"Design with discourse" for design from the "ethics level"

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i Introduction

To make the world a better place, I, with my colleagues, system-atized a design framework and a design method. The framework is what we call "design from the ethics level" and the method "design with discourse." In this paper, I will introduce and eval-uate design with discourse chiefly, and design from the ethics level supplementary.

Design with discourse is a method that allows us to linguisti-cally design values of artifacts in the whole world. In practicing it, we are supposed to articulate, construct and position logic of artifacts from considering what is a better world and what is needed for that world. And design from the ethics level is a framework in which we design from such highest purposes to make the world a better place.

Effects we expect from design with discourse is, in design-ing from the ethics level, we can more clearly understand and describe the design for a better world, and more valuably get viewpoints and hypotheses which connect to the ethics level. It is because design with discourse is to provide special discourse, which consists of its own lexicon and grammar and is exactly what we need to articulate and describe the values. With this discourse, to describe values consistently becomes our design activity.

Then, five cases of design with discourse will be introduced such as a redesign of a robot and a redesign of the passenger plane. These cases will concretely show what design with dis-course is and how to practice it.

In this century, we still have big problems. For example, global warming, war, terror, poverty, disease, and increasing of mental disorders are candidates that should be solved as soon as possible. In addition, it is wonderful if we can intentionally add

a little happiness to our everyday life. Design with discourse aims to contribute these purposes.

I would like to offer this paper as a textbook which covers sufficient discourses usefully systematized to learn a way to design to make the world a better place. Actually and unfortunately, this paper is not an academic paper, because it is not submitted to any academic society and does not follow its guidelines.

Then, I renounce my copyright of this paper. It hopes that a lot of people will read this paper and freely use the arguments to make this world a better place. But please be careful when you use the materials to which this paper referred because they have their own copyright. In this case, it is necessary to follow laws and guidelines. Anyway, I will be very glad if this paper will contribute to make the world a better place and allow us to live in a better world.

Finally, investigations described in this paper are based on what I investigated at the University of Tokyo. I would like to acknowledge instruction and support from my colleagues: especially members of AI Laboratory at the University of Tokyo and members of Global Center of Excellence for Mechanical Systems Innovation.

ii For design from the ethics level

"Design with discourse" is systematized for design from the "ethics level" [Sekiguchi 10b]. In this chapter, I will describe what the ethics level is and what design "from" the ethics level is.

The ethics level is a level of values in the whole world

First, the ethics level is a level at which values of an artifact in the whole world are expressed. These values consist in relations among the artifact, other artifacts, people, society, and nature. Here I use the term "value" to signify something which is sensed to be significant, which is implied when we articulate a "term" defined by a whole relations of terms called "system" [Saussure 10]. Economical values are included in this signification, but it is not the only one. For example, it also includes such as "diversity," "sustainability," "plurality," and "human rights" in the whole world. In other words, at the ethics level, we are to express what a world we would like to realize is.

Second, the ethics level is a level of the hierarchical representation of artifacts, and there are other levels such as the interaction level and the system level. And each level has corresponding values. For example, in the case of a car, a value at the system level is such as to look "stylish" or to run "fast," and a value at the interaction level is to allow us drive "intuitively."

Third, as to the term "ethics," it seems to be used in two significations generally:

1. A system to deal with values in the whole world
2. A system to deal with individual moral issues

The former signification is leading in terms of the ethics level. The latter signification is also taken notice of when we design

artifacts from the ethics level, for example, as a professional designer, but it is secondary in our framework. It is probable that those who design from the ethics level becomes an ethical person in the latter signification. But to investigate this point needs another serious work.

In relation to these two significations, for example, Luciano Floridi calls the former "macro ethics" and the latter "micro ethics" ([Nishigaki 07] Chap. 2). And this macro ethics is what we deal with to design from the ethics level.

Recently, Michael J. Sandel clearly described why "cultivating virtue and reasoning common good" ([Sandel 10] p. 260) is necessary for justice owing to such as Aristotle. The level at which we investigate these questions about artifacts is exactly what the ethics level corresponds to.

Then, we can say that the level of Aristotle's politics corresponds to the ethics level. If we read following sentences with replacing the term "community" with "world," and "citizens" with "artifacts," then we can confirm that it is reasonable.

> For even if the good of community coincides with that of the individual, it is clearly a greatest and more perfect thing to achieve and preserve that of a community; for while it is desirable to secure what is good in the case of an individual, to do so in the case of a people or a state is something finer and more sublime.

> Such, then, is the aim of our investigation; and it is a kind of political science (trans.'s note: Aristotle seems to regard ethics not as a species of politics but as a sort of introduction to it) ([Aristotle 04] pp. 4–5)

> ... the end of politics is the highest good; and the chief concern of this science is to endue the citizens with certain qualities, namely virtue and the readiness to do fine deeds ([Aristotle 04] p. 21).

It is clear that his politics corresponds to the former signification I described above, and his ethics corresponds to the latter signification. The point is that the fine "deeds" we consider is not only what is accustomed to the society but also what is to make the world a better place.

Then, Takichi Shimizu and his colleague, who translated Habermas's book, described that a typical example of the former ethics is Hegel's "Sittlichkeit," and the latter is Kanto's "moral" ([Habermas 91] pp. 273–274 in Japanese trans. ver.). In addition, we also add Weber's "ethos," which is also introduced as social ethics ([Habermas 91] p. 274 in Japanese trans. ver.), to the former signification. In fact, the term ethos is an etymology of the term ethics, so that this inclusion completely makes sense.

Finally, other candidates of a name of the ethics level may be such as "whole world level," "macro ethics level," "justice level," "politics level," and "ethos level." The reason I selected the name, ethics level, is that I aimed to signify both the broadness of the whole world and its value character and systematize an alternative ethics that is not only to regulate our action but also to generate artifacts for a better future. If we can systematize it usefully, then designers will accept more earnestly because it fits their habitual mind.

In short, the ethics level is a level of values in the whole world.

The ethics level lies at the top of the hierarchical representation of artifacts

First, one of the most important characteristics about the ethics level is its lying at the top of the hierarchical representation of artifacts. The lower levels are the interaction level, the system level, the subsystem level, and so on down to the material level. An overview of this new version of the hierarchical representation of artifacts is described as Figure 2.1.

Ethics level
Interaction (Field) level
System (User interface) level
Subsystem level
Subsubsystem level
⋮
Material level
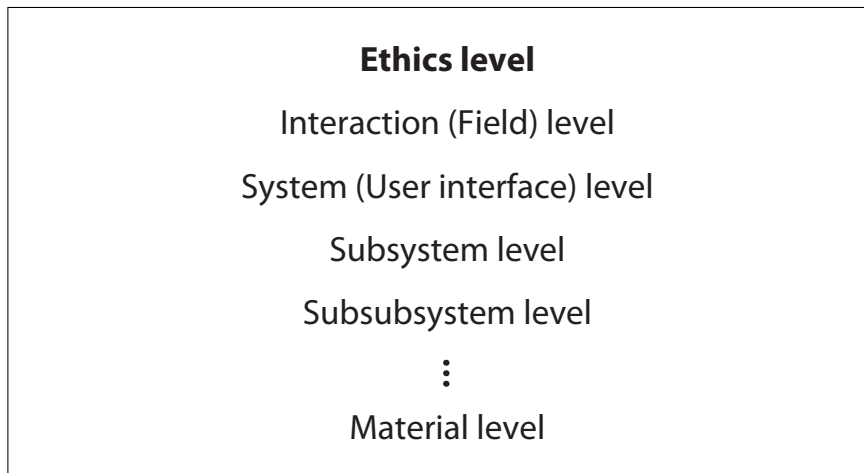
Figure 2.1: An overview of the hierarchical representation of artifacts

Here, to describe this overview, I owed the basics to arguments of Herbert A. Simon [Simon 96], Allen Newell [Newell 81], Koich Hori [Hori 07], and Kumiyo Nakakoji [Nakakoji 07]. It was an adviser of mine who suggested that the level I dealt with seemed to be above the interaction level above the knowledge level. He first called the level like "philosophy level." And what I did is to redefine it as the ethics (ethical) level, replace it at the top of the hierarchical "structure" of artifacts, and investigate it. Then, after a while, he suggested again that the hierarchical structure should be considered as the hierarchical "representation." The trouble is that he did not mention the reason, so that I thought it by myself as that it is because the values at the ethics level are to be influenced by the viewpoints of people who articulate. And I decided to follow his suggestion. Meanwhile the hierarchical representation of artifacts became the present state.

Second, as to the system level, we can refer the term "system," "interface," [Simon 96] and "function" ([Yoshikawa 09] p. 161). I use these terms only to signify the level correspond-

ing to the user interface, which is an interface between its inner environment and its user, no matter how it is useful to use these concepts relatively. The reason is that I need to absolutely define them to position the ethics level above them.

By the way, their original significations are relative as Herbert A. Simon said:

> The artificial world is centered precisely on this interface between the inner and outer environment ([Simon 96] p. 113).

For example, we can not consider only the user interface but also an interface between a bolt and a nut. This is also true of the term "system" and Yoshikawa's "function." In the next section, to signify this relativeness, I will introduce the term "target level" that indicates a level on which we concentrate in design. The effect to introduce this term will be described in detail in the next section, which is an understanding that values at the ethics level play the role of Wittgenstein's hinge in many engineering designs.

Third, as to the interaction level, special characteristics of interactions are to be distinguished. Kumiyo Nakakoji said:

> While the term "interface" makes people consider the character of artefacts as *surface*, "interaction" makes people consider *time*, *flow* and the *change* the artefact creates [Nakakoji 07] (trans. by author).

Here it is implied that the interface is the user interface.

As Nakakoji said, the important point is that it can be insightful to divide one level into two different levels: she divided the interaction level from the user interface level. This is the same logic when Allen Newell used to define and position the "knowledge level" [Newell 81]: he divided the knowledge level

from the symbol level. And because it is insightful, I decided to continue to divide the ethics level from the interaction level no matter how the interaction level can also signify the level corresponds to the ethics level. The insightful understanding this division provides will be described in detail in the next section.

Finally, as to the ethics level in relation to the humanities, the term "social structure," "intersubjectivity," and "identity" can be related to this representation. These terms are described as follows:

Social structure: "The concept of **social structure** is an important one in sociology. It refers to the fact that the social contexts of our lives do not consist of random assortments of events or actions; they are structured or patterned, in distinct ways. There are regularities in the ways we behave and in the relationship we have with one another" ([Giddens 09] p. 9). In other words, the social structure is of macro relations, whereas the intersubjectivity is of micro relations.

Intersubjectivity: The idea of intersubjectivity signifies that there is no authentic independent identity. Nick Crossley clearly described that intersubjectivity has two phases. One "involves a lack of self-awareness and a communicative openness towards the other, which is unconditional. Self engages with other in this modality but has no experience of them as such" ([Crossley 96] p. 23). And the other "involves an empathic intentionality which experiences otherness by way of an imaginative transposition of self into the position of the other" ([Crossley 96] p. 23).

Identity: "The distinctive characteristics of a person's character or the character of a group which relate to who they are and what is meaningful to them. Some of the main sources

of identity include gender, sexual orientation, nationality, or ethnicity, and social class. An important marker of an individual's identity is his or her name, and naming is also important for group identity"([Giddens 09] p. 1121).

Then, we can notice that the social structure concerning an artifact is to be described at the ethics level, the intersubjectivity is at the interaction level, and the identity is at the system level.

In short, the ethics level lies at the top of the hierarchical representation of artifacts.

The values at the ethics level play the role of Wittgenstein's hinge in most engineering design

The most important understanding which our hierarchical representation of artifacts offers is that the values at the ethics level do not tend to be doubted in many engineering designs.

In design, there exist three types of levels: the hinge level, the target level, and the parameter level as Figure 2.2.

Hinge level
(Outer environmet)

Ethics level

Interaction level

−Target level ———————— System level
(Interface)

Subsystem level

Parameter level
(Inner environment)
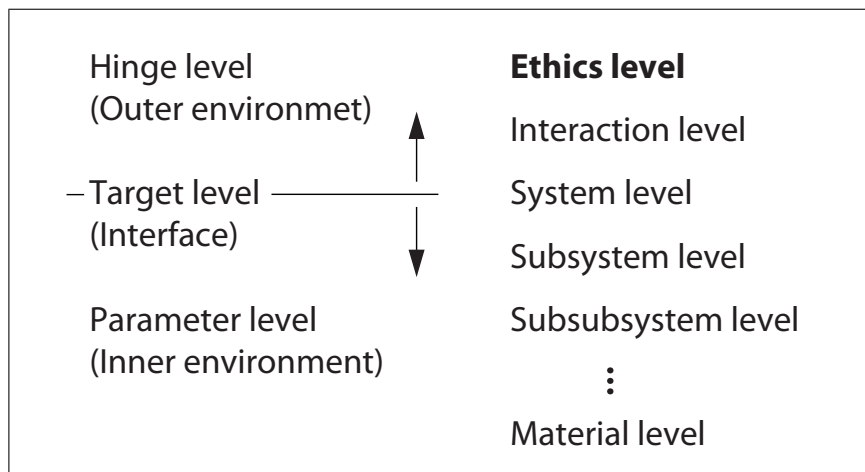
Subsubsystem level

⋮

Material level

Figure 2.2: **Three types of levels in design**

These three types of levels allow us to clearly understand

what we do in design:

1. to define or be provided design requirements at the target level
2. to design values at the parameter levels to realize the design requirements at the target level

The point is that, as to the higher levels above the target level, once they provide design requirements, they become the outer environment and their values are not doubted in design. We call these levels the hinge level.

Then, the ethics level which is the highest level does not tend to be set as the target level. It is because the ethics level can not intuitively be articulated because we don't live on such scale as the introduction of *The limits to growth* [Meadows 72] claimed. For example, we can not see the opposite side of the earth. So it is difficult to articulate values on that scale with the everyday discourse or the engineering one. As a result, values at the ethics level becomes the hinge level.

In relation to the point that we just design the lower level, Herbert A. Simon said:

> ... the behavior of the system at each level depended on only a very approximate, simplified, abstracted characterization of the system at the level next beneath ([Simon 96] p. 16).

This is an ideal case, but we can't get such ideal technologies:

> Often we shall have to be satisfied with meeting the design objectives only approximately. Then the properties of the inner system will 'show through' ([Simon 96] p. 12).

In conclusion, we have to design the target level and the lower levels to get the required functions. But, the higher levels above the target level can not be dealt with in the activity, because it is not necessary.

For example, when we design a stylish car whose value is at the system level, we have to design such as its body, its engine, its tires, its chassis at the subsystem level to realize it. But we can ignore values such as its driving feeling at the interaction level, and such as sustainability in the whole world at the ethics level. In this case, the interaction level and the ethics level becomes the hinge level.

Then, to understand this situation more clearly and philosophically, we can owe the concept of "hinge" to Ludwig Wittgenstein and Shigeki Noya. It signifies that there are some propositions that is not doubted to investigate other propositions, no matter how to doubt them is important. Noya applied Wittgenstein's this "hinge" to describe why it is important to doubt the framework in investigations. Noya referred following sections:

> That is to say, the *questions* that we raise and our *doubts* depends on the fact that some propositions are exempt from doubt, are as it were like hinges on which those turn.

> That is to say, it belongs to the logic of our scientific investigations that certain things are indeed not doubted.

> But it isn't that the situation is like this: We just *can't* investigate everything, and for that reason we are forced to rest content with assumption. If I want the door to turn, the hinge must stay put ([Kobayashi 95] pp. 24–25, [Wittgenstein 69] pp. 44–44e, §§341–343).

Noya also mentioned that to doubt the framework or the hinge of investigations is very important to advance. And this

is also true of our consideration: we doubt the conventional design framework that leaves the ethics level freeing from being doubted.

In conclusion, with this concept of hinge, we can clearly understand that the values at the ethics level play the role of Wittgenstein's hinge in many engineering designs. And this understanding is exactly what we aim to offer by defining the ethics level, which encourages us to design from the highest purposes.

What the "from" signifies in relation to the hierarchical representation of artifacts

In this section and the next, I will describe what the design "from" the ethics level is. In relation to the hierarchical representation of artifacts, to design "from" the ethics level has a broad sense and a narrow.

In the broad sense, it signifies to articulate, connect and position values from the ethics level to the below concrete levels. In this case, it does not matter from which level we start to deal with. What is important is that the ethics level is included.

In the narrow sense, it signifies to articulate, connect and position values from the ethics level to the below concrete levels in due order. For example, first, we deal with the ethics level; second, the interaction level; then, the system level, and so on.

In this paper, I apply the broad sense. And when I emphasize the situation in which we start from the below level, I call it "redesign" from the ethics level.

The point is that we do not design the ethics level alone. We emphasize the relation between levels and between solutions, too. For example, we can find changes at the lower levels that is important to bring about necessary changes at the ethics level. And we can also find extension of possibilities of design solutions which can be generated from considering from the ethics level.

This is why we do not call it such as "ethics level design." And this is the point I was taught to emphasize by my superiors and my colleagues when I belonged to the school of engineering at the University of Tokyo. They said that they, engineers, should not only criticize artifacts but also generate, so that we have to connect the ethics level to the lower concrete levels. I followed this instruction, whose essence is reflected as grammar of design with discourse as described in the next chapter.

What the "from" signifies in relation to the entire design process

Next, in relation to the entire design process, to design "from" the ethics level signifies that the ethics level is dealt with "from" the very first phase in the entire design process.

First, we consider that the entire design process is composed of five phases. They are in due order:

1. to consider individually
2. to dialogue with others
3. to make a prototype
4. to perform an field trial
5. to perform an social experimentation

And in each phase, four phases exist.

1. to generate
2. to detail
3. to evaluate
4. to mediate for sharing

To generate an idea deeply relates why and what we design. And our main scope is to make this generating phase from the ethics level. It is because what we aim is to design to make the

world a better place and the ethics level is to describe from this highest purposes. And because we chiefly focus on the generating phase, we consider it is effective to utilize designer's individuality to produce viewpoints and hypotheses more valuably and comprehensively.

There are architects and designers who suggest that to introduce the individuality into design is significant, whereas there are also those who deny it. For example, Tadao Ando said as follows:

> The most important thing is to clear your own intention through dialogue by yourself, make it an architectural concept, and carry out it until the architecture will be finished ([Ando 99] p. 55) (trans. by author).

A little bit different position is by Tom Kelly and Jonathan Littman who denied the "myth of lone genius" and celebrate the "hot groups," which celebrate the "personality" as a team member, in their design firm, IDEO ([Kelley 01] Chap. 5). They rather femphasize the importance of the second phase: to dialogue with others.

In any case, to generate a design from the ethics level is to express ones individuality ethically.

Then, it is true that all of these phases are actually practiced in a spiral loop. And individuality deeply relates intersubjectivity and its social structure. But, for now, we consider this linear model is insightful because it allows us to understand the essential point. First, it is important to set the ethics level to direct our design. It is because the highest values at the ethics level won't be change so often in the spiral process, and what will change are generally means to realize them at the lower levels. Second, it is important to enhance the individuality of the generating phase. It is because the values at the ethics level

deeply relate who we are, and it is significant both to make designs more plurally valuable and avoid being "totalitarianism" [Arendt 65, Arendt 98]

Finally, in relation to these phases, the first phase is something like "independent inquiry" described in a Japanese animation "The ghost in the shell" [Shirow 06]. Prototyping is famous by IDEO [Kelley 01] in which we confirm designed functions by simulating the real situation it will be used. And "social experimentation" is a concept offered by Roland Schinzinger and Mike W. Martin that signifies the situation in which we product, circulate, and use artifacts in the real world, and get feedback to improve them as an ordinary experimentation does. To perform this experimentation in a limited area and a limited span is what is called "field trial."

In conclusion, to design "from" the ethics level in relation to the entire design process signifies to start to generate why and what we design from the ethics level.

iii Guidelines on design with discourse

To design from the ethics level, we systematized a method which we call "design with discourse." In this chapter, I will describe what design with discourse is.

Discourse is, with its own grammar and lexicon, to express or of expressed messages to guarantee in public

Generally speaking, the term "discourse" signifies an action to express an idea, or what is or was expressed. Each discourse is considered to have its own "grammar" and "lexicon" which govern our viewpoint ([Kobayashi 95] p. 4).

Technically speaking, I apply all the significations following:

1. a text or a conversation
2. a philosophical description
3. an exclusive framework of thinking
4. a dialogue in public

All the significations relate to the essence of "design with discourse." In a word, the purposes to systematize design with discourse is to understand that each level has each discourse, so that we need to introduce discourses corresponding to design from the ethics level: discourses at the ethics level as the target level and at the interaction level as the main parameter level.

As related work, the first signification is known as the usage in the linguistics. The most famous case of the second signification may be the title of René Descartes's work [Descartes 12]. The third signification is known as that of Michel Foucault [Foucault 69, Giddens 01], and that of Ferdinand de Saussure [Saussure 10]. The fourth signification is the famous as that of Jürgen Habermas [Habermas 90, Habermas 91] and it relates

the Hannah Arendt's "action" and "public realm" ([Arendt 98] Chap. 2).

For example, in a textbook for the liberal arts course at the University of Tokyo, Yasuo Kobayashi suggested that to introduce and invent new "logic" or discourse to explore the unknown object is important ([Kobayashi 95] Part 1). This is exactly what design with discourse aims.

Then, Habermas's criticism to Hannah Arendt is that her concept is "helpful" only in the case of the "generation" of political power, and not "acquisition and maintenance" and "employment" ([Kawasaki 05] p. 345, [Hinchman 94] p. 221). We consider this criticism is also true to design with discourse: the generating phase is where it can be helpful the most.

In conclusion, I systematize a discourse to design from the ethics level. It is to express values of an artifact to articulate, construct, and position their logic and to express and guarantee it in public.

Grammar of design with discourse

Grammar of design with discourse is basically composed of four rules following.

1. to use grammar and terms clearly
2. to position your design in existing contexts
3. to apply the hermeneutic grammar
4. to describe " if A is changed to B at the parameter level, then C will change to D at the target level"

The first and the second rules are the characteristics of the "theoretical" grammar that are common to almost all of the sciences and different from the "everyday" one ([Murakami 79] pp. 144–207). The effect of these rules can be confirmed when we see how the sciences today achieve brilliant success. To make

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design with discourse be a special method to design from the ethics level, I apply these rules.

The third rule is to apply the hermeneutic grammar. Table 3.1 shows what the hermeneutic grammar is compared with the natural scientific grammar. Here I mainly owed the understanding to descriptions of Immanuel Wallerstein [Wallerstein 04] and Hans-Georg Gadamer [Gadamer 04].

Table 3.1: A comparison of the hermeneutic grammar with the natural scientific grammar

Hermeneutic	Natural scientific
idiographic	nomothetic
narrative	objective
qualitative	quantitative
e.g. philosophy	e.g. physics

We apply this hermeneutic grammar in design. It is because, to describe the values correspond to design from the ethics level, the hermeneutic grammar is more useful than the natural scientific one. And what is described is neither a truth nor a fact, but a possibility in the future because what we do is to design the future with our imagination.

The fourth rule is from the engineering, which urges us to synthesize. This rule initially originated an adviser of mine's conventional phrase, "then, what will change to what? (in Japanese: Sore de nani ga dou kawaru no?)," who belongs to the school of engineering at the University of Tokyo. Then, it becomes clear that it represents the purpose-means relation, which relates the design sciences as that of Herbert A. Simon as I described in the previous section: the target level and the parameter level. To include this rule into the grammar of design with discourse aims to include the engineering mind into

design from the ethics level. With this rule, we can describe relations of ideas between levels by describing this rules vertically, and relations of ideas between design solutions by describing it horizontally.

In short, what we do is to describe the fourth rule clearly and hermeneutically vertically and horizontally.

Options of grammar of design with discourse

We can use options of grammar of design with discourse: options of the third rule to apply the hermeneutic grammar.

It is said that the hierarchical grammar, in essence, treats the question of experience. Hisatake Kato suggested that, when "experience" is investigated, it is usually considered to be composed of three constituents; "entity," "logos," and "consciousness" ([Kato 80] p. 260). Figure 3.1 describes this situation.
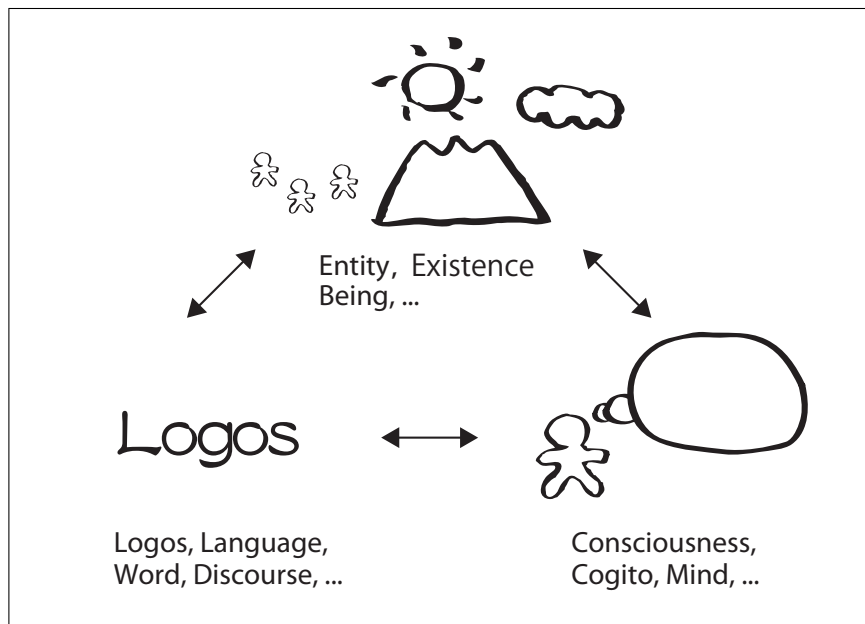
Figure 3.1: Constituents of the question concerning "experience" ([Kato 80] p. 260) described by author

In other words, these grammars concern the way we articulate the world. We therefore can make use of these options in articulating values in design.

Options which I used in this paper are as follows:

Essence intuition: First, we are supposed to do a phenomenological reduction. "This reduction is the decision not to suppress but to place in suspense, or not of action, all the spontaneous affirmations in which I live, not to deny them but rather to understand them and to make them explicit" ([Merleau-Ponty 64] p. 56). Then, we perform the essence intuition. "In order to grasp an essence, we consider a concrete experience, and then we make it change in our thought, trying to imagine it as effectively modified in all respects. *That which remains invariable* through these changes is the essence of the phenomena in question" ([Merleau-Ponty 64] p. 70). It is "... to grasp intuitively, in the unfolding of the intentions essentially involved in such an experience, the sense of the experienced as such, the sense of the relevant class of regional objectivities, and to express this sense in rigorous analysis and description" ([Husserl 89] p. 97). In short, we imagine others to describe common values with this grammar.

Finitude of temporality: Dasein is from what we have to start. "The Self of everyday Dasein is the *they-self*, which we distinguish from the *authentic Self*—that is, from the Self which has been taken hold of in its own way [eigens ergriffen]. As they-self, the particular Dasein has been *dispersed* into the "they", and must first find itself" ([Heidegger 08] p. 167). "*Only an entity which, in its Being, is essentially* **futural** *so that it is free for its death and can let itself be thrown back upon its factical "there" by shattering itself against death—that is to say, only an entity which, as fu-*

tural, is equiprimordially in the process of **having-been***, can, by handing down to itself the possibility it has inherited, take over its own thrownness and be* **in the moment of vision** *for 'its time'. Only authentic temporality which is at the same time finite, makes possible something like fate—that is to say, authentic historicality*" ([Heidegger 08] p. 437). In short, to learn own time and place is what we do with this grammar.

Fusion of horizons: "The horizon is the range of vision that includes everything that can be seen from a particular vantage point" ([Gadamer 04] p. 301). The fusion of horizons concerns understanding, in which the past and the present are combined. "*Understanding is, essentially, a historically effected event*" ([Gadamer 04] p. 299). "*To think historically means, in fact, to perform the transposition that the concepts of the past undergo when we try to think in them. To think historically always involves mediating between those ideas and one's own thinking*" ([Gadamer 04] p. 398). In short, what we do is "applying" ([Gadamer 04] pp. 307–308) with this grammar.

Language game: The term "language game" signifies both "a primitive language" and "the whole, consisting of language and the actions into which it is woven" ([Wittgenstein 63] pp. 5–5e, §§7). First, we should consider that "... games form a *family* the members of which have family likenesses. ... Some of them have the same nose, others the same eyebrows and others again the same way of walking; and these likenesses overlap" ([Wittgenstein 60] p. 17). we should consider that "... the meaning of a word is its use in the language" ([Wittgenstein 63] pp. 20–20e, §§43), and the only criterion we can use to know in which sense people use the word is their "behaviour" ([Wittgenstein 60] p. 138 §§4) or

"reaction" ([Wittgenstein 60] p. 128 §§1). In short, all we can do is describe the "concrete case" ([Wittgenstein 60] pp. 19–20) with this grammar.

Essay: Following Theodor W. Adorno and Blaise Pascal, Kiyokazu Washida said that "... what we want to ask philosophy is ... not a choice between two stances that concerns the question whether or not absolute knowledge, universal validity, and dialectics are possible. Rather we want to ask philosophy for ways of investigating to go deeply into pleats of phenomena, in their intermediate area, in response to various textures of surfaces of representations that comprise the world" ([Washida 07] p. 88) (trans. by author). In short, we struggle to describe the vagueness in the raw with this grammars.

In addition, concepts such as the "hinge" described in the previous chapter and "terms and system" described in the next section are also included.

These options have significant differences between one another. For example, it is important that René Descartes and Edmund Husserl is known as a supporter of hierarchical understanding of the world, whereas Matrin Heidegger a critic. And Heidegger denied the idea of essence. So we have to be very careful when we apply Heidegger's hermeneutic grammar to the hierarchical framework of design from the ethics level.

In short, there are a lot of philosophical achievements that describe how to describe the world in itself, so that we can apply them to design the world.

Lexicon of design with discourse

Lexicon of design with discourse contains terms that correspond to design from the ethics level. Precisely speaking, to

design from the ethics level, we need at least terms at the ethics level for the target level and the interaction level for the parameter level. For example, "sustainability" in the whole world is a term at the ethics level, and "intuitiveness" of the user interface is at the interaction level. They are equally important to design from the ethics level. These terms are initially introduced from the humanities and the social sciences. Their effect to articulate and describe such values can be confirmed by seeing their achievements.

For example, terms which is considered to lie at the ethics level are such as following.

Pluralism: "in the 21st century, both Japan and the United States of America need to shake off their tendency to ethnocentrism, and must be asked how we can learn to coexist in a pluralistic world. Shaking off ethnocentric thought and establishing multiculturalism in international society is supposed to be a long-term experimentation toward a post modernization" ([Yui 95] pp. 231–232) (trans. by author).

Sustainable development: "The concept of 'sustainable development' is represented by the North-South problem and the gap of quality of life which underlie frequently occurring regional conflicts and wars" ([Yoshikawa 05] p. 19) (trans. by author). It is positive not only for economic development but also global environment sustain. And Hiroyuki Yoshikawa suggested that this can be an ultimate purpose for every science and technology.

Totalitarianism: The term "totalitarianism" signifies an idea or a system, especially a centralized government system, which consider individuals as means for the total system and force them to serve it completely. It is described that this term is generally to signify the style common to "fas-

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cism," "nazism," and "stalinism" ([Hiromatsu 98] pp. 960–961). And Japanese militarism in the last century can also be included. Hannah Arendt is famous who struggled against this problem [Arendt 65, Arendt 98]. One of her important work is *The origin of totalitarianism* [Arendt 76] (which I have not read yet).

It is clearly shown that these terms position at the ethics level both "syntagmatically" and "associatively" [Saussure 10]. In short, they do both in its context and system and our experience.

In addition, as to terms corresponding to design from the ethics level, I have already introduced the term social structure, intersubjectivity, and identity in the previous chapter. Other terms I often used to design from the ethics level are such as action, boundary, culture, dialogue, globalization, history, labor, nature, and work. These terms are at the ethics level or at the interaction level: the target level or the parameter level. We introduce these terms intentionally to design an artifact from the ethics level.

I often use the values of pluralism and sustainable development positively, and that of totalitarianism negatively in my design from the ethics level. However, as a friend of mine asked me, it is better if we start from doubting these values: Is totalitarianism always negative? This consideration is insightful but difficult, so that I mainly utilize the results of the humanities such as of historians.

Then, we can redefine or generate a term when we need. In these cases, to position in the existing contexts is very important because no term can exist independently. For example, to define the term "ethics level" and "design with discourse" are the typical examples of such case.

Finally, a few terms may become a root value which is an end node of the description of " if A is changed to B at the

parameter level, then C will change to D at the target level," which represents the highest purpose in design. It is because root values of a design corresponds to these of a designer, and a designer may not have so many root values that are deeply relates his or her view of life and the society he or she live in. For example, a root value of my design is often "plurality" in the whole world.

Technically speaking, here I owe the basics of understanding of the term to Ferdinand de Saussure.

> There are no: a) ideas already established and quite distinct from one another, b) signs for these ideas. But there is nothing at all distinct in thought before the linguistic sign. ...
>
> There are no positive ideas given, and there are no determinate acoustic signs that are independent of ideas. Thanks to the fact that the differences are mutually dependent, we shall get something looking like positive terms through the matching of a certain difference of ideas with a certain difference in signs ([Saussure 10] pp. 138–138a).

This is the basics of the lexicon of design with discourse. But when we apply an option of the grammar as I have mentioned, this basics must change corresponding to the way the option offers. The point is that our framework and the method for it define only the forms to describe the world. This shift allows us to avoid being limited to one sense of values: it rather allows us to relativize values one another.

Evaluation in design with discourse

In this section, I will describe the guideline to evaluate results of design with discourse.

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In relation to the grammar of design with discoruse, one of the most important criteria to evaluate a description is its "consistency" ([Kobayashi 95] pp. 314–316). In other words, we can evaluate whether it is correct or not. And it also important to check whether the description is clear or not.

In relation to the terms and values designed, there seems to be few universal criteria. And we can not evaluate thier correctness. It is because design is "pluralistic" ([Whitbeck 98] Chap. 1), especially if it is from the ethics level. Pluralism can be insightfully understood with the "confetti model" that Yoichiro Murakami introduced ([Murakami 79] p. 140). So I will apply this for evaluation. Figure 3.2 shows a sketch of the confetti model.

$P_i(r_i, \theta_i)$

r_i θ_i

x

r_i : Quality of P_i
θ_i : Direction of P_i
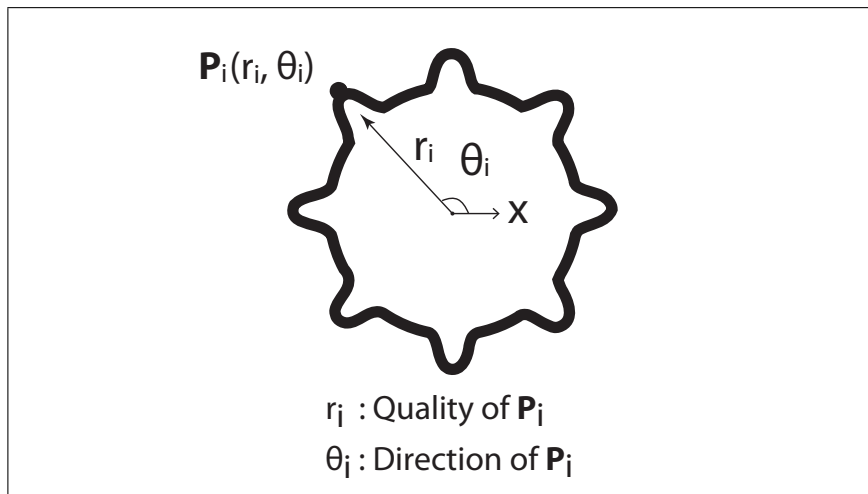
Figure 3.2: A sketch of "confetti model" ([Murakami 79] p. 140) described by author

It is important to evaluate each direction by each criteria. And it is also important to whether such plurality is considered or not in design.

Then, there are a few common criteria concerning terms and values designed. Here I introduce two of them: one is "insight-

fulness" and the other is "likability."

First, we can evaluate whether a result of design with discourse is insightful or not. This criterion is well-known to be useful when we deal with philosophical arguments. For example, Friedrich Waismann said:

> What is essential in philosophy is the breaking through to a *deeper insight*—which is something positive— not merely the dissipation of fog and the exposure of spurious problems. ...

> Their (author's note: Philosophic arguments') purpose is to open our eyes, to bring us to see things in a new way—from a wider standpoint unobstructed by misunderstandings. ([Lewis 56] p. 470)

In other words, for example, whether or not we can define a new direction or a cone in Figure 3.2, or make them clearer are to be evaluated.

Then, we can evaluate whether we, designers, like an idea in design or not. For example, Donald A. Schön said:

> When the practitioner tries to solve the problem he has set, he seeks both to understand the situation and to change it. ...

> The practitioner's moves produce some unintended effects. ... The practitioner evaluates his problem-setting experiment by determining whether he likes these unintended changes, or likes what he can make of them ([Schön 83] pp. 134–135).

This argument is also insightful in terms of design with discourse.

Finally, when I was in the engineering field, I was always said that your paper, your work, and your design are just a tale

and, without substances, we, academic communities, can not consider it as an scientific achievement. But it missed the point. My point is to accept a description such as a tale as an scientific achievement if it is insightful for some people even if it is not for others. So we should truly discuss could be whether or not the sciences should admit it as an scientific achievement in the future.

Actually, this question is exactly what philosophers of the science of the human such as Edmund Husserl, Martin Heidegger, and Hans-Georg Gadamer tried toinvestigate, whose philosophy are described as options of grammar of design with discourse. I just apply them to design from the ethics level, whereas to describe what the world in itself is is the original purpose of them.

Visualization of design with discourse

I have so far supposed that we describe logic of values as sentences. But it is also useful to visualize a whole view of the design as trees. It allows us to understand them more intuitively. Main components of our visualization are a box and an arrow that show "if A is changed to B at the parameter level, then C will change to D at the target level" as Figure 3.3.

The point is that, the arrow from the means to the purpose always directs toward the higher level in the hierarchical representation of artifacts. It is because, as Simon said, the lower level is the parameter level and the higher level is the target level: the lower level corresponds the means and the higher level corresponds the purposes. And what we are to describe is changes which will arise because of our design. And every intentional change must be arise from the level in hand, the parameter level, as it diffuses its influences to the outer environment. An image of the visualization of design with discourse is as Figure 3.4.
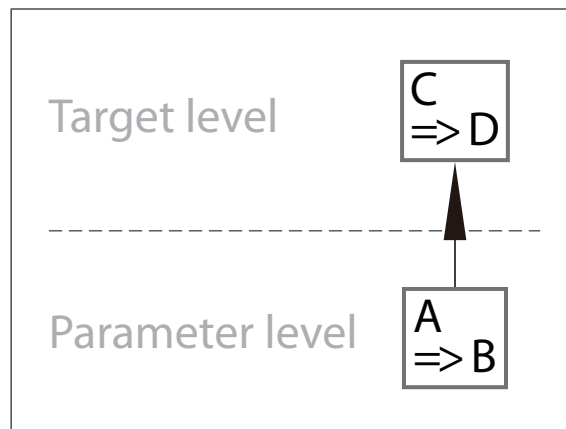
Figure 3.3: An image of boxes and an arrow that describe "if A is changed to B at the parameter level, then C will change to D at the target level"

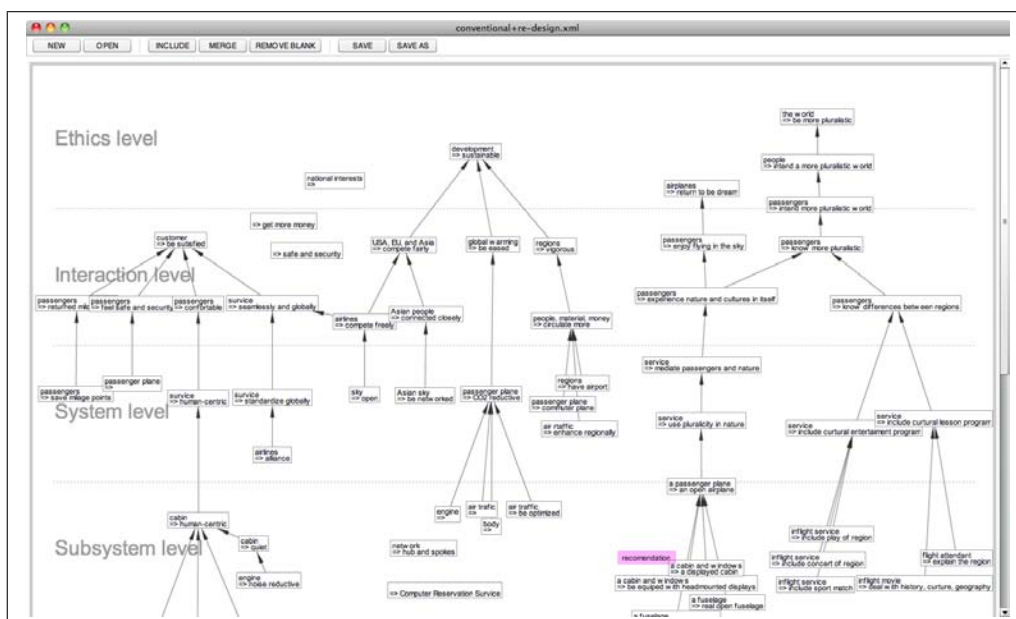**Figure 3.4: An image of a case of design with discourse which shows a network of descriptions of "if A is changed to B at the parameter level, then C will change to D at the target level"**

Each path from the lower levels to the higher levels becomes one story. As Figure 3.4 shows, it allows us to understand its vertical and horizontal connection and position can be understood more intuitively.

iv Effects I expect from design with discourse

In relation to the hierarchical representation of artifacts, effects I expect from design with discourse are that it becomes more systematic from the ethics level:

1. to describe values at the higher levels
2. to describe relations of ideas between levels
3. to describe relations of ideas between design solutions, relativize them one another, position them more clearly, and have chances to generate an alternative solution

In relation to the entire design process, effects I expect from design with discourse are that it becomes more systematic:

1. to provide viewpoints articulated, connected and positioned from the ethics level
2. to provide hypotheses articulated, connected and positioned from the ethics level

In Chapter vi, I will evaluate these points with referring concrete cases and positioning in existing contexts.

v Cases of design with discourse

In this chapter, we will describe five cases of design with discourse. What I will show here is mainly how they more systematically articulated, connected, and positioned from the ethics level by practicing design with discourse. And how it is probable to have chances to generate an alternative solution.

Redesign of Jijo-2 robot

The first case is a redesign of "Jijo-2 robot" [Matsui 00]. This case is what we have almost always adopted to show the effects of design with discourse for design from the ethics level [Sekiguchi 08, Sekiguchi 10b, Sekiguchi 10c]. It is because Jijo-2 robot is a monumental landmark in robotics, so that it can be a good example if we succeed to redesign it. I will reconsider this case here.

First, Jiji-2 robot was originally designed to solve digital divide because a robot can be a more intuitive user interface than a personal computer. To solve digital divide, the project identified its needs as follows [Matsui 00]:

1. An ability to recognize abundant information, integrate and interpret it, and draw a relevant conclusion
2. A learning mechanism to adapt to people and the environment
3. Functions to active to collect abundant information in the real world

Then, the project members implemented an office robot and carried out field trials, in which the tasks were providing an information service on people's locations, guiding users around the office building, and delivering parcels. Main achievements Toshihiro Matsui described are as follows [Matsui 00]:

1. an event-driven multiagent controller
2. face recognition that is robust for distance and rotation
3. improvement in speech recognition by identifying the direction of the sound source and reducing environmental noise
4. a bayesian network for map representation

These descriptions clearly shows that it is true that the project's interest lies mainly at the interaction level or below because main preoccupations were its usability. And propositions at the ethics level were not doubted, even if the issues of the digital divide were mentioned at the starting point. In other words, the ethics level is not doubted and plays the role of the hinge in this case, too.

Then, we try to redesign it. As to the digital divide, it is commonly accepted that not only whether or not we can use a computer but also whether or not we can buy it is a fundamental factor. We can introduce this discourse into robot design. So we think up to add a function to mention the "social structure" ([Giddens 01] Chap. 1) such as culture to the dialogue of the robot This change will change the viewpoint of people to solve the divide at the interaction level. And we can also design a robot whose manufacturing system is to utilize regional materials and facilities, whose idea is famous as "fair trade." This change will change the flows of economics to allow people to get money and chance to have machines at the interaction level.

Furthermore, we can notice that the higher purpose of the digital divide is to provide opportunities for everyone. And the highest is to realize human rights in the whole world. Then, we can associate the design to solve "discrimination" for it. Now, we can consider what can a robot be to solve discrimination?

One probable solution is a robot that attaches greater importance to one's individuality than to his or her social context such as his or her race, class and sex. The aim is, by interacting with

this robot, that people will evaluate another person by himself or herself.

By the way, we can now notice that the roles I designed to solve digital divide and discrimination are opposite: the former robot emphasizes a social structure, whereas the latter robot emphasizes an individuality. The most challenging theme is how to balance them. One robot can play the two roles, so that to invent some mechanism to manage this two roles at the subsystem level can be a challenge in robotics.

As a result, we can add these ideas to the original one as Figure 5.1.
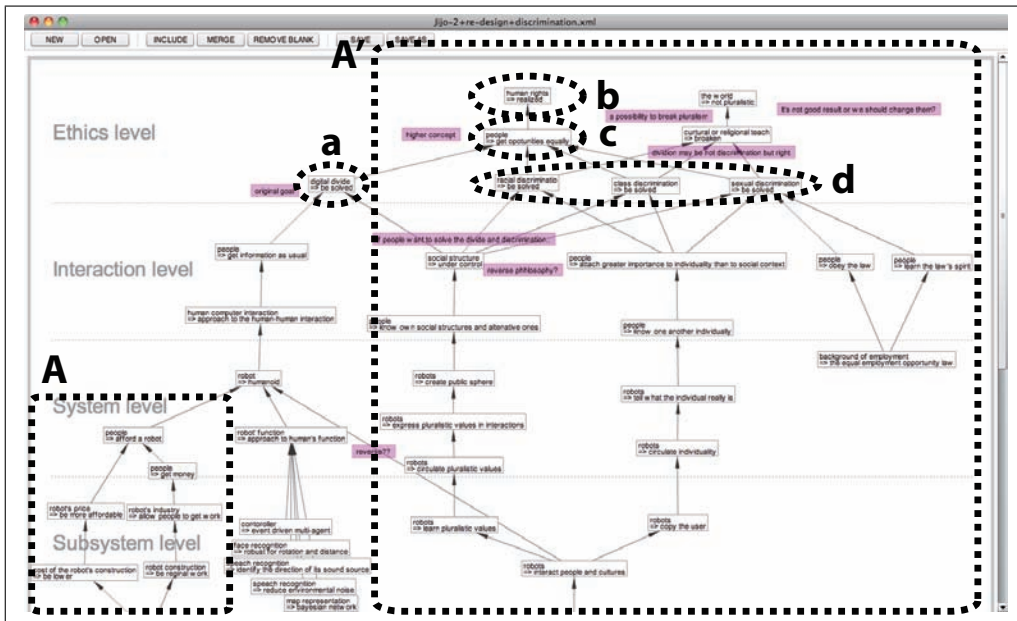
Figure 5.1: An overview of redesign of Jijo-2 robot: (A, A') solutions I added to, (a) "digital divide will change to be solved," (b) "human rights will change to be realized," (c) "people will change to get opportunities equally," (d) "racial discrimination will change to be solved"; "class discrimination will change to be solved"; "sexual discrimination will change to be solved"

As Figure 5.1 shows, we can confirm that we could articulate, connect and position design solutions from the ethics level ver-

tically. And we could also extend design solutions horizontally. Design will continue along these lines.

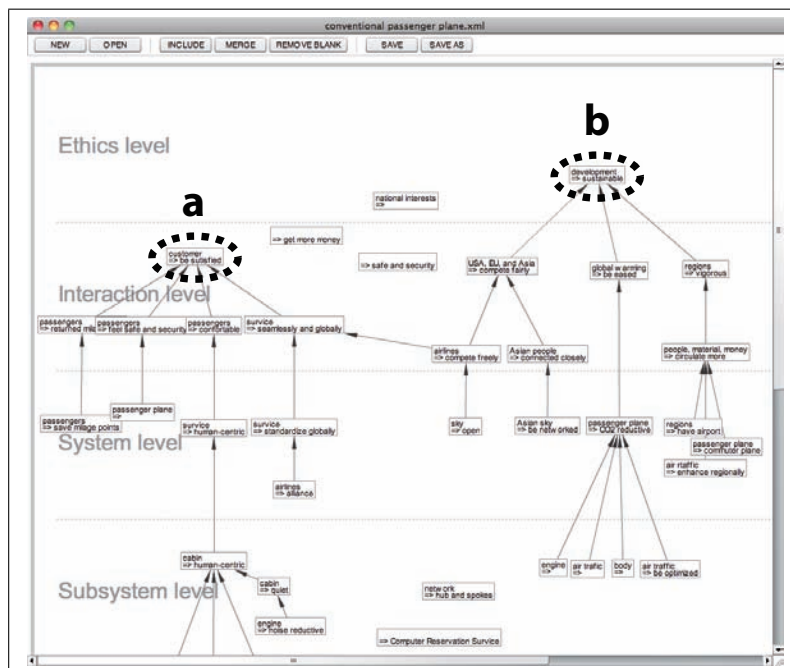## Redesign of the passenger plane

The second case is a redesign of the passenger plane. This case is what I submitted to the Aerospace Innovation Workshop in 2009 and in 2010 [Sekiguchi 09, Sekiguchi 10a]. I will reconsider this case here.

First, we can consider an overview of research and development of the passenger planes as Figure 5.2.

Figure 5.2: An overview of design of the passenger plane: (a) "customers will change to be satisfied," (b) "development will change to be sustainable"

The root values are considered to be the "customer satisfaction" ([ANA 08] Chap. 10) and the "sustainability" [Yoshikawa 05, Yoshikawa 09]. The point is that these values don't relate the

each passenger's objective. For example, whether for a trip, business, or going home doesn't matter. It is because for "transportation" is the passenger plane ([ANA 08] p. 154). Then, I try to redesign it by connecting this value at the system level to values at the ethics level.

First, in order to redesign the passenger plane from the ethics level, we will design what we want the ethics level to be, by owing terms that are inhabited in ethical discourses. In other words, we consider why in the world we design and manufacture passenger planes and make them fly. And I found the term "pluralism." For example, to reflect on the historical tragedies such as World War II required that the world will become pluralistic especially in this 21st century. For example, Daisaburo Yui's work [Yui 95] shows this point. So I decided to consider a passenger plane that aim to realize a pluralistic world to answer that "why." In fact, passenger planes deeply relates global values: we fly and use them because to get something which does not exist at the departure point. In other words, it allows us to get and circulate different values all over the world. In conclusion, we can propose an open airplane, cultural lessons and entertainment programs in the cabin, and to enhance the air traffic that connects different cultures.

Then, I will describe what the open airplane is here. In relation to pluralism, how and what we articulate is a big problem, which concerns where "boundaries" [Sugita 05] are drawn. And as Ferdinand de Saussure said, it is considered to be "arbitrary" [Sugita 05, Saussure 10]. So one design possible to realize a pluralistic world is to take as many arbitrary services away as possible at the interaction level, and allow passengers to freely and interactively articulate values to intend a pluralistic world at the ethics level. And it is also possible to make use of not "necessity" but "contingency" ([Washida 07] Chap. 4) in this purpose.

At the interaction level, one solution is to allow people to experience the world in itself, which contains much contingency as nature, cultures, and climates.

At the system level, one possible solution we can design is an open airplane that is something like an open car and allows people experiencing the world in itself at the interaction level. Figure 5.3 shows an image of the open airplane with other images of airplanes that allow people to experience the world in itself.
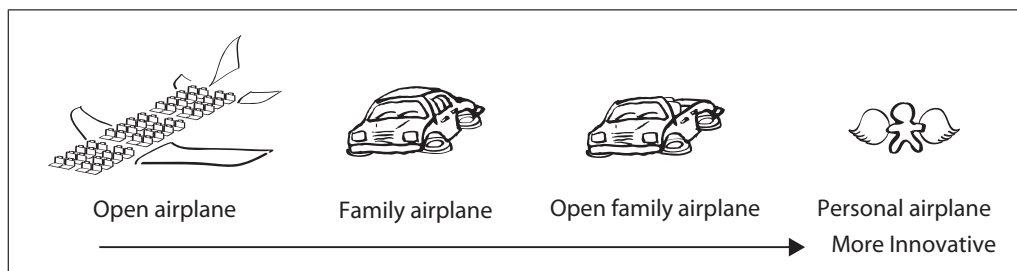
Figure 5.3: An image of an airplane that allows passengers to experience nature in itself

Because I like the open airplane most, I decide to continue to consider it here. At the subsystem level, solutions to implement an open airplane are considered to include a real open fuselage, a transparent fuselage, a display cabin, and a cabin with head mounted displays. Their images are described as Figure 5.4.

Although the real and the transparent fuselage are considered difficult to realize from the standpoint of aeronautics, the display cabin or the cabin with head mounted displays seem to have enough feasibility.

Finally, another important point is: if these airplanes will be realized, then we can enjoy flying more in the sky. This shift is very important because the airplane has a tendency to be used as a political device. Through this design, airplanes will take back the position which represents our dreams.

As a result, we can add a new branch from the ethics level as
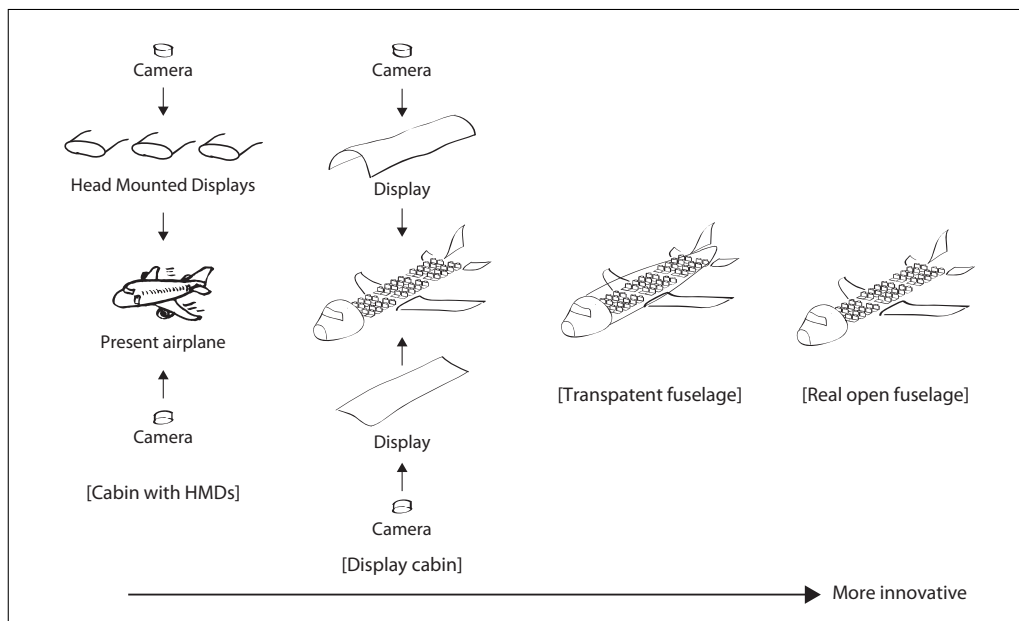
Figure 5.4: An image of implementation ideas of an open airplane

Figure 5.5.

Design will continue along these lines.

Redesign of the ecological car system

The third case is a redesign of the ecological car system. This design is based on what I proposed in a lecture of project based learning offered by Global Center of Excellence for Mechanical Systems Innovation at the University of Tokyo. As a member of a project team, I proposed an idea of green asphalt road system which is covered with plants [PBL Team1 10]. I will reconsider this system here.

First, there seems to be two types of ecological car systems. One deals with the emission from a car, whereas the other deals with the emission from a community, a city or a country. For example, the former includes an ecological car system such as an electric vehicle and a hybrid vehicle, and the latter includes

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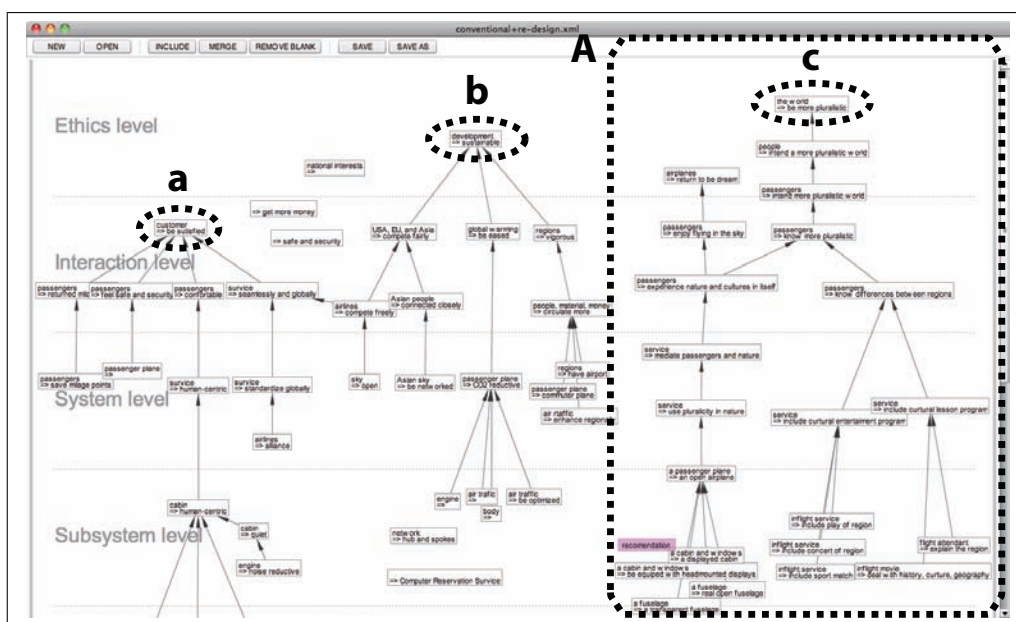**Figure 5.5:** A case of redesign of the passenger plane: (A) solutions I added to, (a) "customers will change to be satisfied," (b) "development will change to be sustainable," (c) "the world will change to be more pluralistic"

an ecological car system such as car sharing, a smart grid and a tax system in a country. The latter has an broader boundary at the system level and concerns how to use cars, too. In relation to design from the ethics level, it is required to reconsider the ecological car system from this broad level.

Second, there seems to be different two types of ecological car systems. One is an ecological car which mainly deals with energy consumption and waste reduction, whereas the other deals with not only such quantitative aspects but also qualitative aspects such as cultural values. For example, the former is such as the zero-emission car, and the latter is such as a policy prohibiting car traffic in city centers. In the hierarchical representation of artifacts, the quantitative aspects correspond to the lower levels such as subsystem level, whereas the qualitative aspects correspond to the higher levels such as the ethics level. Design with discourse, therefore, is good at designing ecological car systems from this cultural level.

Third, I try to redesign an ecological car system from the interaction level. Our purpose is to design an ecological car system which is ecological broadly and culturally, too. The values I set at the ethics level is "sustainability" [Yoshikawa 05, Yoshikawa 09] high "quality of life" and creating a new "culture" and "history."

From my experience living in an urban city in Japan, in summer, what makes me hot seems not a car but a asphalt road which stores the heat of the sunshine. Then, it feels like weird that so much area of my field of vision is occupied by the black asphalt road. And I remember the story that modern city is designed for car traffic: roads. But there is no reason we must keep this rule to design our city in terms of car traffic.

We, however, can not say that we have to resign to use cars, because it becomes an easy "totalitarianism" [Arendt 65, Arendt 98]. And if we stop using cars and asphalt, then a lot of

companies and people may lost their work. This can not be a sustainable way. We have to seek another way.

Then, I propose to green the black asphalt road with abundant plants at the system level. It will provide walkers with a nice experience like walking in a park at the interaction level. And this road can absorb CO_2 that can make the earth cool. Moreover, to live in a city with green rich road can be a new culture and history at the ethics level. Above all, these technologies can utilize existing technologies, so that they can be a win-win relation.

What we have to design at the subsystem is green asphalt and a car that can run over it efficiently no less than an existing car. And we also need plants that can stand no matter how cars run over it.

Finally, an overview of the green road is described in Figure 5.6.

Design will continue along these lines.

Redesign of the service design

The fourth case is a redesign of the service design. This consideration is written in a paper I uploaded to the website of Sekiguchi Kaira Design Office [Sekiguchi 10d]. I will reconsider this case here.

In recent years, service science or service engineering attracts many researchers. Generally speaking, in such service design, the interaction level becomes the target level because the basis of service is considered to be the interaction between a "donor," a "receptor," and its "vehicle" [Yoshikawa 09]. For example, when we design service, we may not doubt the value of the "customer satisfaction" which tends to be a root value at the interaction level. But how about the case that we sell a weapon and the customer is a murder for pleasure.
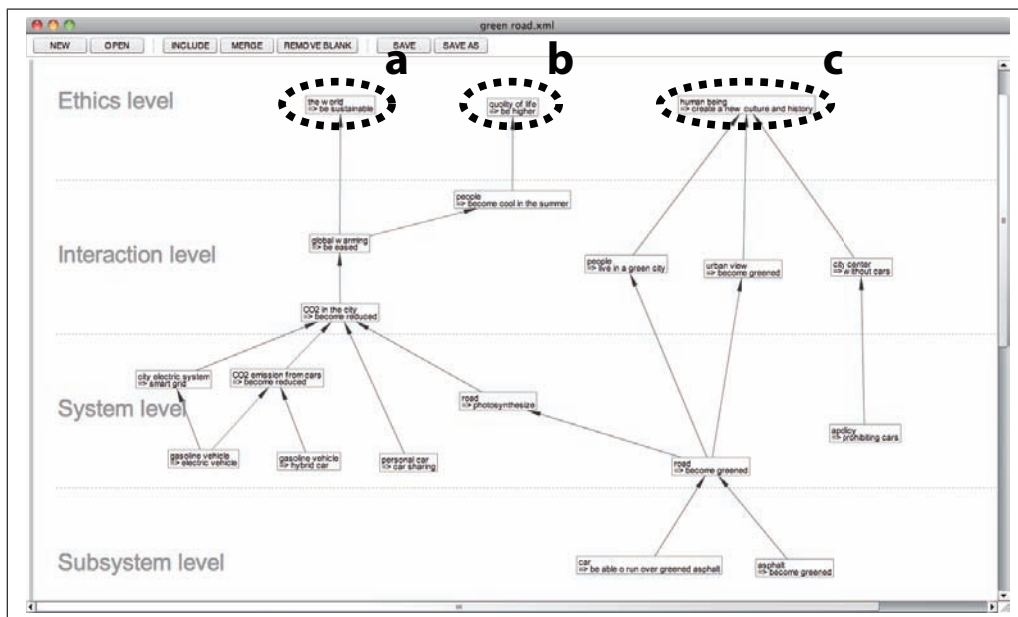
Figure 5.6: An overview of the green road: (a) the world will change to be sustainable, (2) quality of life will change to be higher, (3) human being will change to create a new culture and history

The question is for which value the customers will be satisfied. This can be a question only when we doubt what the service is from the ethics level. Here I do not deny the customer satisfaction, but just relativize it.

In short, if we design service only from the interaction level, we are groundless for whether or not the service realizes a better world as a whole. And we can say that if we can not make the world a better place, we won't satisfy customers truly.

For example, as to the case of the redesign of Jijo-2 robot, its service is to provide information for users in mutual interaction. And its values at the ethics level are such as to solve digital divide, provide equal opportunities, and realize human rights as Figure 5.1. The point is not whether the values at the ethics level is mentioned or not but whether the values are doubted and designed. In other words, it is very important to avoid the values at the ethics level being the "hinge." For example, it is true that the value to solve digital divide is thought in the original work of Jijo-2 robot, but it was just mentioned and not doubted.

Second, as to the redesign of the passenger plane, the same logic consists. For example, as to the open airplane, its service is to allow passengers to experience nature in itself and know diversity of the world. And this design is to realize a pluralistic world at the ethics level.

Then, recently, corporate social responsibility is taken seriously. To design and provide the service designed from the ethics level can be an alternative way to perform it. So it will be said that "let's make the world a better place, together" as well as "we will satisfy you, customers."

By the way, this logic to design service from the ethics level can sound like "totalitarianism." But ways to avoid being totalitarianism must also be designed from the ethics level. For example, as to the open airplane which is one solution of the

redesign of the passenger plane, I do not force passengers to see the world in a certain way, but just allow them to experience nature in itself. This solution is to avoid being totalitarianism. And it is also a good idea that we provide options of whether they choose this service or not. For example, there can be a passenger plane that have both open seats and ordinary seats, or both open seat rooms and ordinary seat rooms. In this respect, a way to implement an open airplane such as a cabin with head mount display may be a better solution, even though they are less interesting than the other ideas.

In conclusion, services designed from the ethics level is to satisfy their customers not only by the services in themselves but also by letting customers take part in an action for a better world. And design with discourse allows its designers to design these services more systematically: with logical grounds.

Redesign of the world

In recent years, we can find discourses which insist to act for a better world. For example, the corporate social responsibility, the social entrepreneurship and the base of the pyramid attract so many people. I am very glad to hear that. But, at the same time, I am very worried about this situation. It is because all the people in the whole world do not necessarily prefer these discourses. For example, some may think that they are just a hypocrisy, and others may think that human being should be more wild. The most impressive story which I have ever known is of Hayao Miyazaki's *Nausicaä* [Miyazaki 97].

> Nausicaä: Suffering and tragedy and folly will not disappear in a purified world. That is why, even in a world of suffering, there can also joy and shining light ([Miyazaki 97] p. 200).

...

Nausicaä: They were to have been a peaceful, intelligent people. Not violent like us.

King of Torumekia: Hah! Can such a creature be called a human being...!? ([Miyazaki 97] p. 211).

In short, it is dangerous to fill the world only with the ethical discourses. Furthermore, it can be totalitarianism. And it is also probable that the world will reverse the situation and everybody will change to reject any ethical discourse. To design from the ethics level, we have to count these cases, too.

One probable solution is a sports event such as the Olympic Games [IOC website] and FIFA World Cup [FIFA website] that allow us to become intoxicated with our nationality. The Olympic game is know by the sublime idea of "Olympic truce," [Parry 08] but another role of the game can be to simulate wars to provide outlets for our aggressiveness. But this discussion must spoil the fun of supporters of the supports events. So we have to design what will satisfy both who prefer the ethical discourses and who does not at the same time. This point can be a next challenge to the present world that is becoming ethical. And this is also my future work.

What I believe is important is the plurality and diversity of the world. We may have to design options or devices for them. To realize a better world, it is necessary to design a world half of which is designed from the ethics level as if it is not designed from the ethics level.

vi   Evaluation of design with discourse

The design method, design with discourse, is also one of the artifacts designed by practicing design with discourse. In this chapter, design with discourse will be evaluated with referring other cases of design with discourse and positioning in existing contexts.

Existing artifacts designed by others won't be analyzed here. An important reason is that it is our message that to evaluate an artifact which have not existed yet in public but seems to be significant in the future is what we need to do to make the world a better place. And past designs are actually not designed by design with discourse. In short, it is necessary to establish a way to hermeneutically evaluate designs here.

To describe values at the higher levels

First, we can confirm that it was effective to introduce the terms. For example, when I redesigned the passenger plane, I set the final purpose to realize a pluralistic world. The value which the term "pluralistic" signifies was connected to researches of repentant of the Pacific War [Yui 95]. These values were available only when we design from the ethics level, and they were ready as the lexicon of design with discourse. Then we can say that we could more systematically design the passenger plane to connect and position such values from the ethics level.

Then, we can confirm that it was effective to introduce the hermeneutic grammar. It allowed us to properly describe such term as "pluralistic" without natural scientific proofs. If we have selected the natural scientific grammar, we would have confirmed whether the redesigned passenger plane will realize a pluralistic world that is scarcely possible to confirm in the real world. And when we will be able to confirm it, we will

notice that the world won't never recover no matter how it will fail. This is the situation we have to avoid.

Finally, we could connect and position the humanities in a design method and the engineering. It is because design with discourse is systematized with applying discourses such as Habermas and Arendt's "public," Aristotle's "politics," and Husserl's "phenomenology." These terms allowed us to systematize design with discourse to be ethically valuable.

In conclusion, design with discourse is effective to more systematically describe values at the higher levels from the ethics level.

To describe relations of ideas between levels

First, we can confirm that to set the fourth rule of the grammar was effective: to describe "if A is changed to B at the parameter level, then C will change to D at the target level." As figures of cases show, relations of ideas between levels can be understood clearly. And if there is a gap or a vacant area, we can intuitively understand that their consistency is jumping.

Second, the most important side effect is that we can connect and position the humanities with the natural sciences in an useful way from a stand point of the engineering. In the hierarchical representation of artifacts, the higher levels correspond to the humanities whereas the lower the natural sciences. In designing, to connect and position all these levels is essential, that signifies the humanities, the natural sciences and the engineering are equally important. This gap is well known as "two cultures" [Snow 98] in academic fields such as the history of science and technology, so that this reconciliation is very significant in terms of the sciences.

Then, to be honest, I am not the first person who investigates design and even discourse of design. Herbert A. Simon

[Simon 96] and Hiroyuki Yoshikawa [Yoshikawa 09] are famous as leaders of the design science. And I became so enthusiasm when I found Klaus Krippendorff clearly spoke what the "design discourse" is and why it is important in design as keynote speech in the First Symposium of Society for the Science of Design, Japan, 1998 [Krippendorff 98]. And Victor Papanek's designs are famous as athical [Papanek 85].

First, there have already existed researchers who introduced the hierarchical understanding of artifacts such as Herbert A. Simon, Allen Newell, Koichi Hori and Kumiyo Nakakoji. And Hiroyuki Yoshikawa's approach of "function" ([Yoshikawa 09] p. 161) also urges us to consider a higher level. But these approaches do not deal with the level corresponds to the ethics level explicitly. The concept of function is relative as the concept of interface is whereas design with discourse urges us to consider the ethics level absolutely with the grammar and terms. We can say that a function of a hammer is to strongly beat something such as a nail but we can not say that its value at the ethics level is to do that. Design with discourse utilizes the specialties of the ethics level whereas they make it be included in the function level, the system level, the knowledge level, and the interaction level.

Second, as to Krippendorff, there also exist differences in detail between my design with discourse and his design discourse. For example, the most important difference is that I emphasize the importance of the hierarchical understanding of artifacts as Descartes and Husserl, whereas he emphasizes the "heterarchical" as Heidegger [Krippendorff 98]. Another difference is that I emphasize the importance of individuality whereas he emphasizes the collaboration. This point can be rephrase that the phase we deal with is different: my phase is the former of his phase. And the other difference I would like to describe is that his purpose is the human-centered design whereas my purpose

is to design from the ethics level which includes animal-centered design, environment-centered design, or even artifact-centered design. This is a logic which is famous as a criticism to the human-centric ideas in the humanities such as the politics and the environmental ethics. In conclusion, the contents of discourse is different; our discourse emphasizes the difference between levels and demand to design the ethics level absolutely. And design with discourse allows us to describe values at these higher levels, and actually change the lower level corresponding to the values.

Third, we can refer Papanek's design arguments such as "ecological design" [Papanek 85]. These dealt with the ethics level implicitly. Our understanding of the ethics level and the method, design with discourse, allow us to understand why the Papanek's work is so important and how to practice it more systematically. For example, Papanek criticized style-oriented design by simply comparing it with his ecological design. This criticism can be reformed that the levels they oriented are different: the style-oriented design orients the system level or user interface level whereas Papanek's design the ethics level. And we may say that both levels are important for truly attractive design: if we properly design the system level, then we can make it more powerful at the ethics level. Or we can more systematically trade them off.

Then, friends of mine kindly taught me that my work looks like following the discussion of "social construction of technology" and especially that of Thomas P. Hughes ([Kanamori 02] Chap. 3). This question can also be true when we consider design with discourse in relation to the media studies [McLuhan 64, Yoshimi 94]. My answer is that my method utilizes the hierarchical representation of artifacts that provides the important understanding that the ethics level plays the role of Wittegenstein's hinge. Then, their work analyzes past cases whereas my

work try to synthesize artifacts for a future as Yoshikawa has suggested [Yoshikawa 09]. And my method encourage to design from the ethics level. Above all, design with discourse could relativize the natural sciences, because it clearly shows that the humanities is more suitable to the higher levels as the natural sciences is to the lower levels. These points are clearly shown by the fourth rule of grammar of design with discourse: to describe "if A is changed to B at the parameter level, then C will change to D at the target level." By the way, Yoshikawa aimed to systematize its science as the natural sciences ([Yoshikawa 05] pp. 171–172), whereas I aim to make it more philosophical.

Finally, we can notice that the big problem was solved. In Chapter ii, I described that the social structure concerning an artifact is to be described at the ethics level, the intersubjectivity is at the interaction level, and the identity is at the system level. And the problem is to identify which factor defines the other factors: does the social structure define who we are, or do we define what the society is? This problem can, however, be solved clearly when we introduce the fourth rule. It is because this rule does not demand us to describe what the world in itself is. What means-purpose relations or probable causalities are to realize a better world. In other words, it is to describe differences between the present and a designed future like differential calculus. And it demand us to reconsider a means-purpose relation when it could not be described with this arrow, which lead us to a further understanding. For example, the arrow which direct to the higher level was insightful enough to describe design ideas in the cases of design with discourse.

In conclusion, design with discourse is effective to more systematically describe relations of ideas between levels from the ethics level.

To describe relations of ideas between design solutions, relativize them one another, position them more clearly, and have chances to generate an alternative solution

First, as Figure 5.1, Figure 5.5 and Figure 5.6 show, we can confirm that to introduce grammar and terms urged us to extend the design possibilities. And we can also relativize design solutions by knowing that design solutions can be rooted on different values at the ethics level even though they have equal consistency. For example, as to the redesign of the passenger plane, we can know that a passenger plane for a sustainable world is important as well as a passenger plane for high quality of life or for creating a new culture and history is.

Second, by going back to the root value at the ethics level, we could have chances to generate alternative ideas. For example, as to redesign of Jijo-2 robot described in Figure 5.1, I could generate an idea of "robots for solving discrimination" by going back to the higher value of "digital divide solution"; "equal opportunities" and "human rights."

To extend design solutions, the linguistic character of design with discourse was effective. It is because it allowed us to express our individuality by ourselves in design without expensive and giant experimental devices or compromises with project team members. So the more persons practice design with discourse, the more pluralistic design from the ethics level there can be. For example, I could succeed to introduce the value of "diversity" and "plurality" in the whole world in the redesign of the passenger plane that is a value reflecting my individual intention. And to introduce this term made design more comprehensive. Individualities can also be effective because the main scope of design with discourse is the very first phase such as to generate and consider why and what we design. It is true even though

an experiment and team members are equally important in the latter phase of design.

The point is that it is true that linguistic character enhance the individuality, but it is not enough. The reason is the individuality is not only a matter of identity, but also a matter of its social structure such as where he or she was born and grown. And discourse is considered to connect them: e.g. to learn discourse products or reproducts one's social identity. As we have confirmed, to provide ethical terms allowed us to express our ethical aspects of our individuality. But if there are not enough terms, individualities expressed will be the same. It is necessary to ready terms enough to express one's own individuality pluralistically.

Then, the famous method called "brainstorming" that is also adopted by "IDEO" ([Kelley 01] Chap. 4) is surely effective to extend design solutions. But brainstorming does not guarantee to deal with the level correspond to the ethics level. To combine brainstorming with design with discourse will enhance the effect of it.

Finally, one important limit of design with discourse is that it can not help build a peaceful relationship with others. On the contrary, it may cause an ideological argument which rather tend to break such relationship. We therefore need to combine another method that help this point such as arts of negotiations.

In conclusion, design with discourse is effective to make it more systematic to describe relations of ideas between design solutions, relativize them one another, position them more clearly, and have chances to generate an alternative solution.

To provide viewpoints articulated, connected and positioned from the ethics level

In relation to provide viewpoints connected and positioned from the ethics level, we could confirm its effect in the latter phases. For example, as to the case of the redesign of the passenger plane, we introduce the value of "plurality" and "diversity" in design which might have never been included explicitly without the term such as "pluralism" which researches of the humanities provide. On the contrary, if we do not have this viewpoint, we can not "design" from the ethics level no matte how we interact with prototypes.

Then, we can utilize design with discourse with combining other methods. For example, in relation to interaction design, to refer Schön's argument of "reflection-in-action" here is very significant because it is a masterpiece for interaction designers. The point is that whether we like something or not is not only a matter of our individuality but also a matter of our social structure. So without ethical discourse, we can't like or even dislike any value at the ethics level no matter how we interact with an artifact in design and it have actual power to change the whole world in the future. In other words, design with discourse can enhance the effect of interaction in design such as reflection-in-action because it provides the discourses corresponding to design from the ethics level.

Finally, methods corresponding to dialogue with others can also be combined such as "consensus development conference" ([Kanamori 02] Chap. 5). To position ideas of attendees from the ethics level, underling conflicts of senses of values will be unveiled.

In conclusion, design with discourse is effective to more systematically provide viewpoints articulated, connected and positioned from the ethics level.

To provide hypotheses articulated, connected and positioned from the ethics level

Stories described become hypotheses in the latter phase. For example, as Figure 5.1 and Figure 5.3 show, we can clearly check which description is possible to realize or not by following the paths of solutions.

And it is confirmed that design with discourse allowed us to have chances to generate a alternative solutions. For example, a passenger plane to realize a pluralistic world and robots to solve discrimination can be alternatives in these fields. These alternative solutions make the latter phase more insightful. The hypotheses will includes such alternatives.

Finally, Max Weber suggested that what sociology can do is to provide "hypotheses" clearly ([Weber 02] Para. 1). This situation is true of design with discourse.

In conclusion, design with discourse is effective to more systematically provide hypotheses articulated, connected and positioned from the ethics level.

cf. The framework of design from the ethics level provides a significant hypothesis

Design with discourse is a means to design from the ethics level. And design from the ethics level is a means to make the world a better place. So if design from the ethics level is senseless or disastrous to make the world a better place, then design with discourse is also senseless or disastrous for the final purpose no matter how it contributes to succeed in design from the ethics level. This is the reason we have to evaluate effects of design from the ethics level always.

There exist several discourses which support or deny my position. First, a discourse we owed is of Hisatake Kato; he says

that, when we confront moral and ethical problems, a "guideline" and a "consensus" [Kato 01] are essential. Regarding science and technology, which is considered to play a key role to solve global problems, he identified three positions ([Kato 96] pp. 14–15):

1. affirmative
2. negative
3. restrictive

He explained that people in the restrictive position think that science and technology is a blessing but dreadful, and should be utilized for good purposes in restricted areas with ethical guidelines. He claimed that we should take the restrictive position, and I take this position, too. This suggestion is considered to be supportive for design from the ethics level.

Second, as to information ethics, we can refer three philosopher of ethics: Luciano Floridi, Rafael Capurro, and Charles Ess. Here I owed my basic understanding of their philosophies to Toru Nishigaki and Tadashi Takenouchi who introduced them in Japan [Nishigaki 07]. Roughly speaking, my framework corresponds to Floridi's "information ethics" ([Nishigaki 07] Chap. 2), my method to Capurro's approach of "hermeneutics," and the argument about evaluation of design with discourse to Ess and Nishigaki's "pluralism," though I do not use the term "information" but "value," "term," or "sign" by Saussure. In other words, what I did can unify them. And my contribution is to offer a clear understanding that we have almost always designed an artifact without doubting its values at the ethics level especially in Japanese engineering, which encourages us to design "from" the ethics level. In any case, these discourses can also be supportive for design from the ethics level.

Then, the idea of "affordance" ([Norman 02] pp. 9–11) can also be a ground. It is because it says that an artifact and an

environment directs human actions, and we can somehow design them as Norman suggested [Norman 02].

Finally, objectors may say that to define how to use an artifact is not designers' intentions but interactions between the artifact and users, so that it is none sense to design purposes. Or they may say that the social structure do generate an artifact, and consider it as a result of designer's intention is misunderstanding. And it is also possible to cause totalitarianism in the whole world. In short, they say that the world is far more complicated than what we can design.

If to design from the ethics level turned out to be senseless or disastrous, however, what we have to do is to quit it. And this result can be considered to be designed from the ethics level, too.

In conclusion, the most important effect of design from the ethics level is to provide a hypothesis that is worthy to investigate in this confusing century: if we design artifacts from the ethics level, then the world will be a better place. If it will turn out to be "true," we can more systematically realize to make the world a better place; if it won't, we can avoid spending our resources. In ether case, we human beings will make progress.

vii   Conclusion

Design with discourse is a method for design from the ethics level. Its effects confirmed in this paper were, in a word, to allow us to design artifacts from the ethics level more systematically. It allows us to articulate, connect and position values vertically and horizontally in the hierarchical representation of artifacts. And it provides us with viewpoints and hypotheses from the ethics level. We also provided five cases which were designed from the ethics level and could be alternatives in their fields.

Then, it still seems true, with few exceptions, that the natural scientific proof is more attractive than the hermeneutic one. This is the situation we aimed to change by establishing design with discourse. However, now that we have evaluated the effects of design with discourse hermeneutically, so that I plan to collect natural scientific proofs with practicing the latter phases in the real world.

Finally, what we must truly evaluate is actual effects in the whole world: whether artifacts designed from the ethics level will make the world a better place, which won't be known unless they will actually be produced, circulated and used by makers and users in the real world. So we have to continue to evaluate them by the time we will finally know the result.

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