3D-CG). Users can arrange flowers in homogeneously or in a different kind in the container. Then, users enable to put the planted flowers to the plan of their veranda. We want to propose a garden design method especially for the veranda version in this software. Required functions are

- 1) Designing by a sense of easy drawing,
- 2) Visualization of the designed veranda by 3D-CG,
- 3) Users able to learn the design techniques of veranda gardening.
- 4) Self-learning of the design techniques for veranda,

- 5) Suitable database of plants and gardening items.

### 4.2 Garden technique for veranda

Taking the well-established method into account<sup>[4]</sup>, we introduce the following planning rules for veranda.

- 1) Getting a lot of sunshine to all the plants is important. It is better to arrange the plants from the parapet toward the floor.
- 2) It is better to apply the differences between high and low, front and rear, and left and right of the plants.
- 3) If you don't want to move a large pot everyday, you can put it on the corner.
- 4) By effectively using the upside part space of the veranda, you can hang the hanging basket.

Additionally, we propose two new rules.

- 1) You could put small wall baskets on parapet to enjoy gardening from both outside and inside of the veranda.
- 2) It would increase variation to plant kinds of flowers with the pot.

## 5. Conclusions

In this study, we developed application software "Rakuniwa" to support people who want to do gardening. "Rakuniwa" could help gardening beginners to do gardening based on the design technique. We confirmed that "Rakuniwa" is useful software for garden design.

We also try to develop software, "Veranda Garden Support System (VGSS)", which could help people to do garden design in veranda. The houses or the departments having veranda are increasing especially in big cities in the world. So we believe that there exist strong needs to develop VGSS to support garden design for veranda in the future.

## Acknowledgment

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