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Prior Art searches in Software Patents – Issues Faced

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Prior-art-search is a critical activity carried out by intellectual property professionals. It is usually performed based on known source of literature to ascertain novelty in a said invention. Prior-art-searches are also carried out for invalidating a patent, knowing state of the art, freedom to operate studies etc. In many technological domains such as chemistry, mechanical etc., prior art search is easy as compared to domain such as software. In software domain, prior-art can prove to be a complex and tedious process relying heavily on non-patent literature which acts as a pointer to the current technological trends rather than patent documents. This paper tries to highlight the issues faced by patent professionals while performing prior-art search in the field of software patents.

Keywords: Patents, Software patents, World Intellectual Property Organisation, Prior art, Search Issues

A patent is a form of intellectual property. It provides exclusionary rights granted by national IP office to an inventor or their assignee for a limited period of time in exchange for public disclosure of an invention. Patent right prevents others from practicing (making, using or selling) a claimed invention in a particular territory during the patent tenure.[1] If patent information is properly searched and analysed, it can provide various insights useful for formulating technology strategies, can reveal technological trends, identify emerging technologies and products in a particular domain and also competitors' intellectual property strategies.[2,3] The patent description reveals how to make and use the invention, while the claims define the scope of legal protection and provide boundaries of the patent owner's exclusive rights. Hence, Patent assertion for novelty depends on its claims.[4] Novelty is one of the fundamental requirements for patentability, therefore finding relevant prior art is a crucial step during patent prosecution[5] as well as for granting a patent.[6]

The main objective of prior-art-search is to identify all relevant information to ascertain novelty in the patent application or to invalidate the originality of a claim of a patent application.[7] Prior art information can be documentary technical article published in a journal or some earlier patent or products offered for sale and even prototypes of products.[6] The identification of the relevant prior art, comprising of existing patents and scientific or non-patent literature is important as it has bearing on the quality of granting process or quality of the granted patents.[5] Patent applications are written to show how the invention differs from prior art.[6,8] Thus, patent professionals search for prior arts published before the filing date of a patent application.[9,10] The online databases from patent offices, along with online and offline literature, published papers and articles form the main source of information for prior art.[5] In general, prior art provides basis for different types of patent searches as suggested below:[11]

- State of the Art Search - identify patents for the purpose of a general review (aka landscaping)
- Novelty - identify patents and non-patents which may affect the patentability of an idea/ invention (performed before writing a patent application)
- Patentability - given a patent application, ensure novelty
- Infringement/Freedom to Operate - identify enforceable patents which cover the proposed products or process.
- Opposition - identify literature available to the public to show lack of novelty or inventive step of a granted patent
- Due Diligence - analyze strengths, weaknesses and scope of IP rights.
- Others

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Many techniques have been studied and recommended for efficiently searching the above mentioned prior-arts for patents. Ji and Guo[12] analyse various patent laws in State Intellectual Property Office of China (SIPO) decision stating that the drug standards that are publicly available can qualify as a prior art reference. Gaff and Rubinger[6] highlight that understanding and identifying of prior art is a high stake challenge and is essential while writing a patent application or if embroiled in a patent litigation. The authors further highlight that prior art can limit a patent applications claim as an invention while in prosecution, prior art can invalidate a patent. As these studies are for generalized prior art search and not for prior art searches in the field of software patents. However, there are some problems and concerns of prior art searches related to software patents.

Prior Art Problems in Software Patents

Searching for prior knowledge is an art itself,[13] requiring domain expertise along with knowledge of information sources to search from. Prior art searches are complex, exhaustive as well as repetitive tasks that require systems and procedures in place. Over and above, prior art searches are required to be done in a limited time frame. In case of technological domains such as software, prior art searches can be more complex, tedious and time consuming than others due to reasons highlighted below.

Growth of Software Patents

There is a enormous increase in patent filings in the last couples of decades. This can be seen from the World Intellectual Property Organisation (WIPO) data depicted in Figure 1.[14] This led to an increase in the patent data that is available for searching. As per European Patent Office, it is estimated that there are more than 100 million patents in the world as of now and the count is increasing each day. In case of software, the filings are much more than compared to other technologies (Fig. 2). Based on the worldwide patent filing statistics from WIPO for various technologies, the graph below revels that most of the filings are in the area of computer technology which might be fueled by increased filings related to software related patents.

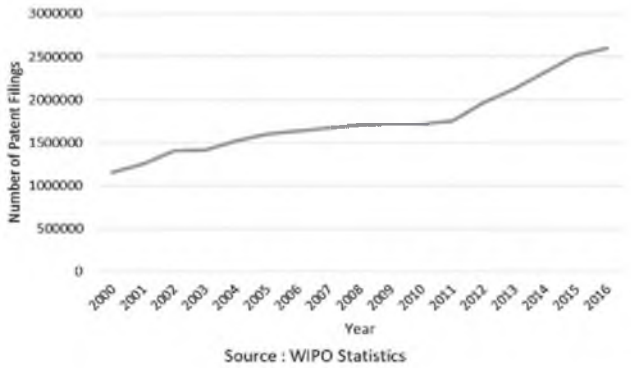

Fig. 1 — Total patent filing trend

The details of technology wise patent filing trend is represented in the Table-1.[14]

Technology Life Cycle Faster than Publication Timeline

In general, a patent application is not published immediately after its filing and it may get published after 18 months. Furthermore, a quick search and analysis based on data for patents applied and granted in US between years 2006 and 2016 for software domain revealed that more than 82 per cent of these patents are published after 18 months from date of filing as shown in Fig.-3. It can be seen from the graph that, the number of patents published after 2 to 3 years are much more than those published earlier. However, software being a fast changing technology, this 18 months lag often creates a void to search prior art in the field of software as the technology may become obsolete by the time application comes in public domain. Hence searches rely less on patent data for searching of prior art in the field of software.

Not Confined to Single Inventive Concept

Prior art search in software patent is a complex task as compared to other domains such as chemistry and mechanical engineering. Software being inherently conceptual and involving multiple technologies thus making it difficult to represent in single inventive concept. On the other hand,

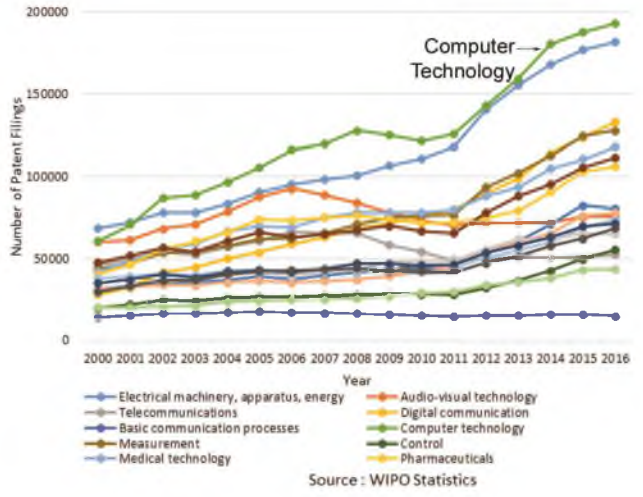

Fig. 2 — Technology wise patent filing trend from WIPO statistics source[14]

Table 1 — Technology wise patent filings worldwide from year 2000 to 2016

Technology/Year	2000	2002	2004	2006	2008	2010	2012	2014	2016
Unknown	25238	28431	21327	46912	37114	29537	30924	24319	23193
Electrical Machinery, Apparatus, Energy	68207	77772	83029	95146	100556	110667	140240	167305	181412
Audio-Visual Technology	59994	67952	78260	92336	83723	72811	71961	71949	75428
Telecommunications	45926	54064	56993	66153	65168	54162	49982	50134	51910
Digital Communication	27889	41322	49975	58707	68336	75728	89411	113825	132580
Basic Communication Processes	14159	16630	16979	16977	16523	15471	15373	15892	14990
Computer Technology	60446	86593	96371	115723	127694	121224	142653	180373	192475
IT Methods For Management	6281	26916	19126	19496	21823	22829	28367	41327	43720
Semiconductors	47056	56344	63535	71796	74378	71547	79618	80782	76742
Optics	48379	59328	66186	73318	70406	60613	61900	61569	65499
Measurement	43729	53113	57345	62045	70739	75815	92968	112249	127527
Analysis of Biological Materials	7800	11707	12481	10971	11465	11422	12240	14366	15425
Control	19653	24517	25944	26408	27965	28099	32017	42417	55206
Medical Technology	42092	55381	66143	68633	77411	77944	87881	104451	117371
Organic Fine Chemistry	39712	48148	54960	54592	55866	54253	54924	58401	61438
Biotechnology	25466	37511	37504	34034	36535	39068	42928	50010	55194
Pharmaceuticals	40476	55557	65906	72769	75732	71276	74791	90391	105785
Macromolecular Chemistry, Polymers	24166	26998	28326	27096	28250	28531	33330	40575	46760
Food Chemistry	14061	16262	19475	19837	23160	27659	34429	56620	64146
Basic Materials Chemistry	31490	34215	36869	37116	41392	44451	53841	70523	80319
Materials, Metallurgy	24243	26817	28856	28545	34208	37377	47725	57945	65982
Surface Technology, Coating	19678	23579	27494	28579	30102	32222	37657	40056	43175
Micro-Structural And Nano-Technology	500	1776	2015	2194	2629	3366	4109	4791	4388
Chemical Engineering	27683	31783	33515	32277	35106	36887	44322	53198	63476
Environmental Technology	17355	19309	20080	20664	22547	25776	31892	36808	46732
Handling	37880	40550	42437	42008	42454	42382	50528	59771	73555
Machine Tools	31476	33917	35168	35305	36957	42237	54815	65024	77649
Engines, Pumps, Turbines	29435	36059	39558	39455	43237	48133	55464	61784	64718
Textile And Paper Machines	31161	35596	37903	36814	33366	30643	34262	35706	39462
Other Special Machines	40129	45400	46906	44003	45966	49107	60854	74877	94791
Thermal Processes And Apparatus	20015	20450	23244	24416	25350	29092	33760	38005	43274
Mechanical Elements	35010	40149	41670	41505	46924	45746	53049	62815	71165
Transport	47099	56209	60154	63057	66865	66359	77730	95250	111058
Furniture, Games	29665	36400	40270	42719	43824	41695	47054	57376	68126
Other Consumer Goods	25033	27610	30910	32127	31453	31915	38376	45419	51161
Civil Engineering	44902	48038	49939	51864	52401	56268	67074	80903	94911
Total	1153484	1402403	1516853	1635597	1707625	1712312	1968449	2317206	2600743

Source: WIPO Statistics[14]

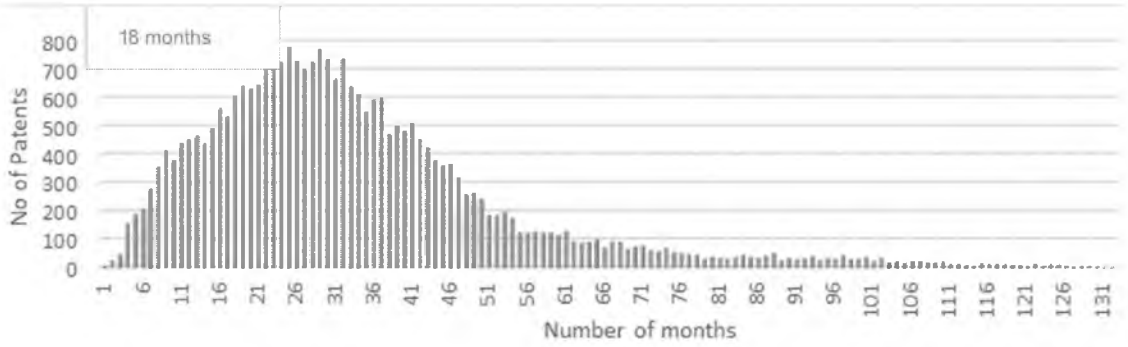

Fig. 3 — Difference between application and publication dates of US software related patent applications

chemical inventions usually involve structure of the molecules having defined boundaries thereby making it unique. Similarly, mechanical inventions represent tangible objects which is useful in understanding the concept and it's working.[15] Thus a search for software invention needs to be performed in multiple concepts involving multi domain expertise.

Dependence of Prior-Art in Software on Non-Patent Literature Sources rather than Patented Resources

Many a times, technology claimed in a patent becomes obsolete by the time it gets published.[16] Many companies publish their own bulletins to publish their research and then cite them as prior art in patents. Apart from this, much technological advancement in software are just showcased in conferences and seminars. Hence, it leads to prior-art searchers of software products to heavily rely on non-patent literature sources which usually feature technology that is more current than that published in patent documentation.[17] However, searching such non-patent literature itself is a huge challenging task as its information sources are not available at a single point when compared with patent databases. Moreover, proceedings of conferences and seminars just focus on the abstracts of the technological advancements and not the in-depth technology. Therefore there is a need for specialized sources of non-patent software resources for prior art searches.

Patent Application Exceptional Rules in USA

The US is the trend setter for computer and software patents as it is the birth place of IT. Majority of the companies from the world first file a patent for software in the US and then seek its protection abroad as it is the main market place for software. A reference to WIPO data shows that more than 30% of the total patent applications in the US are for software patents (Fig. 4).[14]

As the USPTO patent data forms a major source of data for software patents, this has made the patent professionals to search and be dependable for software literature at US patent office, rather than that of patents from all countries. This many a times leads to missing out important technology for which protection is sought in countries other than US.

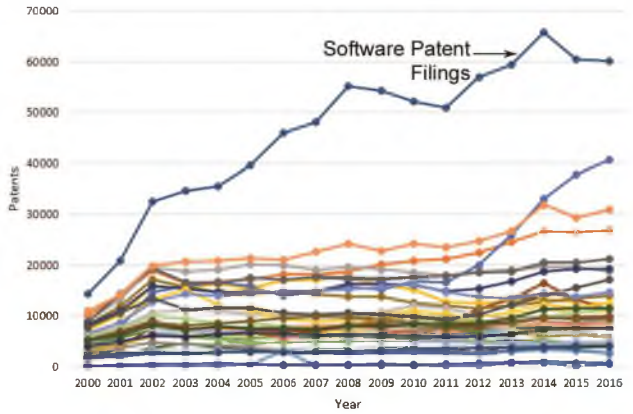

Fig. 4 — Area wise patent filings in USA

Further, for the patents that are filed only in US, The US Patent Office may not publish a patent application until a patent is granted if the inventor applies for the same. This makes a technology hidden from the public domain most of the time. Such patents are commonly referred to as submarine patents, leading to a void in technological information for prior art search.

Software Patents Amended Using Late Claims

Some countries such as US support "late claims" and allow filing new claims directed to previously unclaimed subject matter, particularly in an application claiming the priority benefit of an earlier filed application. A patent application can "claim" an invention in multiple ways. Commonly, preliminary aspect of the invention is claimed in the original application, and then filing of continuation applications (C-I-P) are followed to obtain coverage for other features of invention. This is allowed as per law, but can create practical difficulties, for example, when the applicant adds new features that cover competitors' new product. Prior art for patentability and novelty is mostly searched in the first claim of a patent apart from other sections of a patent document such as description that embodies technical information. However, late claiming that occurs years after the initial filing might result into oversight during prior art search, there by leading to inadequate notice to third parties, who might assume that previously disclosed but unclaimed subject matter has been revealed to the public.

Rules for Software Patent Different Countries

The exact nature of software patentability is a complex matter under different regimes, since rules governing each country for the exact nature of software protection and its patentability is a complicated question.[16] Software is not patentable in some countries, and may have only recently become patentable in others. In such cases, a software patent may be classified in some other technological domain, there by leading to limited or no prior art generated in software from such countries.[16] Hence software patent data is not found in a uniform format, under common IPC's and common technology, resulting in fewer outputs when searched across multiple databases using a common search query. This proves to be a bottleneck in searching for prior-art in software and many a times forces end users to have different techniques for searching databases of different countries based on the rules governed or laws.

Wide Scope of Software Patents

Scope of a Software Patent: Not Limited

Software development is incremental in nature consisting of different multiple existing technologies giving software a broad scope. This leads a Software Patent to be drafted in a generalized way to cover almost all miscellaneous technologies along with a said patent technological domain even though it might not be readily fitting in some practical technological areas.[4] Such broad interpretation often leads to ambiguity for searching patent data in the field of software.

Multiple IPCs for Software Patents Leading to Confusion

Ubiquitous computing has resulted into integration of multiple technological concepts. Therefore, the existence of prior art for a software is not restricted to any specific patent classifications related to software patent. Furthermore, technology changes in the software domain happen at faster pace than revision of IPC. Many times emerging technologies do not have relevant IPC. Examiners may also not be updated about the latest technological changes. This may lead to improper or superficial IPCs assignment to software patents. A quick search on Derwent Innovation using the search strategy given below for patents in the IPC G06F (ELECTRIC DIGITAL DATA PROCESSING) in recent years revealed 28287 patent families. The results highlighted that this IPC is also associated with other technologies classified under IPC codes shown in Table-2.

The search strategy used on Derwent Innovation database was as follows:

(AY>=(2011) AND AY<=(2016)) AND IC= (G06F*)

The Claims Language

The taxonomy of software technology is continuously changing and software technologies are continuously evolving. The terminology used in software is also continuously evolving along with software development. New words, terminologies and taxonomies are coined with every single new technology available in the market. Similar technologies from different vendors are referred by different names. Most of the existing technologies are broken up into different smaller ones and may be attributed with new jargons. These jargons help software patents to conceal its technology thereby causing a hurdle when software prior art search is performed on patented software data. Dulken (2014) highlights the complexity of language used in the patent as follows:

"*The complex and inconsistent nature of the language presents problems for patent searchers researching the prior art. ……. These problems include confusion in translations; "Patentese", the jargon used by patent attorneys; terminology, which can take time to be adopted; 'faux amis", words which you think you know as they look identical to foreign words; the oddities of English spelling; multiple meanings for the same words; words that have opposite meanings; synonyms; Americanisms as different spellings and different words; words that are both nouns and verbs; compound nouns, which are often spelt as two words; spelling mistakes; and syntax. Conclusions suggest using broad classes together with keywords; looking for synonyms; allowing for two words in compound nouns; using adjacency operators; combining sets of results; and using citation searching as an additional search,*

Table 2 — Combination of IPC G06F with other technologies

IPC Code	Number	Description
H04L	6820	Transmission of Digital Information
G06Q	2322	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
H04N	2267	Pictorial Communication e.g., Television
H04W	1624	Wireless Communications Networks
G06K	1567	Recognition of Data; Presentation of Data; Record Carriers; Handling Record Carriers
G06T	1158	Image Data Processing or Generation, In General
H04M	980	Telephonic Communication
G09G	909	Arrangements or Circuits for Control of Indicating Devices Using Static Means to Present Variable Information
G11C	782	Static Stores
H05K	666	Printed Circuits; Casings or Constructional Details of Electric Apparatus; Manufacture of Assemblages of Electrical Components

especially if little is found, or the invention is difficult to describe. A thesaurus of recommended words and spellings would be useful if adopted by those preparing abstracts."[18]

With respect to software patent, many a times, ambiguous and inventor specific terminology is used to mislead or to hide the exact disclosure or to broaden the scope of the patent. Sometimes, software patent are incomprehensible and inventor find it difficult to understand their own patents.[19] In light of the above, prior-Art in software demands exhaustive reading of related literature. Moreover, the quid pro quo requirement of a patent i.e. monopoly on technology in exchange of full disclosure of invention, does not meet as software patents are drafted which lack a "full, clear, concise and exact description" of the invention.[20]

Software is Difficult to Examine

To some extent, software is often a 'black box'. Patents or technical/academic literature that discusses the algorithm or techniques used are seldom available. Hence, it may be difficult to examine/find the software patent application for prior art.

Insufficient Time for Exhaustive Search

While conducting a prior art search, missing a single document may lead to legal consequences especially in Freedom to Operate (FTO) tasks. With the cut throat competition and first to file race, which is quite evident in software domain, the actual time required for conducting prior art search may not be adequate. On the other hand, the patent offices are overloaded with patent applications and need to provide their results within a short period with the limited resources they have. Therefore many a times, examiners rely on searching for single technology in prior art.

Lack of Specialized Databases/Tools for Software Prior-Art

In case of chemical and biological inventions, specialized databases and tools are available for efficient and effective retrieval of relevant prior art. However, there are no such databases/tools available for searching software prior art. Therefore searcher needs to rely on existing resources that are available.

Conclusion

Prior-art-searches for software are critical and mostly involve non-patent documents instead of patent documents. Inherent characteristics of software patents and the technologies they encompass, restrict patent professionals to conduct exhaustive searches. Software patents claim multiple overlapping technologies, making it difficult to represent them in single inventive concept which is not the case in other domains such as chemical and engineering. Software patents are also governed by different rules in different jurisdictions leading to ambiguity on the type of software that can be patented. Prior art searches for software are also constrained by shorter time frame, available resources to searchers and first to file race. Moreover, unavailability of specialized databases and tools further limits endeavor of searchers. Hence, there exists dependency on human intervention and expertise until there is availability of sophisticated software domain specific databases/ tools and/or a standard for software patent drafting is evolved.

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