DEVELOPMENT OF A PICTOGRAM SYSTEM FOR EARTHQUAKE AND TSUNAMI DISASTER REDUCTION

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SUMMARY

The purpose of this study is to develop a pictogram system for natural disaster reduction. Long lasting and tangible achievement of IDNDR is needed which may be used in all over the world for many coming generations. As Neurath said "Words divide, pictures unite", pictograms could be a powerful communication tool as well as an educational tool to improve global disaster awareness. In this project, we formed a multi-disciplinary team to compile "A Database of Pictograms for Natural Disaster Reduction", which we intend to release our copyrights to be used widely and freely as an achievement of IDNDR through internet. We developed the lexicon and grammar of the pictograms for natural disaster reduction. Over 700 pictograms in use were collected for evaluation, and new designs were also added to complete the list of concepts related to natural hazards and their disaster management. Home page will be introduced for world wide participation in this project.

INTRODUCTION

With a rapid population growth in the 20th century, many people are now living in a more disaster prone area where nobody used to live. With a rapid development of transportation systems, many people are now travelling a lot both domestically and internationally. As a consequence, people are now becoming a more vulnerable to disasters because they are getting less aware of the hazards and disasters of the area where they are. Recent statistics on disasters showed a continuous trend towards ever-increasing number of catastrophes with ever-increasing costs [Munich Re, 1997]. With this trend, natural disasters will soon become a "budget time bomb" which no government could afford the costs. Thus, it is important to solicit the participation of the people in disaster management. Increasing hazard awareness of the people and improving their disaster reduction capability is the key for maintaining the sustainability of the world from natural disasters.

At the General Assembly of the United Nations, it was unanimously decided to designate the last decade of the 20th century as the "International Decade for Natural Disaster Reduction (IDNDR)". Since 1990, although a number of conferences and symposia have been held for IDNDR, language is known as the most serious barrier for promoting the disaster education and training.

As Otto Neurath, an Austrian philosopher and educator, wrote "Words divide, and pictures unite", a pictogram system, or a picture language system, has been successful since 1930's as an international communication tool [Neurath, 1934]. Pictograms are those graphic symbols, which are already familiar with us as icons and signs at various public scenes, such as traffic signs, and information signs at railway stations and airports

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The development of Pictogram System for Disaster Management was started in 1993, using Tsunami warning sign as a prototype [Hayashi, 1993]. It was unsuccessful, however, at the beginning. Developing the effective pictogram system is a multi-disciplinary collaborative work, so that the multi-disciplinary project team including disaster researchers, graphic designers, computer system engineers, sign products makers, legal experts, and disaster managers was organized for this study. Based on the collaborative work mentioned above, this paper presents a pictogram system for earthquake and tsunami disaster reduction for promoting the world awareness and understandings of the disasters, and introduces as application of sign system for a small town where is located in the tsunami hazard area as an example.

PICTOGRAM SYSTEM FOR DISASTER MANAGEMENT

The pictogram system is a communication tool utilizing picture expression, which helps the communication among people who have different culture backgrounds. There are at least three different ways to use pictogram systems: 1) icons, 2) signs, and 3) educational tools.

Icons

With a rapid development of computer technology, Geographical Information Systems (GIS) have been widely used for disaster management. The spatial distribution of hazard and damage due to disasters, as well as the resource allocation for mitigating and preparing for disasters can be displayed on screen, so that it is useful for disaster mangers to understand the disaster situation. These GIS based disaster management systems have been developed by various disaster management organizations. At present, however, there is little agreement among the icons used. Different icons represent the same concept, and/or the same icon represents different elements.

Figure 1: Tsunami Pictograms in Use

Looking back to the history of pictogram, the U.S. Department of Transportation (USDOT) made great contribution for the development of pictograms. USDOT published “Symbol Signs” in which 34 pictogram designs used at ports and stations [The American Institute of Graphic Arts, 1976]. In this book, many pictograms in use were collected and evaluated so that USDOT recommended what they think best. USDOT also released the copyrights of their recommended designs to facilitate their use at various ports and stations all over the world. Just like the USDOT did for the public signs at ports and harbors, we need to have some kind of de facto standard designs related to disaster reduction. By providing a common design, it would be a great help for better disaster management that needs the coordination among many different organizations and jurisdictions. These de facto standard pictogram designs are named as the “lexicon” of pictogram in this study. For this

purpose, existing icons in use that would relate to disaster situation are collected. Figure 1 shows an example of existing icons in use for tsunami disaster.

As to the design work, it is our goal to have a complete list of pictograms in a coherent manner. In order to realize this goal, we need to design our own when no pictogram in use is available. The following design principles have been adopted for our new designs: 1) Use a distinctive design as much as possible; 2) Use a concrete design as much as possible; 3) Use a simple design as much as possible; and 4) Use the design that can be correctly understood under different condition of visibility

As shown in Fig.2, disaster management consists of various disciplines from hazards to contingency planning. Since nobody could be the expert of all disciplines, the coordination among the experts in different disciplines are essential element of disaster management. The lexicon for the pictogram system could be a great help for establishing the coordination among various disciplines relevant to disaster management.

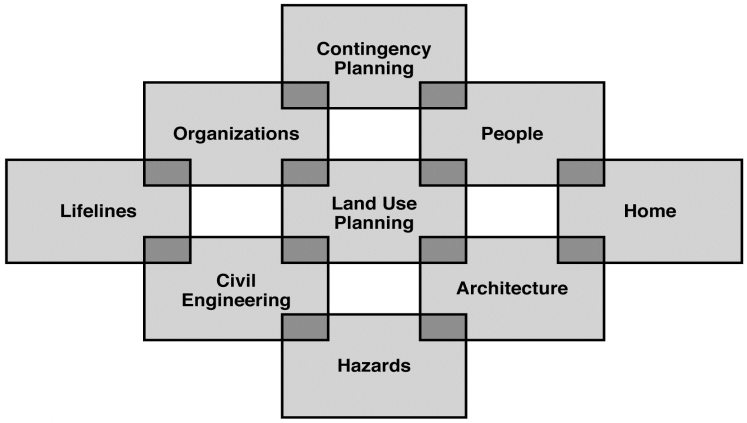

Figure 2: Different Disciplines Relevant to Disaster Management

Sings

As you might know, it is possible to create a new “Kanji (Chinese Characters)” by combining other kanji. Just like kanji formation, we should be able to create new pictograms by some syntactic rules for combining pictograms. Since the world of disaster is not a fixed one, something new would always be added to our knowledge and experiences with every new disaster. Accordingly the pictogram system for disaster reduction should not be fixed. It should be flexible to add new designs into an existing system in a coherent manner. The syntactic rules used for the pictograms for disaster reduction is named as the “grammar” of pictogram in this study.

For the pictogram system for disaster management, we adopted the following principles: Whenever we have the international standard, we respect that. Thus, we respect all the rules and designs used in ISO7001. If we have national standard in some country, we respect that in that country. For example, we respect the designs defined in ANSIZ535 for the United States.

As for the pictogram system for disaster management, we think it should be emphasized the following three aspects: 1) Signs for safety and danger, 2) Signs indicating directions, and 3) Sings indicating degrees and quantity. These three groups of signs may be indispensable elements for making signs, which should be compatible with ISO7001/3864/4196 as shown in Fig. 3.

Educational Tools

By establishing the lexicon and grammar, the pictogram systems for disaster management can be a basic communication tool as well as a basic educational tool. When Otto Neurath started to use pictograms for the first time, he called them as “.ISOTYPE”, which is the abbreviation of “International System of Typographical Picture Education”. As the director of the Social and Economic Exhibition Hall in Vienna in 1920's, Neurath designed many statistical charts with simplified pictures, with his intention to use them as a powerful tool for the dissemination of the scientific knowledge. In that sense, scientific education is a prime goal of pictograms. The pictogram system for natural disaster reduction, thus is the tool of scientific education on natural hazards and their disaster reduction.

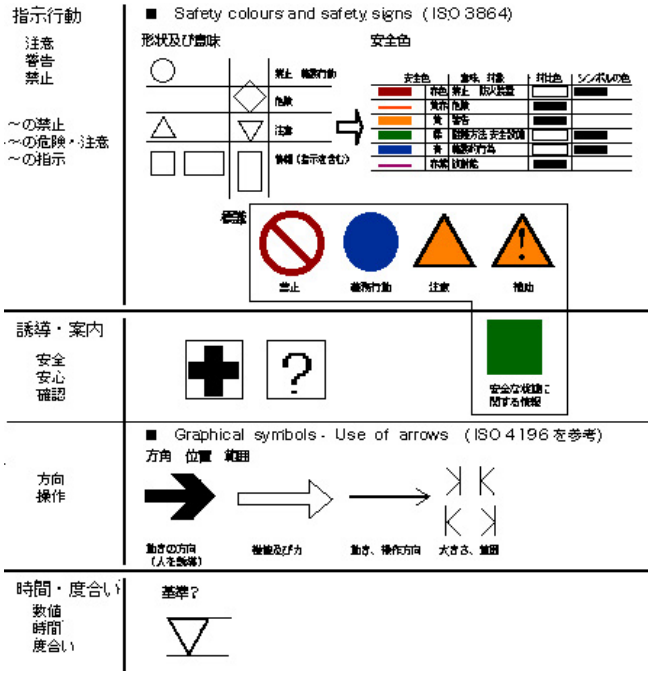

Fig. 3: Grammatical Signs Taken from ISO7001/3864/4196

WWW SITE FOR THE PICTOGRAM SYSTEMS

As the final product of this project, we initially intended to compile a reference book of pictograms for disaster management. In the process of compiling the reference book, the following step were taken:

1) Identify the concepts to be included in the reference book. For example, they are hazards, damages, mitigation countermeasures, preparedness, disaster response, relief, and recovery. Collected a total of 700 pictograms in use from 48 different sources.
2) Construct a database classifying them into sub-groups based on various dimensions of design theme.

With this database, we planned to evaluate them to recommend the best design for each concept. This process was to be documented in the reference book.

Constructing the database over 700 pictograms, we now come to a very different conclusion for the final product of this project. It seems to us that the reference book is not the best way to present the ideas. We think we should take into account the following points:

1) We are now really at the beginning , not the final stage, of the pictogram project for disaster management,

2) We would like to welcome any new input from all over the world: New examples of pictograms in use should be added to broad our understanding. New original designs will also be welcomed to the database. The database should keep growing.

3) It is much more informative to overview all the pictograms in use rather than to look for a one best design. For example, Red Cross and Red Crescent are different in design but same in meaning. It is impossible to select one over the other. By learning two designs side by side will be the most informative way of presentation.

4) Everybody who wants to participate should participate in design evaluation process.

5) Different people may want to search pictograms with different purposes in mind.

6) If people want to use the pictogram design, they may have it in the digital data form

Taking these points into account, we decided to open up the WWW site for Pictogram System for Disaster Management as a forum for those who wish to participate in this movement. In this WWW site, people can find

all pictograms for a particular concept, they can show their preference in pictograms, they could register their original designs, they could introduce new pictograms in use, and they could download the pictogram they need, as shown in Fig. 4.

TSUNAMI WARNING SIGN SYSTEM

As an example, a prototype of the application of pictogram systems for reducing the tsunami damages in a small town in Shikoku Island, Japan is proposed as shown in Fig. 5. This town is facing the Pacific Ocean, and has been hit by devastating tsunami attack almost every 100 years due to the Nankai earthquake. This town has a population of 4000 people, and famous for the beach that attracts many visitors. At the railway station, and at the harbor, there are signboards that tell the visitors the potential hazard, and the warning and evacuation systems (1, 2). This board also helps showing all the pictograms used. The electronic sign boards hanged over the road will change its display from road information to show the evacuation directions when the earthquake of over Ms6.6 occurs (3). At the major intersections, the directions for evacuation will be signed up (5). The poles used for emergency public address system are also used to let the people learn how high the past tsunami attacks were, so that people could have a sense of how high they should go (4). The evacuation sites, such as the top stories of the engineered structure more than three stories and the bridge, and is indicated by the green banner as the goal for evacuation (6). This banner can be glowed even in the dark. By combining these elements for the evacuation from tsunami attack, we could have a sign system with pictograms.

CONCLUDING REMARKS

The development of a pictogram system for disaster management is presented in this paper. As the result of the multi-disciplinary collaborative work, over 700 pictograms in use were collected for evaluation, and the lexicon and grammar for natural disaster management is developed. A database is constructed for the pictograms, and the internet homepage is introduced for world wide participation. This “Pictogram System for Disaster Management” hopes to be one of such long-lasting and tangible IDNDR achievements by making use of picture language. In addition, we believe the pictogram system is useful for public education tools to improve their awareness to reduce the number of casualties and refugees from natural disasters.

ACKNOWLEDGEMENTS

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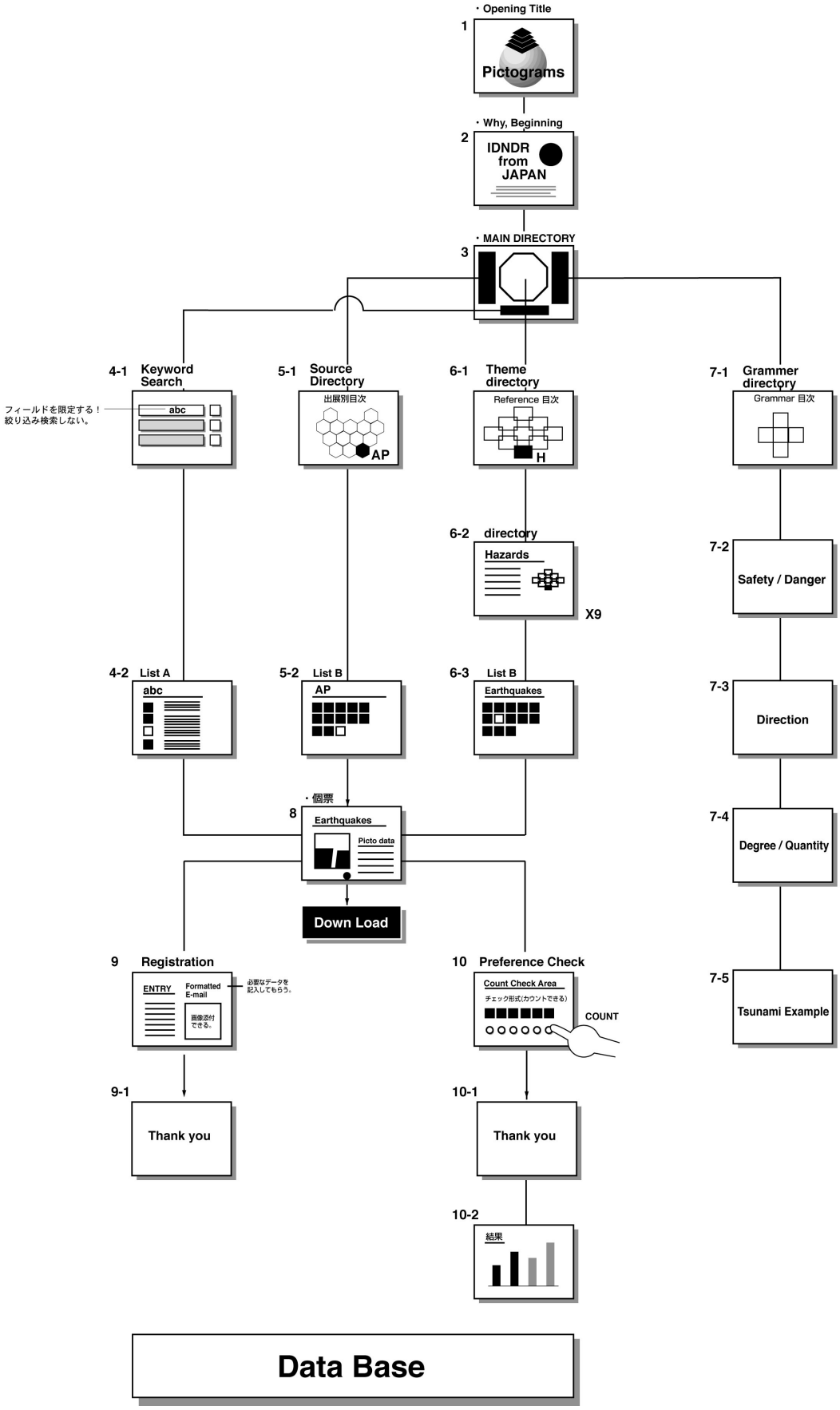

Fig. 4 WWW Site for Pictogram System

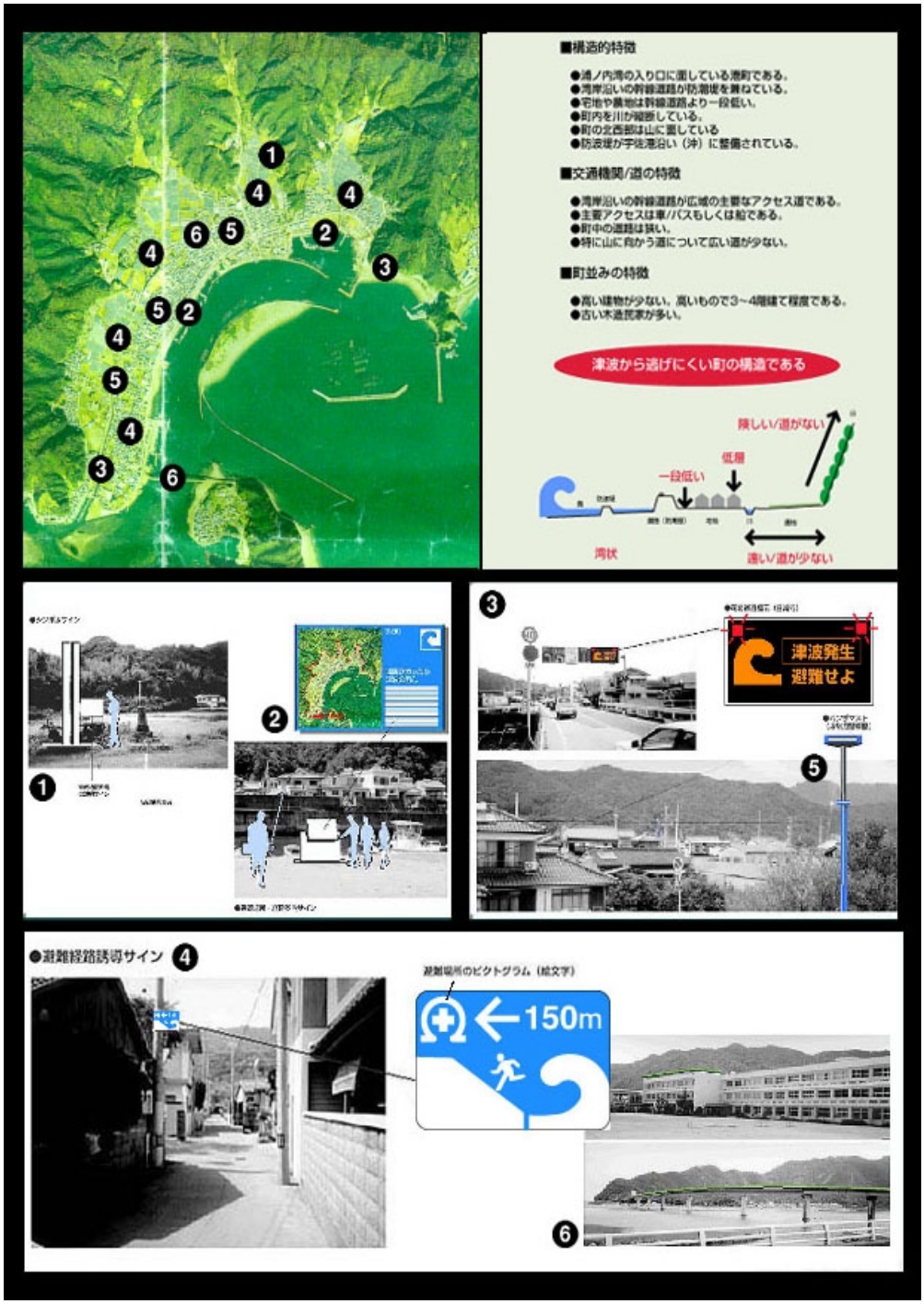

Fig. 5 Tsunami Warning Sign System –A Prototype for Application