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# A STUDY OF THE « SILVER AGE » TECHNOLOGIES

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## Abstract

The "silver tsunami" is going to get more and more concern in various countries. The number of elderly is increasing dramatically and in this context new technologies giving rise to apparatus, and various systems, facilitating the life of the elderly will be necessary. Projects funded by the European Community indicate the deeper concern as well as commitments from various countries such as China. In this paper after a brief presentation of the patent information available, we used the APA (Automatic Patent Analysis) to determine which types of technologies and applications are developed, and which country are the most advanced in this domain. The trend in technology development as well as the main actors and country will be determined. The knowledge of the different facilities available for elderly is important since it will favor the development of an engaging communication able to encourage the elderly to take advantage of them.

## A. Introduction

In 2013, the first European Forum for Public Procurement of healthcare Innovation was held in Paris to develop the Silver [1] (Supporting Independent LiVing for the Elderly through Robotics) program with as a goal the development of innovative products and services which will improve the health care sector performance. We are getting older and less people will be available for care [2]. In the same time the family will not be able to provide informal care due to the dispersion, the care increasing cost and the lodging situation. Moreover, most of the older people will finish their life alone due of course of the difference in life expectancy between male and female but also due to the large number of divorces [3] appearing after sixty years. This is the reason why many programs grounded on the use of new technologies are developed, many of them are dealing with Internet and all the linked facilities to provide safety, care monitoring, etc. But other are looking for new technologies which will provide new products to facilitate the life of elder people such as mobility, safety, classical house tasks, etc.

The case of China [4] is interesting on two points of view. China has a massive population, and if in the United State it takes 79 years to double the number of elderly in the population (from 7% to 14%), in China this will take only 27 years. If in some country such as the United States it was

common to say that elderly are more or less rich, this is not the case in China and also to other countries where the impact of the crisis and unemployment is strong. In these conditions, China plan to develop its elder care industry on a wide base and since China is the first patent producer in the world, the status of the Chine inventions in this domain will be interesting.

In Japan, although that the same level of life is a lot greater than in China, the problems risen by the old people is very acute sine the expectation is 25% of the population by 2020 [5] This is the reason why for many years Japan developed a large amount of research in various domains such as for instance robots. "The Japanese government is extending financial assistance to companies who can develop low-cost nursing home robots, this as a part of Japan's push to deal with the issues of having a large population of elderly people and also to help spur economic growth. The government is looking to support the development of robots with limited functions for very specific nursing care tasks, designed to assist elderly people in daily activities, thereby reducing the burden on nursing home workers [6].(able to give rise of product able to assist the elderly.)

## B. Material and Method

Patents are an interesting source of information since they describe the state of the art of various technologies, because their access is free and also because the information provided in patents is most of the time not published in other information sources [7].

### a. Patents

The world patent database accessible via the European Patent Office (EPO) [8] covers more than 90 countries and contains approximately 85 million of notices. It is updated regularly and if it is not completely exhaustive (some national offices do not transmit the information), it covers the principal countries as well as the world and European patents. Research on the database is carried out with a Boolean combination of keywords present in the title or abstract and if necessary of terms of the international patent classification (IPC) [9], which allows you to select the scope of applications and technologies. Once the research is completed, the selection of notices is uploaded and analyzes

are performed with a specific software, as Matheo-Patent [10]. The most delicate part is the realization of a rather broad research equation, covering the subject. The clarification of this one is carried out by successive iterations, to lead to the following requests:

**(elderly or « old people ») and (apparatus or device), old people** is used in the search as a string search,, *dates* : the search limit is 1995 to 2013 (September), Search done in title only. The number of patents recovered is 333.

**(elderly or « old people ») and (apparatus or device), old people** is used in the search as a string search,, *dates* : the search limit is 2002 to 2013 (September), Search done in title and abstract. The number of patents recovered is 2243, but only the first 2000 will be uploaded.

Both groups of patents are uploaded to create two local databases which will be further analyzed according the APA.

## b. APA Automatic Patent Analysis

Automatic Patent Analysis [11] uses bibliometrics to combine the different data which are present in a patent. These “documentary fields” are the title, the abstract, the patent number and the priority number, the patent dates, the inventor(s), the patent assignee(s), the patented country and the IPC (International Patent Classification). The IPC is very important because it describes the technologies and applications presented in the patents. The IPC goes from letters A to H and is a combination of letters and digits going from one to 8 digits. The more digits the most precise it is. The APA presents many advantages: fast analysis, global overview of a subject, possibilities to create new information from selection of various items in the corpus and creation of meta-informations by combination of these selections with already existing ones.

## C. Results

### a. (elderly or « old people ») and (apparatus or device) – Title only (1995-2013)

“old people” is used in the search as a string search, *dates* : the search limit is 1995 to 2013 (September), Search done in title only. Result: 333 patents recovered

### Trend in patent application and patent granted

The following figure shows that most of the interest for the above theme started really around year 2000. This indicate that in spite of the various signals concerning the fast growing of elderly, the consciousness of the companies and decision makers was late compare to the urgency of the problem.

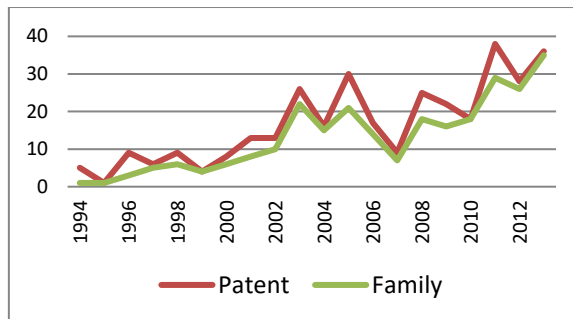


Figure 1 : Trend in patent application and granted patent

### List of the main countries involved in the subject

The list is done by selecting the priority patent. Most of the priority patents are deposit by real domestic firms. If not the data are corrected. Table 2 shows the result.

Table 1 : Main countries involved in the subject

Country	Patent	Family
China	53	53
Japan	41	41
Germany	23	23
United States	21	21
France	20	20
South Korea	14	14
Taiwan	5	5
Great Britain	5	5
Italy	2	2
Australia	1	1

China with 53 patents represents 16 percent of the total of patents. Japan gets the second place. It is interesting to see that Germany, France and United States have almost the same position. This means that if we add all the patents produce in European countries the European Union (EU) represents 47 patents, reaching the second position. This second fact shows elderly will be one of main problem for EU [12].

### List of the main technologies developed

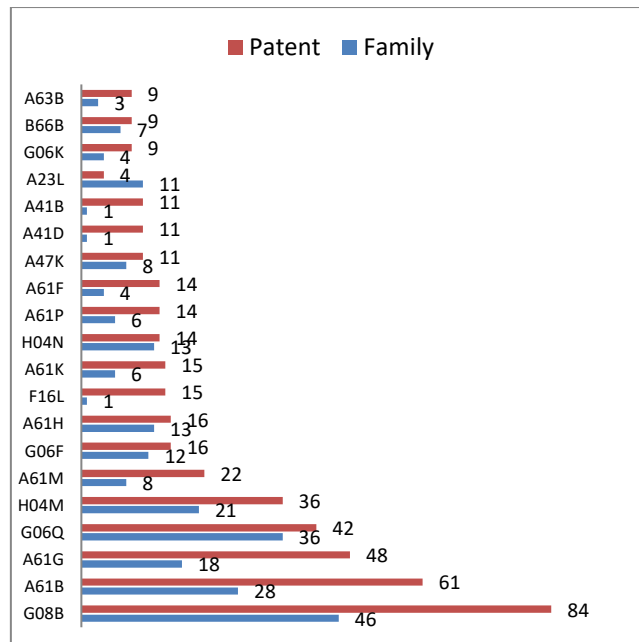
The table 1 lists the various IPC concerned by the patents. The main areas of development are:

- Data transmissions, sensors, captors, used for security, monitoring, alarm systems (eg cardiovascular..),
- Movements (eg wheel chair, elevators)
- Apparatus implanted into the body (eg filters)
- Bandages, adsorbent pads
- Apparatus for physical training
- Underwear, outwear
- Nutrition
- Sanitary equipment

**Table 2 : Main Technologies**

IPC	IPC Meaning	Family	Patent
G08B	Signaling or calling systems; order telegraphs; alarm systems	46	84
A61B	Diagnosis; surgery; identification	28	61
A61G	Transport or accommodation for patients; operating tables or chairs; chairs for dentistry; funereal devices	18	48
G06Q	Data processing systems or methods, specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes; systems or methods specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes, not otherwise provided for	36	42
H04M	Telephonic communication	21	36
A61M	Devices for introducing media into, or onto, the body	8	22
G06F	Electric digital data processing	12	16
A61H	Physical therapy apparatus, e.g. devices for locating or stimulating reflex points in the body; artificial respiration; massage; bathing devices for special therapeutic or hygienic purposes or specific parts of the body	13	16
F16L	Pipes; joints or fittings for pipes; supports for pipes, cables or protective tubing; means for thermal insulation in general	1	15
A61K	Preparations for medical, dental, or toilet purposes	6	15
H04N	Pictorial communication, e.g. television	13	14
A61P	Therapeutic activity of chemical compounds or medicinal preparations	6	14
A61F	Filters implantable into blood vessels; prostheses; orthopaedic, nursing or contraceptive devices; fomentation; treatment or protection of eyes or ears; bandages, dressings or absorbent pads; first-aid kits	4	14

A47K	Sanitary equipment not otherwise provided for toilet accessories	8	11
A41D	Outerwear; protective garments; accessories	1	11
A41B	Shirts; underwear; baby linen; handkerchiefs	1	11
A23L	Foods, foodstuffs, or non-alcoholic beverages; their preparation or treatment, e.g. cooking, modification of nutritive qualities, physical treatment; preservation of foods or foodstuffs, in general	11	4
G06K	Recognition of data; presentation of data; record carriers; handling record carriers	4	9
B66B	Elevators; escalators or moving walkways	7	9
A63B	Apparatus for physical training, gymnastics, swimming, climbing, or fencing; ball games; training equipment	3	9



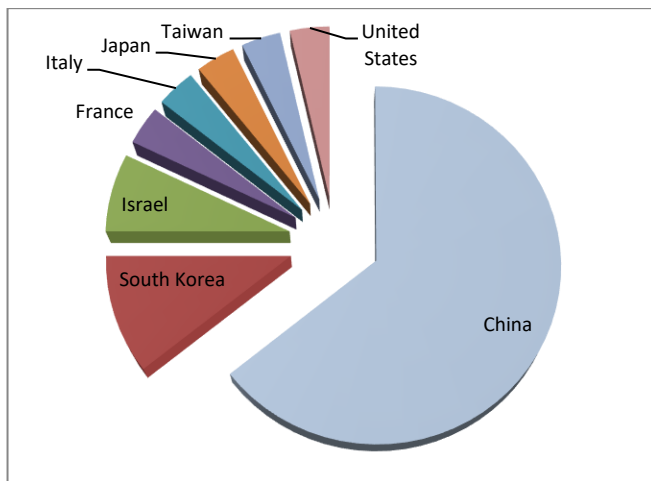
**Figure 2 : Main Technologies**

### Universities involved in the technological development

The involvement of Universities in this area is important and it is interesting to list the universities involved. To know the universities is interesting, because innovations often start from them and also because more information can also be obtained from Internet by querying Google for instance with the name of the university and the name of the inventors. In these conditions Google Scholar [13] is very rewarding.

**Table 3 : Universities involved in the technological development**

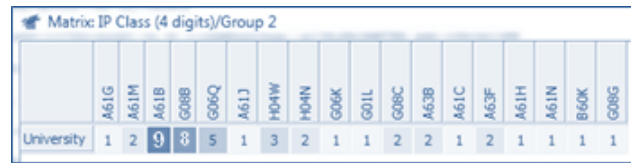
Universities and Institutes names	Freq.
Univ ZheJiang Science & Tech China	6
Univ Zhenghou China	2
Weifang Leiwei Medical Instr co Ltd China	2
Univ Texas United States	1
Univ Suzhou vocational China	1
Univ South east China	1
Univ Shanghaijaotong China	1
Univ Shanghai China	1
Univ Rennes France	1
Korea Electronical Res Institute South Korea	1
Korea Polytech univ ind acad South Korea	1
Meijo Univ Japan	1
Natpingtung University of Education Taiwan	1
Northeastern University Qinhuangdao Branch China	1
Sichuan University Jintang College China	1
Univ Beijing Technology China	1
Univ Ben Gourion Israel	1
Univ Firenze Italy	1
Univ Korea Res & Busfound South Korea	1
Univ Najing Aeronautics China	1
Unvi Ramot Israel	1



**Figure 3 : Countries of the universities involved in the technological development**

We can see the very important impact of the Chinese Universities. This means that China is investing widely in prospective technologies (generally linked to University work). The total of Universities concerned is 28 which represent around 8.5% of the total amount of patents. China with 18 universities confirms its strong involvement in the development of products and services for the elderly. It is

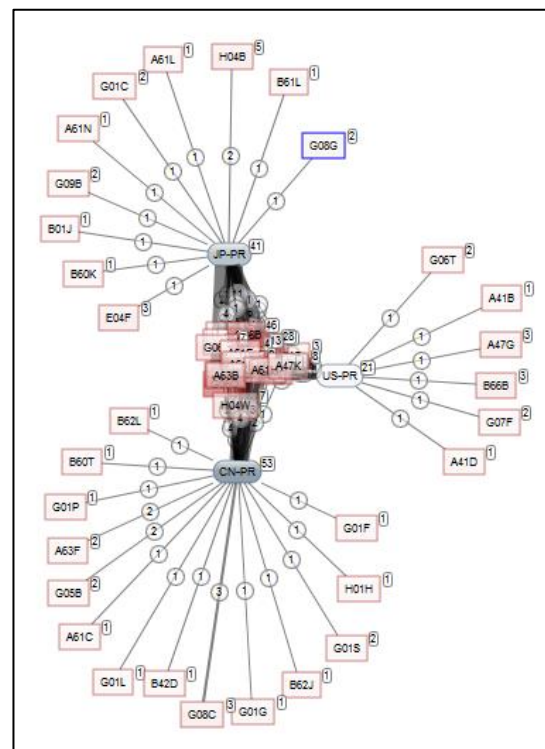
also interesting to note the presence of 2 Universities from Israel. The main IPC involved in universities research are presented in the figure below.



**Figure 4 : Main technologies involved in Universities and institutes R&D**

**Distinctive R&D between the three main actors in the field China, Japan, United States**

To see the difference in R&D between these three countries, we made three groups of the priority patent of these countries. Then we built the network between these groups and the IPC (4 digits). We put in the center of the network the IPC common to two or three countries. The remaining is the difference of R&D between these three countries. We may note that for United States, one of the priority patents is not from a United States patent assignee, but from the Ramot University of Israel. We took care of this difference in the network.



**Figure 5 : Difference in R&D between China Japan and United States**

b. (elderly or « old people ») and (apparatus or device), Title and abstract form 2002 to 2013

“old people” is used in the search as a string search, *dates* : the search limit is 2002 to 2013 (September), Search done in titles and abstracts. Only the first 2000 have been uploaded from the 2460 patents results (limit of the size of the downloading allowed), then the data were corrected by adding to the local database the complement from 2002 to 2004. The software eliminates automatically the duplicate. We then build up a local database of 3001 patents present in 1969 families.

The first thing to note is that the general rule of the thumb which says that when you use only the title words, the search is more precise does not hold for this subject. The diversity of applications leads the attorneys in charge of the patent redaction to describe in the title the object of the patent in the best possible way. For instance: “washing device for human and animals” US patent WO2008103360A1. Another point that we corrected is that the use of the term “system” may introduce some artifacts leading to medicinal compositions. This discrepancy was corrected. Then, this second search leads to a wider variety of applications and must be considered as the best image of the field.

**Trend in Patent applications and patent granted**

The trend observed is different than the one observed in the first search, where it was in the year 2003 that a significant amount of patents was noticed. Here the number of patents is growing each year with an acceleration of patenting beginning in 2010.

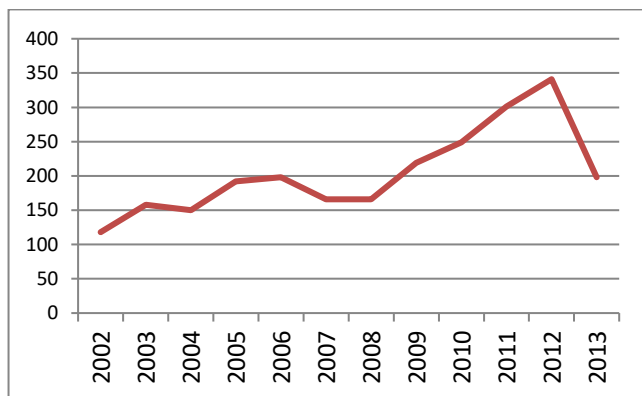


Figure 6 : Trend in patent application and patent granted

**List of mains countries involved in the “silver age” technology**

**Table 4: Mains countries involved in the “silver age” technology**

Country	Family
China	977
Japan	545
United States	176
South Korea	100
Great Britain	34
France	31
Germany	31
Taiwan	21
Russia	6
Italy	6
Canada	8
Australia	4

China produces about half of the family patents (977 over 1969). This large amount of Chinese patents is due to the “utility models” (651 patents). Note also the presence of two world patents both of them having in their family an utility model.

WO2011106999A1 PERSONAL WIRELESS MOBILE REMOTE MONITORING SYSTEM
Abstract: The <b>present utility model</b> relates to a personal wireless mobile remote monitoring system, which includes a remote monitoring server and a signal collection/control apparatus and has main technical characteristics: the remote monitoring server connects to a user mobile phone via a mobile communication network; the remote monitoring .....
WO2011082691A1 PERSONAL WIRELESS MOBILE VIDEO MONITORING SYSTEM
Abstract: The present utility model relates to a personal wireless mobile video monitoring system which is constructed by connecting a video monitoring server with a video acquisition equipment. The utility model has the main technical characteristics: the video monitoring server is also connected with a user cell phone via a mobile communication network.....

The utility models [14] are interesting since they are granted in less than one year, with almost no examination and for a very low cost. Their span is 10 years in China and they can be transformed in a patent or they can be opposed to products or patent applications and then be examined. Even if in western countries the utility models are considered as less significant than a full patent, we suggest that they should be examined carefully. Utility models have real teeth in China. In a celebrated case, Chinese company the Chint Group was awarded approximately US\$45 million in damages for alleged infringement of its utility model patent protecting a miniature circuit breaker by the Frenchheadquartered Schneider Electric company (although

China later settled for a lower amount of approximately US\$23 million) [15]. Moreover, for foreign companies which expect to make some business in China, they could use the utility model also to protect their invention. The utility models are not extended to other countries, most of the time. Then, the invention can be used in these other countries. The only restriction is that you cannot export to China an apparatus or service described in the utility model. Utility models can also be a good source of new ideas and innovation. Four countries have a certain leadership China, Japan, United States and South Korea. Note that the addition of the European patents gives a total of 108 patents which will place Europe just before South Korea (cf figure 7).

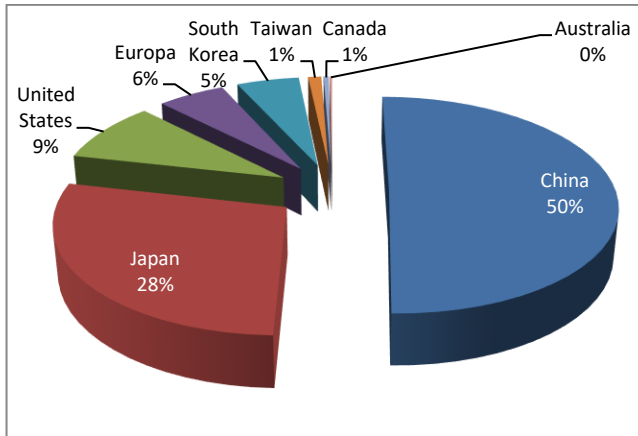


Figure 7 : Parts of the main countries involved in the “silver age” technology

### List of the main technologies developed

The list of the main technologies involved in this second search is almost the same than those present in the first search. Nevertheless a larger number of IPC are present due to the wide diversity of the applications. In this case to search the titles and abstracts is the best way to get the best overview of the subject. This is not always the case, with for instance a search on products derived from plant extracts, where the search on the abstracts introduces a lot of noise with the retrieval of no significant patents. The results are indicated in the figure below. But, if the IPC present are most of the time the same, the domain of application are a lot more diversified. For instance all systems concerning the sighted people and blinds (table 5) and different types of sticks (table 6)

Table 5 : Systems for sighted people and blinds

Number	Title
+ US6615107B2	AUTOMATED SYSTEM AND METHOD FOR DISPENSING MEDICATION
+ EP2544436A1	INTERFACE DEVICE FOR MOBILE COMMUNICATION TERMINAL AND
+ CN102499862A	INTELLIGENT BLIND GUIDING RESCUE SYSTEM
US2007085993A1	AUDIBLE DISTANCE MEASURER-OBJECT DISCRIMINATOR COGNITION
KR20110023957A	PORTABLE VOICE GUIDE DEVICE FOR BLIND AND OLD PEOPLE
JP2010270977A	HOT WATER SUPPLY REMOTE CONTROL DEVICE AND HOT WATER
JP2005124874A	MEDICAL APPARATUS
GB2424136A	RADIO SUITABLE FOR USE BY THE DISABLED, ELDERLY OR BLIND
CN2879845Y	ELECTRIC HEATING BLANKET WITH SOUND WARNING FUNCTION
CN202355554U	INTELLIGENT BLIND-GUIDING RESCUE SYSTEM
CN202120408U	SALVATION CALLING DEVICE
CN201986847U	CONVENIENT MULTIFUNCTIONAL CRUTCH
CN201346242Y	INFUSION-SUCTION TYPE TOOTH-CLEANING HANDLE
CN201238888Y	ELECTRIC EXHIBITING RACK
CN201219079Y	TOUCH POSITIONING KEYBOARD
CN201111737Y	ELECTRONIC VOICE DESCRIPTION
CN200987642Y	PORTABLE CLOSET
CN1967714A	RADIO-FREQUENCY INTELLIGENT VOICE PLAYING SYSTEM
CN102404873A	INDOOR ELDERLY PEOPLE MONITORING METHOD AND SYSTEM BA
CN101571749A	BOTH-HANDED EIGHT-FINGER TRACK FIXED KEY POSITION TOUCH

Table 6 : Different systems of sticks (partial data)

Number	Title
WO2008142416A1	SAFETY APPARATUS
US2007085993A1	AUDIBLE DISTANCE MEASURER-OBJECT DISCRIMINATOR COGNITION STIM
TWM450260U	AUXILIARY DEVICE OF ELDERLY WALKING STICK
KR2010069348A	SIGHT DISABLED STICK
KR20070087772A	DATA TRANSMITTING SYSTEM AND METHOD BY INTERNET PROTOCOL PHON
JP2010081927A	FISH BONE-PICKING DEVICE
JP2009028476A	GRIP DEVICE FOR STIMULATING ACUPRESSURE POINT ON PALM BY ACUPRE
JP2006141740A	THROWING TOY
JP2006085609A	ELDERLY PERSON WATCHING SYSTEM
JP2005271974A	STICK TYPE PACKAGE
JP2005118331A	FERRULE APPARATUS FOR WALKING STICK
JP2005058497A	FERRULE DEVICE FOR WALKING STICK
JP2003325600A	I.T. STICK WITH LIFE MONITOR (LIFE MONITOR WALKING INFORMATION R
JP2003033405A	LIMITING METHOD FOR JOY-STICK OPERATION OF ALL DIRECTION MOVEME
JP2002306218A	STICK WITH COMMUNICATION MEANS AND SERVICE SYSTEM USING IT
FR2954813A3	STICK DEVICE FOR E.G. ELDERLY PERSON'S CANE, HAS STICK ELEMENT COI
DE202005001422U	MOBILE PHONE FOR THE ELDERLY HAS 12 FUNCTION AND/OR SELECTION BU
CN2888950Y	MULTIFUNCTIONAL WALKING STICK
CN2879745Y	MULTI-FUNCTIONAL WALKING STICK
CN2843139Y	MULTI-PURPOSE WALKING STICKS
CN2831835Y	MULTIFUNCTIONAL WALKING STICK
CN2774230Y	WALKING STICK WITH ANTI-FALLING DEVICE
CN2618476Y	WALKING STICK WITH SEAT
CN2588826Y	MULTIFUNCTIONAL WALKING-STICK
CN2573020Y	TERRACE BALL COMBINED WITH SET OF SPORTS EQUIPMENT
CN2548449Y	MULTIFUNCTIONAL STICK
CN2482329Y	LUMINOUS MULTIFUNCTIONAL ALARM WALKING STICK

Name	Family
G08B	216
A61G	176
A61B	168
A61H	164
H04M	145
G06Q	127
G06F	123
A63B	116
A47K	109
H04N	98
A61F	84
A45B	58
A61M	57
H04W	52
B62K	47
Empty Field	42
A61J	40
G06K	36
A47C	36
H04B	35
B66B	35
H04L	34
B62M	31
A47G	31

**Figure 8: Main Technologies involved in the second search (title + abstract from 2002 to 2013)**

The new main IPCs appearing in the table are the following:

**Table 7: New IPCs present in the second search**

IPC	Meaning
B62M	Rider propulsion of wheeled vehicles or sledges; powered propulsion of sledges or cycles; transmissions specially adapted for such vehicles
A47G	Household or table equipment
B66B	Elevators; escalators or moving walkways
A45B	Walking sticks; umbrellas; ladies' or like fans
A63B	Apparatus for physical training, gymnastics, swimming, climbing, or fencing; ball games; training equipment
H04W	Wireless Communication Networks
B62K	Cycles; cycle frames; cycle steering devices; rider-operated terminal controls specially adapted for cycles; cycle axle suspensions; cycle sidecars, forecars, or the like
A61J	Containers specially adapted for medical or pharmaceutical purposes; devices or methods specially adapted for bringing pharmaceutical products into particular physical or administering forms; devices for administering food or medicines orally; baby comforters; devices for receiving spittle

A47C	Chairs ; sofas; beds
H04B	Transmission
H04L	Transmission of digital information, e.g. telegraphic communication

The IPCs : A23L, A61P, F16L, A61G, A41D which were present as main technologies in the first search are not present in the second one.

### Trend in patent deposit by countries

The matrix involving all the countries group (of priority patents) and the priority years will give the trend in patent deposit.

	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
CN - PR	6	207	178	127	100	87	60	47	53	42	23	30
JP - PR		1	7	17	36	41	42	60	63	69	76	73
US - PR	2	13	23	20	14	20	18	19	21	23	27	21
KR - PR		3	19	12	23	9	11	7	4	1	4	6
TW - PR		2	2	3	3	3	4	1		2		
FR - PR			3	5	6	2	3	2	2	4	5	3
DE - PR			3		3	3	1	6	5	2	7	2
IT - PR								2	1	2	3	2
GB - PR	1		5	4	5	3	5	2	2	2	5	2
CA - PR						1			1		1	
AU - PR				1		1			1	1	1	
RU - PR				1	2				1			1

**Figure 9: Trend in countries patent deposit**

China is the country which shows the larger growth of patents from 30 in 2002 to 209 in 2012. A contrario the number of Japanese patents decrease from 2009 to 2012. United States has a constant amount of patent every year a lot lower than China and about one third of the amount of Japanese patents. The figure shows also if the production of patents by one country is constant over the years or not.

The above figure, underline that in recent years, China takes really the lead in this area of R&D. May be new starting projects like the European initiative (opus cited) will introduce some changes, but this is not really obvious according the large number of Chinese patents present. May be also, western countries are more inclined to develop chemical drugs for elderly instead like Chinese to develop apparatus and devices to help them.

In new area such as robot, robotic, etc... it is interesting to see, that if Japan is present, as the feeling of the subject suggests it, other countries are also in that field. The two world patents are one with US priority and the second a

South Korean priority. The results are presented in the next table.

**Table 8 : Patents in the “robot’s” field**

Number	Title
+ WO2005098729A2	AUTONOMOUS PERSONAL SERVICE ROBOT
+ WO2011126204A1	FEEDING ASSISTANT ROBOT
+ EP1566782A1	METHOD AND DEVICE FOR MONITORING OLD PEOPLE AT HOME.
+ CN101862255A	GAIT REHABILITATION ROBOT FOR USING ROPE TO PULL LOWER LIMBS
+ CN101803988B	MULTIFUNCTIONAL INTELLIGENT REHABILITATION ROBOT FOR ASSISTING ST
US2013178982A1	INTERACTIVE PERSONAL ROBOTIC APPARATUS
TW201117192A	FIXED-POINT ALGORITHM FOR HTK KERNEL MODULES BASED ON ARM920T
KR20130030465A	SYSTEM FOR ASSISTING ELDERLY MEMORY USING WALKING ASSISTANT ROBO
JP2009059288A	MERCHANDISE PURCHASE SUPPORT SYSTEM, CART, MERCHANDISE PURCHAS
JP2006178644A	BEHAVIORAL REPRESENTATION SYSTEM AND BEHAVIORAL REPRESENTATION
JP2005110726A	LEARNING APPARATUS AND METHOD THEREFOR
JP2005101962A	WELFARE PURPOSE INTERCOM SYSTEM
JP2005061836A	METHOD AND APPARATUS FOR DETECTING AND ELIMINATING ODOR EMISSIO
CN2688278Y	MULTIFUNCTIONAL ROBOT FOR UPPER LIMB REHABILITATING EXERCISE
CN202753155U	ROBOT DEVICE USED FOR INTERNET
CN202682285U	EXTERNAL SKELETON WEARABLE TYPE LOWER LIMB REHABILITATION TRAININ
CN202515651U	ACCOMPANYING ROBOT WITH REMOTE MEDICAL TREATMENT FUNCTION
CN202397747U	ROBOT FOR HELPING OLD PEOPLE AND HANDICAPPED
CN202060883U	REMOTE MONITORING ROBOT
CN201457428U	MULTIFUNCTIONAL CARRIER
CN102755194A	REMOTE MONITORING ROBOT
CN102670377A	EXOSKELETON WEARABLE LOWER LIMB REHABILITATION TRAINING ROBOT D

The same analysis can be done if we look for “intelligent” systems, devices and apparatus. There are only two world patents (cf table 8), one is from the United States and the other from Sweden. We can note a few US patents as well as South Korean, Japanese and French patents. The rest of the patents are all Chinese. This again underlines the very strong impact of the Chine R&D in this domain.

**Table 9 : Patents in the “intelligent” field (partial data)**

Number	Title
+ WO2004047039A1	METHOD AND DEVICE FOR FALL PREVENTION AND DETECTION
+ US2010108443A1	ELECTRONIC STAIRS BARRIER AND GUIDE
+ CN102499862A	INTELLIGENT BLIND GUIDING RESCUE SYSTEM
+ CN102125496B	INTELLIGENT ANUS-FLUSHING MULTIFUNCTIONAL DEVICE FOR MEDICAL
+ CN101897640A	NOVEL MOVEMENT IMAGERY ELECTROENCEPHALOGRAM CONTROL-BASE
+ CN101803988B	MULTIFUNCTIONAL INTELLIGENT REHABILITATION ROBOT FOR ASSISTIN
+ CN101564338A	AUTOMATIC CARE BED
+ CN101190158A	INTELLIGENT WHEELCHAIR
WO2013109795A1	INTELLIGENT MOTION CAPTURE ELEMENT
US2013128022A1	INTELLIGENT MOTION CAPTURE ELEMENT
US2006207140A1	GOOD SIGNS
KR20120085962A	WALKING TRAINNING SYSTEM USING FORCE SENSING RESISTOR SENSOR
JP2005110726A	LEARNING APPARATUS AND METHOD THEREFOR
FR2982130A1	INTELLIGENT SYSTEM FOR IMPLEMENTING THERAPIES TO IMPROVE PSYC
CN2816522Y	INTELLIGENT TEMPERATURE-CONTROL WATER-MIXING WATER TAP
CN2790440Y	FULLY-AUTOMATIC OLD-PATIENT INTELLIGENT BED
CN2626025Y	INTELLIGENT ALARM SWITCH
CN2573020Y	TERRACE BALL COMBINED WITH SET OF SPORTS EQUIPMENT
CN2569795Y	INTELLIGENT ARM RECOVERY EXERCISER
CN202874035U	INTELLIGENT BRACELET
CN202774557U	INTELLIGENT UMBRELLA APPLICABLE TO OLD PEOPLE
CN202761729U	INTELLIGENT DRUG DELIVERY SYSTEM OF ELDERLY HYPERTENSION PATIE
CN202753155U	ROBOT DEVICE USED FOR INTERNET
CN202636928U	INTELLIGENT PULSE TESTING POSITIONING ALARM
CN202620084U	MULTIFUNCTIONAL HOUSEHOLD INTELLIGENT ON-BED SQUATTING PAN

When we examine the two last tables, a question can be asked : why is the number of extended patents (WO world, or EP European) so weak? The answer is not so simple. May be the products described are aimed to the domestic market, may be there is a strong internal competition, may be (especially for China) the domestic patents build up a protection barrier against extension or deposit (priority) of foreign patents in China. For the other countries than China, may be the industry started too early in this domain of R&D and the progress are not yet sufficient to justified, World or European patents. To try to clear up this question, we will analyze the WO and EP patents to see the repartition of these patents between the main patenting countries. The result is presented in figure 10. The total amount of world patents is: WO 165 patents and 127 families and the total number of European patents is: EP 134 patents and 70 families.

	US - PR	KR - PR	JP - PR	IT - PR	GB - PR	FR - PR	ES - PR	DE - PR	CN - PR	CA - PR	AU - PR
WO	40	11	22	5	9	8	3	7	7	2	1
EP	19	3	11	5	9	8	1	7		2	

**Figure 10 : Repartition of World and European Patent per family and per countries**

It is interesting to note that China, in spite of its very large amount of patents, has only 7 world patents. United States has 40 and Japan has 22 and these two countries are leader. The same two countries are also leader in European patent deposit, but in the sum of the patents of the European countries 32, puts Europe at the first position. Nevertheless this reinforces the idea that if the world patents give an idea of the international market shares, this is these two countries which will make the larger business in an international scale. It reinforces also the idea that the very large amount of Chinese patents contribute to the domestic competition and also to some extent to protect China against foreign country to take out a patent in China [16].

### Benchmarking between all countries

The matrix build up between all the countries and the IPC 4 digits (8 digits can be used if necessary for more precision) shows in which domains one country is more specialized than another.

	G08B	A61G	A61H	A61B	H04N	G06Q	G06F	A63B	A47K	H04M	A61F	A63D	A61M	H04W	B62K	A61J	A47C	G06K	
CN-PR	61	88	30	8	1	50	10	43	61	48	25	46	47	37	21	41	26	14	14
JP-PR	60	46	35	35	73	83	51	32	33	60	24	6	11	23	4	6	7	15	
US-PR	24	9	8	19	7	9	18	13	8	6	6	1	4	2	1	6	8	4	
KR-PR	13	7	5	4	4	21	3	6	3	2	3	1	1	6					
GB-PR	10	7	1	3	2	1		3	2	2	1	2							
FR-PR	7	2	2	6	4		2	4	1		1								
DE-PR	7	7	1	5	1		1	1	4		2		1		1	1	1		
TW-PR	6	3		2		3	2	1		2	1	1						1	
IT-PR	2	2	1	1	2		1	1	1	2		1							
CA-PR	1	2			1		1	1				1							
ES-PR							1	1											
RU-PR				3							3								
AU-PR		1							1									2	

Figure 11 : Benchmarking between countries

Japan is ahead in 4 domains (G08B, H04M, G06Q and H04N) compare to China. Note also the priorities for United States (G08B, A61B and G06F) and for South Korea (G08B and G06Q).

## D. Engaging communication able to encourage elderly to use various technological facilities

The study of "silver technology" should not be removed from the market economy. If we consider that patents are similar to supply markets (where the patent is applied for marketing purposes), we must also take into account the

demand in that market. Although there may be prescribers, particularly in the medical field, the demand emanates directly from elderly people. A major difficulty on this market lies in the ownership of these technologies by older people, even if they significantly improve their lives in today's society. It is important to change their mentality and behavior so that they can benefit from these advances. Academic research has focused on this topic [17] : The objective of the engaging communication is not really to provide only information but to change in the same time the behavior of the elderly. Different studies show that independently of their level of life, many are reluctant to change their habits even if they are well informed. Then if we want to push the development of new facilities to help the elderly it is necessary to push them to consider all the benefit that they can get from these ones. These behavioural changes will not only benefits to the elderly, but in the same time it will induce enterprises to consider this field of development as important [18]. The technologies are there, but sometimes the enterprises did not move because they considered that the market is not large enough. Then, the engaging communication will not only have an impact of the elderly, but in the same time on the enterprises able to develop products from the available R&D. It is out of the scope of this study to fully develop the various aspects of the engaging communication, but different research works suggest that the engaging communication aimed at the elderly prompt them to change their mind about healthcare [19], to use new products and consequently second their living conditions.

Example 1: many old people have hip problems and they may or they may not have surgery. But very often they need to have a stick to walk. But in many cases they are reluctant to have one because they feel that to use such a facility will make them look as a handicapped person. This behaviour impacts on their health because it induces wrong body position and back pain and if they did not have a prosthesis it may have worse action. The table indicates various technologies available such as walking stick with and anti-falling device, multipurpose functional sticks, etc. The knowledge of this kind of products will help to develop an engaging communication in retirement home for instance.

Example 2: many old people become shortsighted and have various difficulties to see clearly. In this condition they cannot benefit from books and magazines or TV. One way to break their loneliness is to turn them to music listening.. But, because of their eye's handicap they cannot manipulate and monitor DVD for instance. The following patent offers a way to overcome this difficulty and if this system is developed and available, that may shift old people from loneliness to a better condition of life.

The utility model relates to DVD expanded field, in particular to a DVD-ReWritable with an audio control device, which includes a DVD-ReWritable shell and a DVD-ReWritable circuit including a central processing unit and a D/A transducer. The utility model is characterized in including an audio control special purpose ear phone. The DVD-ReWritable shell is equipped with a microphone, the DVD-ReWritable circuit, a filter circuit, an A/D transform interchange and a storage interchange. The utility model meets the needs of using a remote control for old people who can't see the remote control clearly, children who are not able to use the remote control and disabled people, realizes the liberalization of controlling a DVD of old people and children, increases the flexibility function of controlling and playing a DVD and realizes hommization of a DVD. The design mainly faces multifunctional household recreation and in the meantime is suitable in social welfare organizations of a kindergarten, and a gerocomium or the like.

## Conclusion

This brief study of the subject of “apparatus, system, device” able to help the elderly indicates that the patent information is, for this domain very interesting. It emphasizes also the fact that if in academic research works patents are most of the time not cited, they constitute nevertheless a wide research domain in the field of Information Science. The introduction of units dealing with patent analysis in laboratory has a real impact on the research subjects as well as on university – industry co-operation [20] [21].

The use of titles words to perform the query did not lead to the most relevant patent as it is sometimes suggested. This indicates also that when the attorney makes the patent filling, he most of the time describes the invention in the title, and that he did not use a broad generic description.

The study shows also that almost 1/3 of the patents are Chinese, and that two third of them are utility models. These utility models which most of the time are not extended to other countries are a good source of information. In the discussion we emphasize the fact that may be the large amount of Chinese patents is a way to protect China from foreign extended patents. But there may also be another explanation: China export many products at a very low cost, so they do not really care about outsiders. But, because the patents protect only the invention in the country where the patent has been granted, this situation may conduct countries where the man power is less expansive that in China, to use these patents to produce goods able to be exported (everywhere but China) at a better price.

The WO (world) and EP (European) patents (we will not speak here of triadic patents [22]) are considered as the best patents. In spite of the very large amount of Chinese patents, this is the United States and the Japan which are leaders.

The APA is the unique tool which allows a global analysis of a wide subject, since handling thousands of patents cannot be done manually. This confirms that the synergy between APA and the gratuity of the patent access is a must in all technological strategic studies as well as in Competitive Intelligence.

The possibility to develop meta information by combining various selections from the local database allows the user to develop many “probes” to get the best view of the interaction between all the patents present. Combined with the possibility to update the local database, to export all the database or part of it at various formats, to comment and weight patents, to string search locally the titles and the abstracts, to upload the first page or the full text of a patent, make software such as Matheo-Patents an essential tools in Competitive Intelligence and Strategic Technological surveys.

The knowledge of the technologies available in this field will help to develop an engaging communication going beyond the classical information to act on the behavior of people and engage them to consider the products derives from these technology as critical for their well-being.

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