Comparative Studies in National Characteristics of Robot Design -with the Focus on use of Interactive Mapping

Jungmi PARK*, Hyungkeun KIM**, Kunpyo LEE***, Kim Sang-Ryong****
Dept. of Industrial Design, KAIST,**,****
*Samsung Advanced Institute of Technology*****

1. Purpose

This research is former research to find new application of robots. We can see existing robots' developing patterns through interactive mapping, specially mark the difference of national design characteristics.

We determine robot evaluation criteria for detail information data of robots, evaluate robots via criteria. As a result, we can see visualize information data of robots to compare each other.

2. Procedure

First, we search commercial or research prototype robots, make 113 robot data samples. Data samples are shown via 7 robot evaluation criteria-morphology, intelligence, mobility, interaction, purpose, service, nationality.

Making map using 113 robot data samples, we select 2 of 7 robot evaluation criteria to X, Y axis. Putting 113 robot data samples on map, we make 21 map layouts. They help to find design patterns.

3. Collecting robot data samples

Above everyting, we examine various robot research groups in the world. Commercial or research prototype robots of them are targets. Purpose of collecting data samples is to deal with diverse scope of robots.

4. Robot evaluation criteria

To evaluate 113 robot data samples, we choose 7 robot evaluation criteria, representative characteristics of robots. Robot evaluation critera are morphology, intelligence, mobility, interaction, purpose, service, nationality, using semantic differential method. Detail information is presented in [table 1]. We can visualize detail information of 113 robot data samples via robot evaluation criteria.

criteria	detail criteria	p.
Morphology	Machinery/Unrefined	1
	Artificial/Product-level	2
	Animal-like/Toy-like	3
	Partially Human-like	4
	Close to Human	5
Intelligence	Simple Reacting	1
	Multiple Interacting	2
	Autonomous/Judging	3
	Self-learning/Evolving	4
	Creative	5
Mobility	Stable (with Joint)	1
	Wheel-based	2
	Quadruped/Wheel+Joint	3
	Wheel + Arm/Bi-ped	4
	Bi-ped+Arm	5
Interaction	2D/with Button	1
	Replying/Multi-channel	2
	Contextual/Adaptive	3
	Expressive/Emotional	4
	Advanced/Social	5
Purpose+Use	Academic R/D	1
	Governmental R/D	2
	Industrial R/D	3
	Commercial for Industry	4
	Commercial for Home	5
Service+needs	Physical Assist	1
	Safety/Care	2
	Entertainment	3
	Information/Education	4
	Multi-Service	5
Nationality	Korea	1
	USA	2
	Japan	3
	Europe	4
	Etc.	5

Table 1: robot evaluation criteria

5. Interactive Mapping

Purpose of interactive mapping is to analyze characteristics of 113 robot data samples. The robot's interactive mapping is designed in order to make the robot able to operate interactively by various evaluation criteria. Producing software is Macromedia Flash.

Usage of interactive mapping is to understand the present condition of robot research through robot evaluation criteria .

Address: 3407, dept.of industrial design, KAIST, Dae-Jeon, Korea
Tel. /Fax: +82-42-869-8776, +82-42-869-4510
E-mail : poet@dpl.kaist.ac.kr, kplee@kaist.ac.kr

Also we can see correlation of each evaluation criterion. Interactive mapping helps to find technical issues and keywords for new application of robots. It is also helpful when using user-centered design, as a stimulant.

For Macromedia Flash, we can animate the movement of each data samples when arranging them again. Also we can see detail information of robot data samples without opening data files.

6. Result

Putting 113 robot data samples on map, we make 21 map layouts. Among them, we find national design characteristics I robots using maps which are connected with nationality.

First, we put morphology on X axis, nationality on Y axis. We find that there are many machinery or product level robots in Europe, America is the same. Robots in Europe and America focus upon doing specific functions than emotional figure. What emerges from this brief discussion is thinking robot as a 'tool'.

50% of humanoid type robots are developed in Japan, so there is thought robot as a 'partner'. In Korea, most humanoid type robots are in university or laboratory, so a capacity of being commercial is low than Japan.

Figure 1: Morphology classified by nationality

The second, we put intelligence on X axis, nationality on Y axis. There are few robots having high-degree intelligence. Among them, humanoid or pet type robots have advanced intelligence. Many humanoid type robots in Korea, America or Japan are focused on implementing movement than intelligence. Also we find doll or animal type robots having powerful intelligence, being in need of interaction.

Figure 1: Intelligence classified by nationality

there are many machinery or product level robots in Europe, America is the same. Robots in Europe and America focus upon doing specific functions

Putting mobility on X axis and nationality on Y axis, we find America and Europe are not concentrate on bi-ped mobility and robot arms. To be contrary, there are many bi-ped robots having arms in Korea. Characteristics of Korea are similar to that of Japan.

7. Discussion

Through interactive mapping, we can place 113 robot data samples to various arrangement following robot evaluation criteria. Also we can see each sample's detail information using interactive mapping, so we can understand disposition visually.

Also we get national design characteristics via interactive mapping. They consist of America & Europe's and Japan & Korea's. America and Europe are basically think robot as a 'Tool' and the thought reflects robot evaluation criteria. But Japan and Korea consider robot as a 'Partner' or 'Neighbor', so develop more social and interactive robots.

8. Reference

•C.Breazeal, T.Fong, etc. "cHRI:Human-Robot Interacion from a Cognitive Viewpoint"

•E.Rogers, R.Murphy, "Final Report for DARPA/NSF Study on Human-Rbot Interaction"

•J.Scholtz, S.Bahrami, "Human-Robot Interaction: Development of an Evaluation Methodology for the Bystander Role of Interaction"

•H.Yanco, J.Drury, "A Taxonomy for Human-Robot Interaction"

Address: 3407, dept.of industrial design, KAIST, Dae-Jeon, Korea
Tel. /Fax: +82-42-869-8776, +82-42-869-4510
E-mail : poet@dpl.kaist.ac.kr, kplee@kaist.ac.kr