

A Study on the Patent Map of Apparel Design using Computer Technology

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Abstract

This study attempted to create patent map for 163 cases of patent for technology of apparel design using computer technology and researched the trend of patent application by country, technology, applicant and filing date.

In regard to application by country, the United States marks the first place with 99 cases (61%), Japan marks the second with 34 cases (21%), Korea the third with 19 cases (12%). Comparing the patent applications in specialized technologies, we find the United States is overwhelming the technologies for garment production process, patterning process and preparatory process, and Japan is currently undergoing development works in this area, while most of Korean applications are focused in the technologies for selection or substitution methods related to purchase and sale of apparels, body image and design service. Therefore, it is required to preoccupy and defend patent rights as well as develop technologies aggressively and extensively in preparation for the expansion of e-commerce market. Analyzing the speed of progress in technology in terms of number of applicants and application cases, we can say it entered into developing stage from the middle of 1990s and it seems that they will continue the development work from now on. In case of Korea, they began in 1996, somewhat late, but reached a similar level with the United States in 2000.

Key words : patent map, patent Information analysis system(PIAS), computer technology, digital fashion.

I. Introduction

1. Background and Necessity of the Study

It is known that the 21st century is a knowledge-based society where knowledge and information are the core sources of corporate competitiveness. Development of own technology and securing intellectual property rights, therefore, are coming to the front as critical factors

influencing the competitiveness of a country. Accordingly, they recognize that it is necessary to catch the level of technologies of the industry through systematic analysis of technologies, find the technologies to develop strategically and establish the direction and subject of the industrial technologies¹⁾.

Patent information can be said to be a very valuable information material as technical information and as the information on the rights and

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This study is supported by Natural Science Institute of Seoul Women's University, 2001.

¹⁾ Ministry of Commerce, Industry and Energy, *Handbook of Semiconductor & Electric Industry*, 1999, pp.3-10.

firms as well, because it is the treasure house of technical information covering a broad range from basic technologies to application technologies to industrial technologies and reflects the development of technologies of each firm²⁾.

In regard to analysis of patent information, among domestic firms, Gold Star Co., Ltd. started to contribute to enhancing the efficiency of patent information for developing technologies by adapting and applying the patent map analysis technique developed in Japan. to research activities of the firm³⁾. The term of Patent Analysis at abroad emerged around nineteen sixties when they started to take it as the subject of academic research in the United States where they had used the statistical information on patent as the economic criteria. The U.S. government newly established the Office of Support for Technology-later renamed the Office of Technology Assessment & Forecast - and let them carry out patent analysis for policy development in 1971. Some advanced countries in Europe including the United Kingdom have also used the patent information as the economic criteria from early days. A British firm Derwent issued and distributed World Patent Index (WPI) to search for world patent information in 1963. World Intellectual Property Organization (WIPO) was established in 1970 and the research data on patent analysis were published one after another, and it facilitated the patent analysis activities in Europe. In Japan, they set the year 1972 as the first year of preparing patent map and began to prepare the patent map aggressively⁴⁾.

Patent map is to organize the bibliographies of patent information by various analysis items,

process the analyses of the technical matters of patent information, analyze and interpret the patent information through processing it using the own characteristics as information on properties, patent information only has, and then describe by charts and tables to see at a glance the result of analysis after synthesizing⁵⁾.

The Korea Intellectual Property Office (KIPO) recently developed Patent Information Analysis System (PIAS) and distributed it free of charge from March 1, 2000. PIAS is an analysis system of patent information to search and gather patent information on the internet and provide the result of analysis in the form of patent map and various solutions to analyze patent information. Using this system, we can gather and process various kinds of patent information on the web for free and see the result of analysis in the form of graph and chart that we are able to grasp at a glance the trend of technologies and patent application, distribution of technologies and the developmental stages of technologies, from the past till now.

Even though the importance of patent map grew much bigger as the intellectual property rights were emphasized in the 21st century, most of domestic firms have not prepared the patent maps yet because of insufficient capital and personnel. The KIPO prepared patent maps for 24 kinds of technology areas among 254 technologies selected through survey from government agencies, small-and-medium sized firms and research institutes in 2000. Additionally in the long run, KIPO is planning to establish the patent map system for whole industry by preparing patent maps for about 150 technologies⁶⁾.

At present, however, the subjects of the

² Korea Institute of Science and Technology Information, *Theory and Reality of Patent Information*, 2002.

³ Korea Intellectual Property Office, *Analysis of Technology and Analysis of Patent Information*, 2002, p.35.

⁴ *Ibid.*, p.36.

⁵ Department of Administration, Korea Intellectual Property Office, *White Paper on Knowledge Management*, 2002, p.69.

⁶ Korea Intellectual Property Office, *2001 White Paper on Intellectual Property*, 2001, p.345.

technologies selected as new technology items are too inclusive that it is nothing but grasping the trends of technologies in domestic and foreign industries. Even though each subject is analyzed into tens of sub-categories of technology, it is not easy to expect a thorough result of analysis because we have to analyze excessively many kinds of sub-categories and heavy volume of information. Therefore, experts in each industry field should deal it with in full scale as academic research theme. We have to begin with information search from the beginning again about sub-category technologies in terms of the purpose and scope of analysis required by researchers or firms and carry out thorough analysis applying appropriate analysis techniques and marking technologies, in order to bring a satisfactory result.

2. Scope and Method of Study

Information on patent technology includes trend of patent registration and patent application filing. We will gather, classify and analyze the data on the trend of patent application filing in this study to grasp exactly the trend of technology development. The subject of patent analysis in this study is the technology of apparel design using computer technology, and the scope of study and method of search are as follows :

Scope of study: 1974~2002

Country: United States, Japan, Europe, and Korea

Database: US PTO, DELPHION, EPO, PAJ

No. of cases classified: Foreign - 1,786, Domestic - 194

No. of cases searched: Foreign - 123, Domestic - 40

Key words of search - common search:

1. <computer aided design> and <garment<or>clothing<or>apparel<or>fashion>
2. <digitalization> and <garment<or>clothing<or>sewing<or>fashion>
3. <electronic business> and <fashion>
4. <clothing pattern>

5. <dress pattern>
6. <CAM> and <fabric>
7. <clothing manufacturing>

- field search:

1. <Title/computer aided design> and <Abstract/fashion>
2. <Abstract/marketing> and <Abstract/fashion<or>clothing<or>garment>
3. <Title/CAM> and <Abstract/fabric>
4. <all field/computer> and <Abstract/apparel<or>illustration<or>garment>

Remark: We excluded the designs of special apparels, functional uniforms and textiles. We referred to research papers, technical books and technical journals to see the trend and outlook of technology and market situation.

3. Content and Object of Study

We searched for the patents for technology of apparel design using computer technology and sorted them by technology, applicant, filing date and by country. As for the outlook of application technologies, we analyzed and summarized the patent data in terms of application by country, application by technology and technology by filing date. We also prepared Analysis of Progress in Technology to show patent trends by applicant and number of cases, and produced some tables with for the patents of core technologies.

Object of study:

1. To produce patent map as an analysis of patent rights for technology of apparel design using computer technology.
2. To research and analyze the trend of patents by patent map and carry out a comparative analysis of the progress of technology in domestic and foreign countries.
3. To show the current status and problems of domestic technologies of apparel design using computer technology and suggest the future subjects of technology development.

4. Significance and Effects of Study

A study dealing with the patent map in the

area of apparel design academically, it can be used as a source for establishing the direction of technology development using computer technology in the area. The study can also be used to develop strategies to enhance the competitiveness of domestic apparel industry through digging out the status of domestic technologies, new technologies and gaps in technology.

II. Outline and Composition of Apparel Design using Computer Technology

1. Application of Computer Technology for Apparel Design

As we entered the 21st century, the apparel industry is being born again as one of knowledge industries creating new image. The apparel industry specifically enjoyed the benefit of computer technology in enhancing the creativity of designers and making production, sale and service faster and more elaborate. The concept of relation between consumers and suppliers or manufacturers turned into that of consumer-oriented market place and it contributed to increase of production speed, diversification of products, cost saving in production and decrease of inventory.

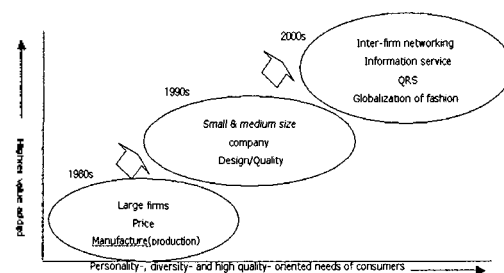
Computer technology is utilized in apparel design as follows:

- 1) It enabled to construct a flexible production system suitable for Job Shop Type Production Small Batch Production using CIM⁷⁾ in production administration.
- 2) In design and engineering, CAD enabled to design apparels and textiles faster and more elaborately. Computer technology provided a very convenient tool to construct a database to shorten the production time and satisfy the various needs of consu-

mers. It also improved elaborateness and productivity by enabling pattern making, grading, marking and cutting processes.

- 3) In distribution and sales, the combination of CAD, CAM, virtual reality and internet design accelerates the development of technology for realizing e-business. The change in apparel environment caused by development of internet brought the technologies to provide consumers with information to add reality and credibility about the products. Those technologies include realizing virtual textile and virtual clothes on the monitor and virtual reality technology enhancing the real feeling of dressing products.
- 4) Technology to develop 3D human body measuring system for mass customization using digital technology in the era of mass-produced ready-made clothes.

Apparel industry generally is divided into textile industry related to manufacturing and processing textiles and materials and garment industry such as manufacturing and distribution of garments. We can categorize textile industry into three streams by process flows. Up-stream includes spinning, silk-reeling through twisting. Middle-stream is for weaving, knitting through



<Fig. 1> Change in Operational Characteristics of Korean Apparel and Fashion Industry.⁸⁾

⁷ CIM System consists of C4: CAD(Computer Aided Design), CAP (Computer Aided Process Planning), CAM (Computer Aided Manufacturing), CAQ(Computer Aided Quality Control).

⁸ Jong Sook Chun. Application of Computer Technology to the Apparel Industry, *Fiber Technology and Industry*, vol.5, no. 1/2(2001): 47.

dyeing while sewing and garment manufacturing make Down-stream. Textile industry is closely connected with continuous flow from textile material to weaving to the final product apparel.

Textile industry has been known to be a labor-intensive industry and it is required to develop into information industry, maintaining its technology-intensive characteristic, where the knowledge from each field flows and accumulates compound by process and by field. The industry is converting from price- and manufacture- oriented operation to personality-, diversity- a high quality- oriented operation to meet the needs of consumers, constructing Quick Response System (QRS) as a new management strategy and constructing e-market place for the industry, in order to cope with the change of the market.

It is expected that they will put more efforts to combine the information industry with apparel and textile industry in order to create higher value added through combining with advanced technology and information technology such as scientific design and manufacture of apparels and digital management.

2. Outline and Classification of Apparel Design using Computer Technology

We classified the technologies of apparel design using computer technology as follows:

- A. Technology to measure human body: Body Measuring & Sizing System
- B. Technology to design pattern: Pattern making, Pattern grading, Pattern marking, Pattern cutting
- C. Technology for production: Production & Garment sorting, Sewing, Finalizing & Article classifying
- D. Technology for design: Compounding Design & Color, Design process, & Design Macking, Computer feature embedded clothes
- E. Technology for body image and design service: Body image & coordination, Try on garment, Order-made design
- F. Technology to provide and analyze information: Design information, Consumer in-

formation, and Market information

- G. Technology to sell garment: Purchase and Sale of garment goods through e-commerce, internal information sharing, Design service

The technology items in the above include all the processes by stage from conventional offline production, design and sale of general garments to online processes enabled by development of internet environment.

III. Analysis of Patent Rights of Apparel Design using Computer Technology

The technologies of apparel design using computer technology are classified as shown in the following table:

Major group : Apparel design(Code A)

Sub-major group : Computer technology (Code A)

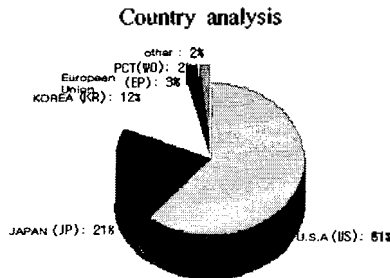
Minor group (Code A, B, C, D, E, F, G)

1. Trend of Technology Development by Country

The following graph shows percentage rate of patents filed by each country out of 163 patents in total.

(Table 1) Classification of Technologies of Apparel Design using Computer Technology

AAA	Body measurement & Sizing System technologies
AAB	Pattern making and Production preparation technologies
AAC	Production technologies
AAD	Design combination & Designing & design technologies
AAE	Body image & Design service technologies
AAF	Information service & Information analysis technologies
AAG	Purchase & Sale of garments (e-business) technologies



<Fig. 2> Filing by Country in %.

Out of 163 patents in total, United States occupies 61%, Japan makes 21%, Korea 12%, European Union (EP) 3%, PCT (WO) 2% and other countries take up 2%.

1) Trend of Technologies of United States

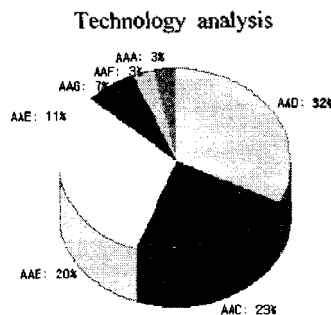
Analysis of the 99 patents of United States covering 61% of 163 patents consists of the following technologies.

About 32% of the patents filed by United States are for design combination and designing & design, while 23% are for production technology, 20% for pattern and production preparation technology. The technologies for pattern preparation and production take up 75% of total patents.

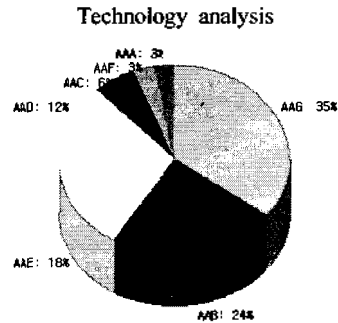
2) Trend of Technologies of Japan

Analysis of the 34 patents of Japan covering 21% of 163 patents consists of the following technologies.

About 35% of the patents filed by Japan are



<Fig. 3> Technologies Filed by United States.



<Fig. 4> Technologies Filed by Japan.

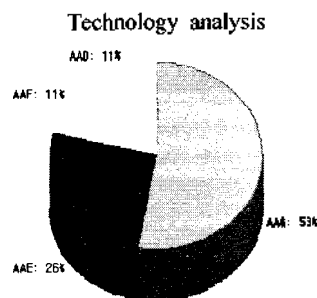
for purchase & sale of garments (e-business) technologies, 24% for pattern and production preparation technology, 18% for body image & design service technologies.

3) Trend of Technologies of Korea

Analysis of the 19 patents of Korea covering 12% of 163 patents consists of the following technologies.

The technologies filed by Korea is composed of 53% of technologies for purchase and sale of garments, 26% for body image and design service, 11% each for information service & analysis, and design combination & designing & design. We can hardly find patent for production technology in contrast to the United States. Japan is similar to Korea in that the patent for purchase and sale of garments occupies the highest portion.

The following <Table 2> shows the number of patents by technologies of USA, Japan, and



<Fig. 5> Technologies Filed by Korea.

<Table 2> The Number of Patents by Technologies of USA, Japan, Korea

Code	Classification of Technologies	Country			Total
		U.S.A	Japan	Korea	
AAA	Body Measurement & Sizing System Technologies	3	1	·	4
AAB	Pattern Making and Production Preparation Technologies	20	8	·	28
AAC	Production Technologies	23	2	·	25
AAD	Design Combination & Designing & Design Technologies	32	4	2	38
AAE	Body Image & Design Service Technologies	11	6	5	22
AAF	Information Service & Information Analysis Technologies	3	1	2	6
AAG	Purchase & Sale of Garments (e-business) Technologies	7	12	10	29
Total		99	34	19	152

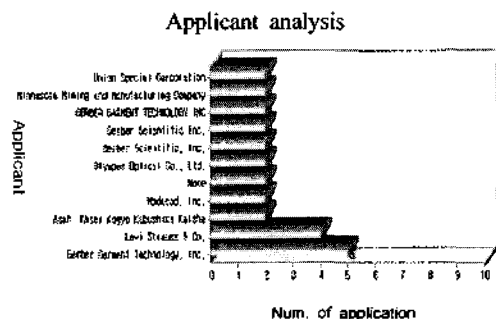
Korea.

2. Trend of Patent Application Filing by Applicant

1) Patents by Applicant in the United States

Patent by applicant in the United States is as follows:

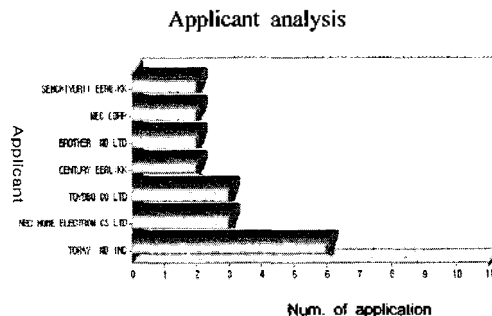
As for the United States, Gerber Garment Technology, Inc. marks the first place with seven cases followed by Levi Strauss & Co. with four cases. Some applicants follow with two cases each such as Asahi Kasei Kogyo, Kabushiki Kaisha, Modacad, Inc., Olympus Optical Co., Ltd., Gerber Scientific, Inc., Minnesota Mining and Manufacturing Company and Union Special Corporation.



<Fig. 6> Patent Filing by Applicant in the United States.

2) Patents by Applicant in Japan

Patent by applicant in Japan is as follows: As for Japan Toray Ind, Inc. marks the first place with six cases followed by Nec Home Electronics Ltd and Toyobo Co Ltd with three cases. Some applicants follow with two cases each such as Cenyury Eerukk, Brother Ind Ltd, Nec Corp, Senchiyurii.

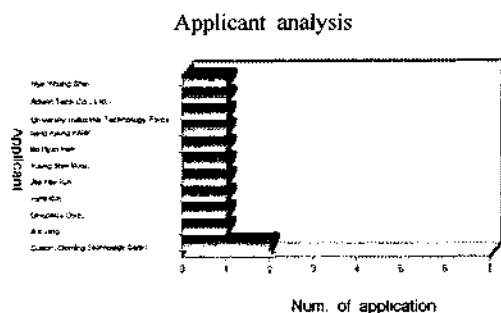


<Fig. 7> Patent Filing by Applicant in Japan.

3) Patents by Korean Applicants

The following is the analysis of patents by applicant in Korea.

As for the Korean applicants, except Custom Clothing Technology Corporation that filed two cases, all the rest of applicants filed one case each and most of them are individuals. It is because there are not many big specialized firms in Korea such as Gerber of U.S.A or Toray of



〈Fig. 8〉 Patent Filing by Applicant in Korea.

Japan.

The following 〈Table 3〉 shows patents by

applicants and the number of application of USA, Japan, and Korea.

3. Trend of Patent Application by Filing Date

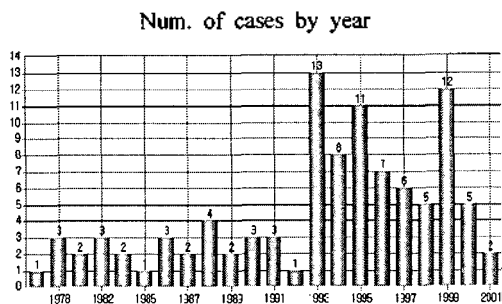
1) Application by Filing Date of the United States

The trend of patents by applicant of the United States is as follows.

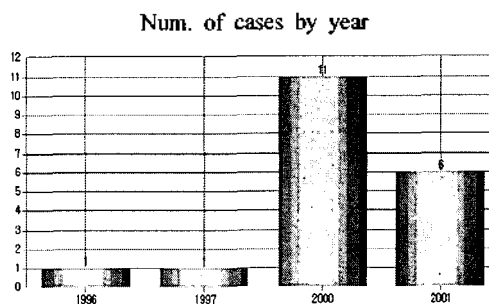
Patent application of the United States started first in 1974 and had maintained certain level continuously until it increased sharply in 1993 with 13 cases. However, it plunged to low level in 2001.

〈Table 3〉 Patents by Applicants of USA, Japan, Korea

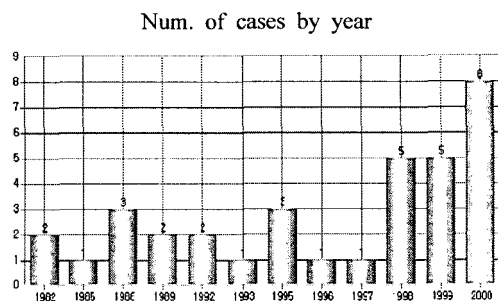
	Applicants	Num. of Application
U.S.A,	Gerber Garment Technology, Inc.	5
	Levi Strauss & Co.	4
	Asahi Kasei Kogyo Kabushiki Kaisha, Modacad, Inc., Olympus Optical Co., Ltd., Gerber Scientific, Inc., GERBER GARNEBT TECHNOLOGY INC Minnesota Mining and Manufacturing Company Union Special Corporation.	2
Japan	Toray Ind, Inc.	6
	Nec Home Electronics Ltd Toyobo Co Ltd	3
	Cenyury Eerukk Brother Ind Ltd Nec Corp Senchiyurii	2
Korea	Custom Clothing Technology Corporation	2
	Ji Il Jang Glnophica Corp.: Yumi Kim Jae Hak Kim Young Shin Moon Bo Hyun Park Sang Kyung Park University Industrial Technology Force Artwin Tech Co., Ltd.: Hye Young Shin	1



<Fig. 9> Application by Filing Date - United States.



<Fig. 11> Application by Filing Date - Korea.



<Fig. 10> Application by Filing Date - Japan.

2) Application by Filing Date of Japan

The following is application by filing date of Japan.

The year 1982 is the first year of patent application for this area in Japan and it maintained in the range of 1 to 3 cases per year until it started to grow fast in 1998 and it increased to eight cases in 2000.

3) Application by Filing Date of Korea

The following is application by filing date of Korea.

Korean applicant began filing for this area in 1996 with one case but it increased fast to 11 cases in 2000. This fast growth is probably attributed to the governmental support for information technology industry and fast growth of internet both of which in turn caused a rush in technology development combining information industry and apparel industry, mainly led by individuals and high tech ventures.

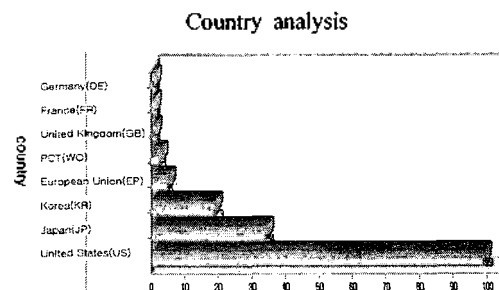
IV. Future Prospect of Apparel Design Technology using Computer Technology

1. Trend of Patent Application by Country

Comparing the number of applications by country, we find the United States filed 99 cases, Japan filed 34 cases, Korea 19 cases, European Union 5 cases, PCT 3 cases, and United Kingdom, France and Germany filed one case each. A leading country in computer technology, the United States leads the patent application with 99 cases and is followed by Japan with 34 cases and Korea with 19 cases. The number of application by European countries is very low as appeared.

2. Trend of Application by Technology

Among the categorized technologies, 26% (42 case) of whole application is for design combination & designing & design technology, 20

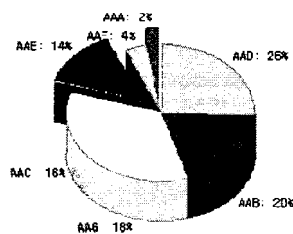


<Fig. 12> Filing by Country.

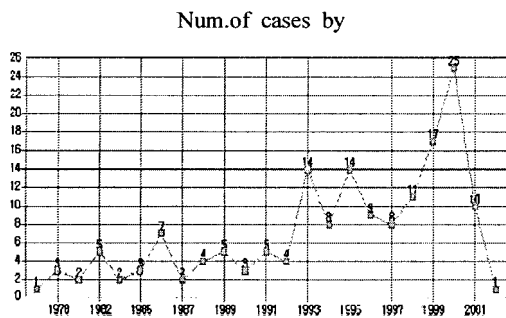
%(32 case) of application is for pattern production and preparation for production technology, 18%(30 case) for purchase and sale of garment technology, 16%(26 case) for production, 14%(23 case) for body image and design service, 4%(6 case) for information service and information analysis and 2%(4 case) for body measurement and sizing technology. The technology for design and pattern production takes up 45% of whole application and is followed by the technology to connect the internet to sale of garments. Technology of body measuring for pattern production or sale of garments and, or sizing technology for body image is still in an insignificant level. It is highly required that the technologies for 3D body scanner, using the data from 3D body measuring for CAD/CAM and virtual reality should be combined with the developing internet technologies in order to cope with the trend of mass customization to produce ready-made garments based on individuals' requirements.

3. Patent Applications by Filing Date

The first patent application for this area was



<Fig. 13> Analysis of Technology Trend.

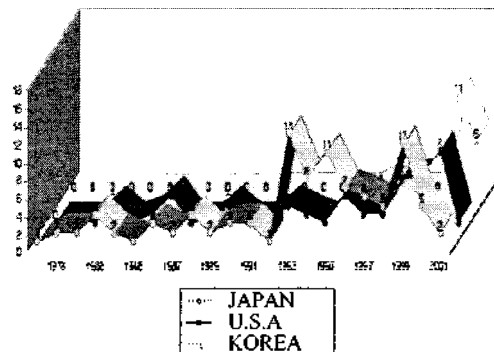


<Fig. 14> Patents by Filing Date.

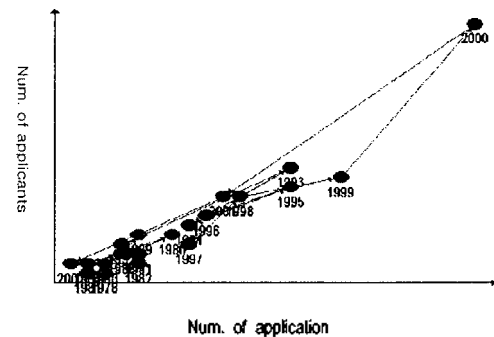
made in 1974 and it increased sharply in the middle of 1980s. The number of application surged again around the end of 1990s when the internet was spreading fast. We expect there will be continuing development of the technology from now on.

1) Patent Application by Country and Filing Date

The application trend by country and filing date shows that the application was firstly filed by United States in 1974 and development of technology has been convergent and more progressive since 1993. The first filing was made in Japan in 1982 and there has been convergent development since 1998. Korea started late in 1996 but development in 2000 is as high as that of the United States. The reason why the num-



<Fig. 15> Application Trend by Country and Filing Date.



<Fig. 16> Technology Development by No. of Applicants and Cases Filed.

〈Table 4〉 Number of Appliance-Number of Applicants

Year	Num. of Appliance	Num. of Applicants
1978	1	3
1981	1	2
1982	2	5
1984	2	2
1985	2	3
1986	5	7
1987	2	2
1988	3	4
1989	5	5
1990	2	3
1991	3	5
1992	4	4
1993	12	14
1994	6	8
1995	10	14
1996	7	9
1997	4	8
1998	9	11
1999	11	17
2000	27	25
2001	9	10
2002	2	1

ber of cases in 2002 is low seems to be because some application filing has not been published yet or not all the cases are included in the search.

2) Analysis of Technology Development by Number of Applicants and Cases Filed

Analyzing development of technology by number of applicants and that of cases filed, we can say the technology has entered developing stage since the middle of 1990s.

4. Analysis of Core Patent

Out of 163 patents in total, 13 patents have been quoted in 117 patents. The 13 patents quoted are for the technologies of apparel design using computer technology. Core patents and the patents quoting the core patents with number of quotation are listed as follows.

V. Overall Analysis and Conclusion

〈Table 5〉 Quotated Patent

No. of Patent	Filing Date	Applicant	Title	Num. of Quotation
US1978-0914301	1978-06-12	Goldman; Robert N.	System for specifying custom garments	17
US1982-0362164	1982-03-26	Gioello; Debbie A.	Method for designing apparel	15
US1984-0604982	1984-04-27	Richman Brothers Company	Method and apparatus for producing custom manufactured items	12
US1990-0480551	1990-02-15	DEZIEL MICHELLE	System for designing custom-made, formfitted clothing, such as bathing suits, and method therefore	11
US1990-0611582	1990-11-13	Slilaty; Halim	System for measuring custom garments	10
US1988-0169046	1988-03-16	Minnesota Mining and Manufacturing Company	System for preparing garment pattern data to enable subsequent computerized prealteration	8
US1981-0282055	1981-07-10	Spackova; Daniela S. Chen; Richard M.	Previewer	8
US1988-0169047	1988-03-16	Minnesota Mining and Manufacturing Company	Computerized system for prealteration of garment pattern data	7
US1985-0713856	1985-03-20	Paly; Rene Svanda; Jacques	Method for the automatic grading and cutting of articles such as garment pieces	7
US1986-0904682	1986-09-05	CDI Technologies, Inc.	Surface detail mapping system	6
US1988-0268760	1988-11-09	Sony Corporation, Tokyo, Japan	Dress design forming apparatus	6
US1993-0175780	1993-12-27	Beavin, William C.; St. Louis, MO 63112	Computerized clothing designer	5
US1991-0694666	1991-05-02	Gerber Garment Technology, Inc.	A computerized pattern development system capable of direct designer input	5

This study attempted to create a patent map for 163 cases of patent for technology of apparel design using computer technology and researched the trend of patent application by country, technology, applicant and filing date.

In regard to application by country, the United States marks the first place with 99 cases (61%), Japan marks the second with 34 cases (21%), Korea the third with 19 cases (12%), Europe (EP) the fourth with 5 cases (3%) and PaCT (WO) the fifth with 3 cases (2%).

Among the categorized technologies, 26%, 42 cases of whole application is for design combination & designing & design technology, 20%, 32 cases of application is for pattern production and preparation for production technology, 18%, 30 cases for purchase and sale of garment technology, 16%, 26 cases for production, 14%, 23 cases for body image and design service, 4%, 6 cases for information service and information analysis and 2%, 4 cases for body measurement and sizing technology. The technology for design and pattern production takes up 45% of whole application and is followed by the technology to connect the internet to sale of garments.

The technologies filed by Korea is composed of 53% of technologies for purchase and sale of garments, 26% for body image and design service, 11% each for information service & analysis, and design combination & designing & design. We can hardly find patent for production technology in contrast to the United States. Japan is similar to Korea in that the patent for purchase and sale of garments occupies the highest portion.

The application trend by applicant shows that there has been convergent and progressive development of technology after 1993 since the development had been initiated in the United States in 1974. It surged again around the end of 1990s when the use of internet increased sharply. Analyzing the speed of progress in technology in terms of number of applicants and application cases, we can say it entered into developing stage from the middle of 1990s and

it seems that they will continue the development work from now on.

In case of Korea, they began in 1996, somewhat late, but reached a similar level with the United States in 2000. It coincides with the time when the use of internet increased sharply and it is attributed to the increased purchase of apparels and active development of technology in those days as shown in the trend of application by technology.

In terms of trend by applicant, seven applications were filed by Gerber Garment Technology, Inc. of the United States, six applications by Toray Ind., Inc. of Japan and two to three applications by some other firms, while few applications were filed by Korean companies. Most of Korean applications were made by individuals, indicating that there is little or no R&D effort by Korean firms to develop technologies in this area.

Based on the result of study on the technology development until now through analysis of patent map, we found the status and problems of domestic technologies and suggest the following for the future.

United States is leading the area of technology to utilize computer technology for apparel design. Having recognized the possibility in this area in 1974, some firms like Gerber Garment Technology, Inc. invested extensively in this and they are creating high value with advanced technologies today. In contrast, Korea is still in the underdeveloped stage as it lacks facilities and researches in the technology to utilize computer technology for apparel design. Therefore, it is urgently required to recognize the importance and necessity of this area, train the research personnel and support the research to compare with advanced countries in developing the technologies. Additionally, there are many applications filed by individuals that it will be a good idea to organize an association of those related, establish research institutes and proceed joint research projects by industries, academies and research institutes.

Comparing the patent applications in speci-

alized technologies, we find the United States is overwhelming the technologies for garment production process, patterning process and preparatory process, and Japan is currently undergoing development works in this area, while most of Korean applications are focused in the technologies for selection or substitution methods related to purchase and sale of apparels, body image and design service. Therefore, it is required to preoccupy and defend patent rights as well as develop technologies aggressively and extensively in preparation for the expansion of e-commerce market.

Technology of body measuring for pattern production or sale of garments and, or sizing technology for body image is still in an insignificant level. It is highly required that the technologies for 3D body scanner, using the data from 3D body measuring for CAD/CAM and virtual reality should be combined with the developing internet technologies in order to cope with the trend of mass customization to produce ready-made garments based on individuals' requirements.

Currently, they are actively applying information technology to conventional apparel industry such as mass-production by CAD and CAM, increase of e-commerce by increased use of internet, mass customization, and digitalization of apparel industry. It is known that the economic principle of first mover's advantage works in discussing the effect of use of information technology applied to conventional industry. It is therefore strongly required to develop technology patents and continue the progress in order to fortify international competitiveness of apparel industry.

Patent map helps analyze the actual information and suggests the direction of technology development and market potential using evaluation of each patent in terms of actual expected effect and applicability. It enables firms

to obtain various information on patent, business operation, market and product of other firms, enhance the position of the firm's patent and execute aggressive and effective patent strategy⁹.

We hope this study will invigorate the patent map preparation and research on detailed trend of technology of apparel design using computer technology, trend of patent application regarding apparel design and overall apparel material industry and trend of patent application for sub-category technologies as well.

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⁹ Department of Administration, Korea Intellectual Property Office, *White Paper on Knowledge Management*, 2002, p.69.