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AUTOMATIC PATENT ANALYSIS (APA) to IMPROVE INNOVATION and DECISION MAKING in SCIENCE and TECHNOLOGY

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Abstract : Patents are a unique source of information which links science and technology. The world patent database available free of charge via the EPO (European Patent Office) prompts for the use of patents as a privileged source of information. But, to have the best possible view of the whereabouts of a subject, it is necessary to perform searches large enough to embrace all its different aspects. This will lead to the creation of a local database of several hundred even thousands of patent notices. The analysis of this large amount of data calls for the use of special resident software which will enable the user to mine the patent data and get the best possible knowledge of the subject. This paper deals with the presentation of various analysis done through the use of the Matheo-Patent software and their links with the development of a Competitive Intelligence Unit in Scientific laboratories and SMEs

Keywords – APA, automatic patent analysis, competitive intelligence, patent, EPO

INTRODUCTION

Databases such as the US Patent databases [1], the World Patent Database from the EPO (European Patent Office) [2] are available free. Because the patents provide a unique information which most of the time does not appear elsewhere, this living encyclopaedia of more than 89 million of patent notices constitute one of the best way to get aware of the technology trends, the main actors (applicants as well as inventors), the automatic benchmarking of companies or inventors knowledge, the research potential of enterprises or laboratories with granted patents, etc. The analysis of large groups of patents provides also most of the answers to the questions asked when you perform a SWOT analysis or when you determine the Porter's five forces. The answers provided by this type of analyse are also a bridge between academics and industry, helping to the development of PPP (Public Private Partnerships). [3]

MATERIAL

We use the World Patent Database available through the European Patent Office host. This database covers about 90 countries among which the most important EU (European Union), Japan, United States, etc. This database is free and gives access to the bibliographic data of a patent as well as to the full text and drawing if necessary. A local automatic extraction of the words from the titles and abstracts allows the user to develop strategic groups of patents which will be analysed in detail if necessary. All the documentary fields of a patent presented underneath can be correlated to provide lists, matrix, networks on the full local database or on strategic selected groups of patents.

A. Fields available in a patent notice

In a patent notice the main fields available, and which will be used to build up all the necessary bibliometrics correlations are the following:

Title: full title of the patent, in English AP: applicants or patent assignees PR : priority number, first patent granted PN: patent number, extended patent Date : patent date IPC : International Patent Classification Abstract : abstract of the patent most of the time in English

Provided offline: extraction of the words from titles and abstracts - drawings (from the first page of the patent) to build up a drawing local database - time line which is the "life of the patent" various extensions, demands, etc.international patent coverage – Inpadoc (International Patent Documentation Center) [4] and links with the EPO Register (where all the remarks, development and implementations, advice of the examiners, cited patents if they are available) – link with the WIPO (World International Patent Office) database (Patentscope).[5]

B The International Patent Classification (IPC)

The bibliographic description of a patent does not contain key words. Then, the International Patent Classification has been developed to provide a fine description of the products, applications and uses of a patent. The IPC is available free, online through the EPO host [6]. The classification contains 1 to 8 digits, the more digits the more precise is the classification. The table 1 gives an example of the IPC dealing with "welding".

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B23K38

H01M2

H01J29

TABLE 1 EXAMPLE OF IPC Find classification(s) for ke View section welding Search Find descr Search Arc welding or cutting (electro-slag welding B23K25i00, welding s H01F, weldi B23K not specially adapted to a procedure covered worn on the operator's body or carried in the roups (eye-shi ling the parts to be B29C66 B29C65

Resistance welding: Severing by resistance heating
 Working by law beam, ag welding, cutting, cutting, borng (keess per sel<u>H15346)</u>. IN laws assister deposition C236, lease
 Monderic value and the several sever

Constructional details or processes of manufacture of the non-active parts
 Details of cathode-ray tubes or of electron-beam tubes of the types covered by group H01J31/00 [C1108]

The letters A to Y deal with different aspects of the technology such as A:Human necessities, B;Performing operation, transporting, C:Chemistry, metallurgy, etc. In most correlations the IPC with 4 digits is used and if the correlations must be more precise the full IPC may be used.

METHOD

A. Creation of the local database

The software resident interface Matheo-Patent [7], allows to query the EPO database (or the two US Patent Databases (Patent granted or on demand). The query is performed through the use with Boolean operators of the titles and abstract words, the IPC, the PN or PR numbers, the Applicant or Inventor names, the dates. Once performed the query gives rise to a window which shows all the patent titles. The user may select some patents or all the patents and download all of them with or without the patent family members. A patent can be extended to other countries then the same invention may be described by different patent numbers. All of them constitute the patent family. The figure 1 shows the way that this system works: [8]

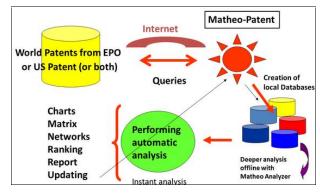


Fig 1 How Matheo-Patent works

Once downloaded all the patent titles and family members appear on the screen, and clicking on one titles makes available in another window the bibliographic data of the patent as well as the drawing, the IPC, PN and PR, the abstract, the cited documents (related patents cited by the examiner), the time line, the world coverage, the Inpadoc comments and the links with the EPO register [9] and the WIPO patent database. But to process that way with a large number of patents is tedious, even impossible when the number is large. For this reason, the software provides via the Analysis, the facility to select and display all the patents related to the various items present in the patent notice fields as well as related to the titles and abstracts words and the drawings (if present in the first patent page). The figure 2 indicates the selection of patents dealing with the query "welding AND apparatus" performed in patents titles on the World Patent EPO database, from 2010 to 2012, 1581 patents are reported. You can select some patents for downloading or download all of them if necessary.

Add patents to your	project		
Espacenet - Worldwide			spacenet Worldwide database for: tus) AND (pd:[2010 TO 2012]) using Guided Search.
Advanced Search Title or Abstract or Applicant or Inventor	Do	wnload Selection (23)	Download All (1581)
	*	Patent	
Title welding AND apparatus		EP 16 10355B 1	Relay contact welding detection method and apparatus 2012-12-05 NEC CORP [JP]
Title or Abstract		EP2332689B1	Apparatus for welding motor vehicle components with a sca 2012-12-05 COMAU INC [US]
Inventor		EP2377642A4	Welding apparatus and method of welding using the apparat 2012-12-05 IHI CORP [JP]
Applicant		US2012298304A1	Friction stir welding apparatus 2012-11-29 KATO YOSHINORI []
Patent Number		US2012298630A1	Welding apparatus having a wire pulser and methods there 2012-11-29 AQUILEX WSI INC []
Application Number		US2012298639A1	Laser welding method and laser welding apparatus 2012-11-29 PANASONIC CORP [JP]
Priority Number		US2012298727A1	Self-guiding friction stir welding apparatus and method 2012-11-29 ALCOA INC [US]
		US2012298724A1	Friction stir welding tool and friction stir welding apparatus 2012-11-29 KATO YOSHINORI []
IP Classification		WO2012162436A1	Welding apparatus having a wire pulser 2012-11-29 AQUILEX WSI INC [US]
E Classification		WO2012162606A1	Self-guiding friction stir welding apparatus and method 2012-11-29 ALCOA INC [US]
Publication Date (Year) 2010, 2012		EP2527074A1	Friction stir welding tool with groove on a shoulder surface; 1 2012-11-28 MITSUBISHI HEAVY IND LTD [JP]

Fig. 2 Selection of downloaded patents

The figure 3 indicates how, after downloading you can obtain the detailed information about a patent.

Search Enter la													
S C D Relevance	Number	Title											
•	 VIC2008 308728A8 	CONTACT DEVICE FOR WELDING APPARATUS		A 1 8 1 9 1	1 .) (B)								
• •	* EP1477266A1	LASER SPOT HELDING METHOD AND DEVICE TO B	Relevance Comment Association Ass	Elevies Status Dougs Do	rotad Diport								
• •	 WC2004088696A1 	RELAY CONTACT WELDING DETECTION METHOD	Bibliographic Data Description Glam	is Claims free groador. The Li	ie World Coverage	Textual Analysis Otation Temperate Pa							
• •	 WC2008069886A1 	APPARATUS AND HETHOD FOR PEASURING LOAD	EP250529941	VORRICHTUNG UND VERFAHREN ZUM SCHWEISEN VON									
• •	 WC2008120696A1 	WELDER AND WELDING METHOD	★ 63/20/2012	MOTORFAHRZEUGKOMPONENTEN									
	· Anna Antonia	summaries and antisperson satisfies merely		APPARATES AND METHOD FOR HELP	INTE MOTOR VEHICLE	COMPONENTS .							
· ·	+ WC200902269941	LASER WELDING QUALITY EVALUATION METHOD	4										
• •	+ WC2013063623A3	RESISTANCE INFLORING METHOD, RESISTANCE -IN	Priority Number	Applicant		Classification							
• •	+ W0200814482941	APPARATUS FOR FABRICATION OF STRUCTURAL	EP11152656A 27/04/2009	THE CORAU INC	IHAU INC	International							
• •	· W02011131985A1	APPARATUS AND HETHODS FOR REDUCING THE	EP09155794A 27/04/2009			823537/047 - 823F21/60 - 862065 862065/10							
9 9	+ W0201107074941	PRICTION STIR WELDING APPARATUS AND HETH	US26995508A 13/11/2008	inventors		BURNELLE							
	+ WO2013055325A2	APPARATUS AND HETHOD FOR WELDING		WE KILIBARDA VELD	eng.	European							
• •	+ W0201007119941	VIEWLOINS APPARATUS AND METHOD OF WELDS	Application Bumber	Charlestown, Jake		623+37/047							
• •	+ WC2011086682A1	METHOD FOR PRODUCING 300/IT MEMBER AND P	EP12171162A 27/04/2009										
	+ EP2505296A1	PRICTION STIR WELDING APPARATUS											
	+ 8P291403381	CONVEYOR DEVICE FOR OBJECTS HAVING DIFFE	Abstract										
• •	+ W02011300554A3	METHOD AND APPARATUS FOR WELDING -TYPE P	English										
• •	+ W02013073238A1	AUTOMATIC HIELDENG METHOD USING A WELDEN				caffold structure (19) including a top wall str raity of inverted robots (20) are supported in							
P 9	+ LISS30468382	SEAM VIELDING APPARATUS AND SEAM INFLORM	longitudinally spaced relation on th	e top wall structure (22) and extend	downwardly from the	top wall structure (22) into the open working							
• •	+ U52012241436A1	SPOT WELDING APPARATUS AND SPOT HELDING	connected to the inverted robots (2) are carried on the s	scaffold structure (19) and are operatively							
	· WO2012118454A3	VACUUM AND WELDING APPARATUS FOR PACIEN											
	+ WO2012052877A3	METHOD AND APPARATUS FOR WELDING PRINTE											
• •	· WC200906896641	VIELDING CONTACTOR APPARATUS WITH IMPRO	INPADOC Patent Family										
	+ U52012267429A1	SERVIC CONTROLLED ROTATING CLAMPING DEVIC		009285666A1 - CN101579792A - D	002009000004D1	CA2663307A1 - EP2332689A1							
	+ U52012241424A1	VIELDING NETHOD AND WELDING APPARATUS	EP211953281 - EP2119532A1										
• •	+ US2012241421A1	VIELODIG METHOD AND APPARATUS	Toolfor External Links										
• •	 89252707441 	PRICTION STIR WELDING TOOL WITH GROOME O	Toolbox External Links										
0	· IPOStabasas	A HIGRED VIELOUNG APPARATUS AND SYSTEM AN	Especienti European Patent Regi	ater									

Fig.3 Information about one of the downloaded patents

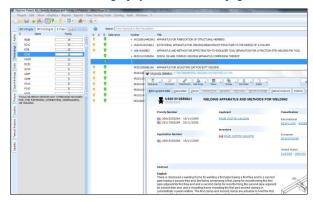
The figure 4 precises the type of information which can be obtained automatically.

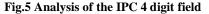
00	30/03/200	7 10	1	
				0 C 4
ALUATION METHOD AND ITS DEVICE	10/08/200	7 9	4	
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METH P2505299A1 VORRICHTUNG UND VERFAHREN ZUM SCHWEIßEN VO	4			

Fig. 4 Type of information which can be obtained

B – Selecting patent throughout their bibliographic field's analysis

Now, the problem when you have to deal with several hundred of patents is that you cannot look to the patents one after the other. It will be a lot too long. This is the reason why we provided the automatic analysis system which presents all the available field's contents with the associated patents. A click on a patent provides all the information about this patent. This system, which provides in fact lists of field's contents and the patents associated may be useful to select important patents and put them into a group. But the information provided needs to be implemented by more advanced correlations such as matrix or network between various fields present in the whole local database or in various patent groups. The patent groups may be also used as entity in matrix or network giving so a meta-information. The figure 5 indicated how the patent analysis works. In this example the IPC 4 digits are analysed and for each of them the relevant patents are listed. A click on one patent provides the information (bibliography, abstracts, first page, etc.)





GROUP CREATION AND EXAMPLES OF RESULTS

A Group creation

We are interested in certain welding systems such as friction, laser, etc... Using the analysis of the titles and/or abstracts words, we selected the relevant patents and put them into different groups: available in table 2 which represents the domains in which we are interested.

group	Nb of families	Nb of patents
laser	153	408
friction	63	187
ultrason	26	95
vibration	17	48
plasma	10	32

TABLE 2 WELDING SYSTEMS

We are also interested in the comparison of the US, South Korean, Japanese, Chinese and German technology in this area. We will build up the groups related to these countries. The analysis may be developed according the needs of the user as well as the combinations which will result. The objective is to select the right patents and go to the full text of them for a further analysis by experts. These groups may be analysed in detail (list, matrix, network with all the fields available) or may be used in combination to get a metainformation.

B Simple correlations

Let us see the analysis of the groups themselves. For instance we will list the Applicants in the plasma group. This is presented in figure 6.

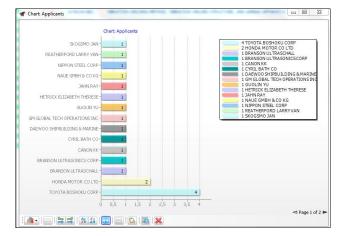


Fig.6 Example list of applicants, vibration group

The lists are important but not sufficient to go deeply into the subject. To do so, here is an example given in figure 7, which presents the automatic benchmarking of the Applicants in the same group. To do so we build the matrix Applicants/IPC4 digits.

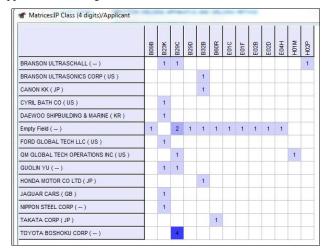


Fig.7 Benchmarking of the Applicants – friction group

The networks will give for instance the representation of the various groups of inventors which are related together since they appear in various patents. This is presented in figure 7.

C – Meta-Information

This information is obtained when a group is directly involved in a matrix or network, either with the data of one of the patent fields or with another group. The figure 8 indicates which Applicants are involved in the various welding systems groups and if some of them have simultaneous competences in different groups. This type of information cannot be answer by the query of the database with Boolean operators [10]

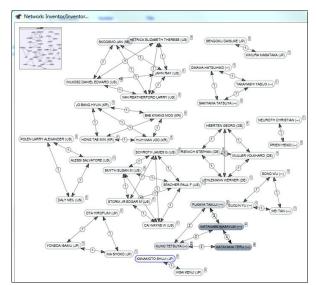


Fig.7 The various grouos of inventors from group friction

This type of information is essential if we want to select the applicants which present the best experience since they have an expertise which covers the larger number of groups.



Fig.8 Partial view of the applicant expertise in different groups

Using now the country groups and the welding system groups we will analysed the different policy in patenting of the different countries in the different welding system groups. This is presented in figure 9.

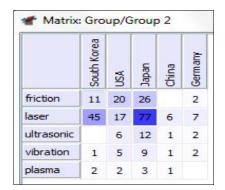


Fig.9 Which countries are involved in the different groups

It is possible also, with the meta-data to see for instance the strategy difference between the various selected countries. This is presented in figure 10. In this table we used all the patents. But because we can select also the type of patents it is possible either to analyse the most important patents, for instance WO, EP, PCT (Patent Cooperative Treaty), US in some cases (this will be what is called triadic patents) [11]), or to refine the analysis by using the full IPC as technology marker.

🗲 Matrix: IF	Clas	Class (4 digits)/Group											6		1								
	B23K	B23P	B62D	8258	825H	823Q	GOIL	GO5B	HOTH	B29C	8658	GOIB	GOIN	F16L	B21C	821D	B65G	B60L	B24B	8638	HO2P	C21D	
South Korea	328	4		7	1	8			1	5		11	13	7	6	3			6	4		9	
USA	142	6	2	3	1	3	1	3	1	25		1	1	2	1	3	2					4	1
Japan	301	3	2			8		3	1	50	3	11	13	1	4	4	1	1		3	2	2	1
China	59							2		6			3		1	1	1						
Germany	26	3	1	1		1				17	5	2	1	1							2	1	1

Fig. 10 Difference in strategy between various countries

USING APA IN COMPETITIVE INTELLIGENCE

There are numerous definitions of Competitive Intelligence or of Economic Intelligence (for French speaking countries), but the core of this discipline is to collect the best possible information, to analyse it to comment it with the help of experts and then to sustain the decision of the makers decision and strategy.

The APA, which deals with scientific and technical information, has a special place in Competitive Intelligence and thus for two main reasons:

The first one is to transform the competencies and knowledge build (mostly with the State money) by the universities and research laboratories in products and services The second because from the work of Michael Porter [13] and of the Holland school about the Triple Helix [14], they underlined that the best way to innovate is to do it in the space provided by the intersection of the spheres of the State, the Industry and Research. This prompt for the development of Public and Private Partnerships and then to develop various "ingredients" which will catalyse this development. Patents, because they are at the intersection of the Research and Industry can be used in this way. They will enlarge the view of the enterprises and show to the academics what is done with their competencies.

Tentative of the use of patent analysis to provide information to SMEs and help them to regroup of to enter in the clusterization process have been done by the WIPO (World Patent Organization) in various African countries [15]. Other examples of the use of APA in the French poles of Competitiveness [16] are also available. This is the reason why, Automatic Patent Analysis should be included in all Competitive Intelligence Units (in enterprises, clusters or poles of competitiveness) not necessarily to protect an invention but as an invaluable source of information. The necessity to decrease the gap between research and industry must also prompts the academics to use most widely the patent information in research projects and PhDs.[17]

CONCLUSION

APA provides a way to enlarge the vision of a technological field and open two windows, one for the enterprises which often have not the time and the facilities to analyse large amount of patents and second for the academics

since patents are most of the time not cited as reference in scientific papers. This double approach is useful since it can be used to pre-clusterize the PPP (Public and Private Partnership) by reducing the gap which exits between research and industry [18]. The system of analysis is simple with a very low cost [19] and the access to the patent databases free. This will be of a great help for SME, researchers and consultants. The words used in abstracts or titles, as well as the applicant and inventors names, can also be used as a significant entry in scientific databases, opening the field to a more precise bibliography.

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