A Guide to Patent Searching Using Publicly Accessible Databases

Indian Institute of Technology Jodhpur
India

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# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BACKGROUND</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>WHAT IS A PATENT</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>ANATOMY OF A PATENT SPECIFICATION</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>BOOLEAN OPERATORS AND CONSTRUCTING STRATEGIES FOR SEARCHING USING KEYWORDS</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>INTRODUCING PATENT CLASSIFICATION SYSTEMS</strong></td>
<td>7</td>
</tr>
<tr>
<td><strong>INTERNATIONAL PATENT CLASSIFICATION SYSTEM (IPC)</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>COOPERATIVE PATENT CLASSIFICATION (CPC)</strong></td>
<td>11</td>
</tr>
<tr>
<td><strong>SEARCHING PATENT DATABASES</strong></td>
<td>14</td>
</tr>
<tr>
<td><strong>ESPACE-NET</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>US PATENT and TRADEMARK OFFICE (USPTO):</strong></td>
<td>17</td>
</tr>
<tr>
<td><strong>PATENTSCOPE</strong></td>
<td>24</td>
</tr>
<tr>
<td><strong>THE INDIAN PATENT OFFICE DATABASE (inPASS)</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>CONCLUDING REMARKS</strong></td>
<td>33</td>
</tr>
</tbody>
</table>
Foreword

Indian Institute of Technology, Jodhpur, India issued its Intellectual Property Rights Policy in December 2019. Among other nuances in the IIT Jodhpur IPR Policy, every postgraduate student and PhD researcher is expected to conduct a holistic literature search covering all forms of literature including patent documents, create and formally submit a comprehensive technology landscape on her/his research project prior to starting the research and also with the synopsis at the end of the research, to be submitted as a partial requirement of the thesis / dissertation.

It was therefore thought essential to expose all the postgraduate students, PhD researchers and Faculty in IIT Jodhpur to basics of patent searching and how to derive technology-based information from patent documents for the preparation of their respective technology landscapes.

Professor Prabuddha Ganguli, Advisor, IIT Jodhpur designed "Patent Searching Training Workshops" and conducted a series of workshops with technical support of Patent Search Experts from the Unit for Research and Development of Information Products (URDIP), Pune, India, which is one of the Council of Scientific and Industrial Research (CSIR). Three Hundred and Sixty Post graduate Students, PhD Researchers, and One Hundred and Fifteen Faculty Members in IIT Jodhpur participated in these workshops during February-March 2020.

It was decided to produce a hand-holding “Guide to Patent Searching” that would serve as a friendly lead companion to each researcher, as they set-out on their “patent searching journey”.

I am pleased release this document titled, “A Guide for Patent Searching Using Publicly Accessible Databases”, authored by Professor Prabuddha Ganguli, with technical inputs from Mr. Venkataraman Parthasarathy & Mr. Nishad Deshpande, Unit for Research and Development of Information Products (URDIP). I am grateful to Dr. Kishore Sreenivasan, Director, URDIP for his support extended to IIT Jodhpur in this venture.

This document is being released under the “Creative Commons Attribution-Non-Commercial-ShareAlike (CC BY-NC-SA) in the interest of the global academic community.

I hope the document will find wide usage among the academic and research community and help to enhance the quality of research in our institutions.

Professor Santanu Chaudhury
Director, Indian Institute of Technology, Jodhpur.
April 2020
Background

Every researcher identifies a technical problem to be solved. It is likely that the problem is known and several earlier workers have explored solutions to the said problem. Alternately, the research problem may be new, but bears similarity to problems in a non-related field from which some leads to the solution may be explored and exploited. It is also possible that the problem is totally new and therefore no solutions exist in the public domain.

In all such cases, an exhaustive literature search is imperative to understand the contours of the existing knowledge in the context of the defined problem. Most researchers are quite contented with literature searches covering books, journals, and other digital and non-digital public knowledge sources.

What is a Patent

Let us begin by understanding what a patent is.

In simple terms, a Patent is

- A grant by a Sovereign or State to a person giving exclusive right to Stop others from "making, using, exercising, vending, offering for sale" an invention for a limited period of time, in exchange for disclosing the invention in a patent specification. 
  Such that any one trained in the art can reproduce the invention

- Patent gives right to the patentee to exclude others from using the Patentee's Invention without the patentee's permission

- Patent Owner has a qualified right to use his own invention. If the laws of the country granting the patent requires the patentee to take clearances from any other statutory body such as for safety, environmental protection, defence, etc, then the patentee can use his invention only after acquiring such clearances.

The following important points from the above statements may be noted:

- The grant of a patent is given by a Sovereign or State. As a country grants the patent, the right is valid only in that country. Therefore, if the inventor wants such a right in other countries, then he will have to apply for the patent in those countries and have the patent granted in those countries.
- The right is a negative right, i.e. to Stop others from "making, using, exercising, vending, offering for sale" the invention without the patentee's permission in the country in which the patent is granted.
- The patent right is for a limited period. The period is 20 years from the date of filing the patent application (provided the patent application gets granted). Further, the patentee has to pay an annual renewal fee to the patent office in
that country to retain the right in that country for that period. After the 20-year period, the patent falls in the public domain and anyone is free to make use of the patented invention without the permission of the patentee.

Further, if the patentee fails to pay the renewal fee (within the specified period), his right lapses and the invention falls in the public domain and anyone can then freely use the patent.

- It is to be noted that the invention is to be disclosed in a “patent specification” such that a person skilled in the art can reproduce the invention.

An invention is first disclosed in a patent application.

It is generally accepted that 70% of the information in a patent document is not published in any other literature. Hence if one does not search patents, one may miss out on a very large volume of relevant literature in a particular field of technology.

This is significant as the disclosure is done in a specified manner, in a specified format, in such detail, that a person skilled in the art should be able to reproduce it. A patent specification is therefore one of the most structured documents of technical disclosure. It is to be appreciated that publications in journals, books and in other forms, the disclosures are generally not done in such detail.

A patent specification because of its detailed disclosure (unlike in a publication) also becomes a source to identify the technical solutions to problems provided by others, analyse their pitfalls, the approaches taken in the prior art to overcome them, and yet leaving several limitations thereby creating opportunities for incremental (or even breakthrough) innovations to fill the existing technology gaps.

Every field of a patent specification is indexed and hence can be retrieved in a digital search. All fields of technologies are classified in an International Patent Classification Scheme (IPC) and hence in a search, the documents can be searched / identified / retrieved using the IPC codes which will be illustrated in a later part of this document.
Further, a patent application undergoes an examination at the patent offices. The examination process is done in detail to establish the “novelty”, “inventive step” and “industrial applicability / usefulness/ utility”. The entire examination process is transparent and all the correspondence between the patent examiner and the patent applicant are also made publicly available to the public in the patent office websites.

Every patent application (whether examined or in the process of examination) is published after 18 months of its filing date and is accessible to the public. Therefore, the first time one is able to access information in a patent database is at least 18 months old.

Further, every patent when granted, is also published in the patent office website. From this publication, one is able to identify the changes that have been made in the patent application during the course of the examination.

**Anatomy of a Patent Specification**

A patent document contains information that covers Bibliographic, technical and legal.

```
<table>
<thead>
<tr>
<th>Patent Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cover page with Bibliographic Information, Abstract and a figure if relevant</td>
</tr>
<tr>
<td>• Text structured as follows:</td>
</tr>
<tr>
<td>➢ Background and Prior art … defining the problem, reference to prior literature including patents, identifying the gaps in technology to be addressed</td>
</tr>
<tr>
<td>➢ Summary of the invention… defining the gap in technology being addressed &amp; enlisting the various objects of the invention</td>
</tr>
<tr>
<td>➢ Detailed Description… describing the invention in detail with reference to figures if relevant. Also providing the variants of the invention with the best working examples known to the inventor(s). Results in the form of tables and figures (including gene sequences), constructions, molecular structures, etc.</td>
</tr>
<tr>
<td>➢ Claims… verbalised boundaries of the invention for which the protection is sought (in a patent application) or claimed (in a granted patent)</td>
</tr>
</tbody>
</table>
```

The **cover page for patents / patent applications in most countries** with bibliographic details contain the following information:

The country in which the patent application has been made / granted, the patent application number / granted number, date of which the patent was filed, the title of the patent application / granted patent, the inventors, the assignee(s), abstract, a diagram illustrating the invention (where relevant), the priority date and the country in which the patent application publication of the document, date on which it was first filed, the national and international patent classification numbers, field indexing numbers for retrieval purposes. In some countries, the literature and patent references cited by the examiners are also included in the cover page.

An illustration of a cover page of a published US Patent Application and a US Granted Patent for an invention related to engineering are illustrated to appreciate the bibliographic details.
Cover page of the corresponding US Patent Application
Pub. no. is 20040201256 A1
Suffix A indicates that it is not yet granted by is still a published patent application
Note no references by examiner as it is not yet examined
Note the filing no. and date
There were 31 claims in the specification though not mentioned in the cover

One should therefore study the patent application and the examination reports to understand why the claims were amended. This will give a clue to the technical aspects and the inventive step vis-à-vis the prior art.

The patent specification in the field of the invention and summary of the invention identifies the problem the invention solves and what the invention does and what effect
the invention produces. The detailed description provides details of how the invention constructed, what materials or methods are used in the construction of the invention, and illustrates through a set of examples the best method of working the invention so that a person skilled in the art can reproduce the invention.

*It is advised to read the patent document (download patent US6820924 B2) to appreciate the manner in which the details of an invention that is disclosed and claimed.*

**Boolean operators and constructing strategies for searching using keywords**

Boolean operators are used to combine and / or exclude keywords in a search strategy.

The commonly used Boolean operators are: "AND", "ANDNOT" (or simply "NOT"), "OR", "XOR", "NEAR", “ADJ”, “SAME”.

The use of these operators is illustrated in the Box below:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>tennis AND ball</td>
<td>documents having both the word “tennis” and “ball”</td>
</tr>
<tr>
<td>tennis ANDNOT ball</td>
<td>documents having the word “tennis” but not “ball”</td>
</tr>
<tr>
<td>tennis OR ball</td>
<td>documents having either the word “tennis” or “ball” or both</td>
</tr>
<tr>
<td>tennis XOR ball</td>
<td>documents having either the word “tennis” or “ball” but not both</td>
</tr>
</tbody>
</table>

**Truncations** called a wildcard operator, may be used to truncate words (i.e. shortened to their primary root or stem, by reducing its length) and is represented usually by an asterisk (*), a question mark (?), a dollar sign ($), or a percent sign (%) depending on the search engine of the patent database being searched. This increases the coverage of the search. An example of the use of truncation is illustrated in the Box below:
Nesting is an operation done by use of parentheses ( ) to organize search queries in order to resolve potentially confusing search syntax. An example of the use of Nesting is given in the Box below:

<table>
<thead>
<tr>
<th>tennis AND ball OR racket</th>
<th>➜</th>
<th>two potential search outcomes to be resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>(tennis AND ball) OR racket</td>
<td>➜</td>
<td>documents having either the words “tennis” and “ball” or the word “racket”</td>
</tr>
<tr>
<td>tennis AND (ball OR racket)</td>
<td>➜</td>
<td>documents having the word “tennis” and either the word “ball” or “racket”</td>
</tr>
</tbody>
</table>

Phrases are created by using quotation marks (« ») to surround a single search. If a group of words is surrounded with quotation marks (« ), everything surrounded by those quotation marks will be treated as a single search term. This allows one to search for a multi-word phrase rather than specifying each word as a separate term. This is illustrated in the Box below:

<table>
<thead>
<tr>
<th>tennis ball</th>
<th>➜</th>
<th>documents having both the words “tennis” and “ball” (by default often treated as an “AND” clause)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“tennis ball”</td>
<td>➜</td>
<td>documents having the phrase “tennis ball”</td>
</tr>
</tbody>
</table>

NEAR operator ….. used to include variations on phrases containing two terms in any order (e.g., “metal cutting”, “cutting metal”, “cutting of metal”, and “cutting through metal”) but to exclude documents in which the terms appear out of context with each other, which might occur if the “AND” operator is used. The use of this operator is illustrated in the box below:

<table>
<thead>
<tr>
<th>tennis NEAR ball</th>
<th>➜</th>
<th>documents having both the words &lt;tennis&gt; and &lt;ball&gt; within a certain number of words of each other. A numerical following NEAR specifies the number of words of each other</th>
</tr>
</thead>
</table>
The **NEAR** operator can also be used with a numerical (e.g. 1, 2, 3, 4, 5) after NEAR to define the maximum distance between the search terms. For example, **NEAR5** specifies that the two terms in any order should be within 5 words distance.

**Ordered proximity operator such as BEFORE(insert a numerical)** may be used to indicate that the two words have to be ordered in a particular way and the distance between the two words in that order should be within the numerical indicated after **BEFORE**. The use of this operator is illustrated with an example in the box below:

```
Ordered: Search terms must be in given order (and within specified distance)
corn BEFORE5 fertilizer (in PATENTSCOPE)
```

**ADJ** operator ……used to link terms close to each other and in the same order

**SAME** operator ……used to identify terms in the same paragraph.

---

**Introducing Patent Classification Systems**

In the Patent System, all fields of technologies have assigned at least one classification term indicating the subject to which the invention relates and may also be assigned further classification and indexing terms to give further details of the contents. Such a classification helps to slot every invention to a specific set of fields of technologies according to their subject matter. As these are indexed, they become searchable independent of the language in which the patent is written or even the words/expressions used to represent the features of the invention. These classifications are done by the professionals in the patent offices and hence possess a fairly high degree of uniformity.

Various countries have their patent classification systems. However, there are three patent classifications systems that are most commonly used namely, i) International Patent Classification (IPC) System, administered by the World Intellectual Property Organisation (WIPO); ii) Cooperative Patent Classification System (CPC), jointly developed by the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO); iii) US Patent Classification System (USPC) developed and followed by the USPTO.

The CPC has come into force from February 1, 2020 in the EPO and the USPTO.

Therefore, while conducting searches in these databases, one has to be careful to select the appropriate patent classification system and the conventions for their representations in each of the patent databases.
International Patent Classification System (IPC)

The official Guide to the IPC provides comprehensive information on the IPC. It is available for download on the WIPO website of the IPC at [https://www.wipo.int/classifications/ipc/en/general/](https://www.wipo.int/classifications/ipc/en/general/)


This is an internationally accepted hierarchical system for classifying technologies that are disclosed in patent documents. All technologies are classified into 8 Sections, which are further subdivided into classes, subclasses and groups.

This classification system serves as an effective search tool for the retrieval of patent documents and ordering patent documents in order to facilitate access to the technological and legal information.

When one does key word searches, the choice of the words is important. The patent attorneys use various expressions / jargons to convey the same concept / word. For example, Swimming pool is replaced by “water retaining recreational structure”; Balloon expressed as “spherical device filled with gas for recreational purposes”; Paper bin as “arrangement for the disposal of refuse”; Shoe as “footwear”; Helmet as “head protector”, “hardhat”, “headgear”, etc.

Therefore, the choice of the “key words” would determine result of a patent search. Most technical persons are not too familiar with the techno-legal jargons used by lawyers. The IPC codes provide a “terminology / jargon independent” tool for patent searches. Further, the IPC codes provide standardized application to documents (by experts of patent offices) and is available for (old) patent documents where no full text of claims / description is available. Also, concept searches can be done easily.

Very often, the search results giving too many search results are targeted and narrowed by combining key words with IPC codes. This aspect will be illustrated in the section dealing with searches using different databases later in this document.

It is to be appreciated that patents are written in various languages and hence selection of appropriate key words is difficult. Under such circumstances, the IPC Codes which are language independent becomes a useful search tool.
As is seen in the above presentation, to conduct a search on Special Purpose Chairs, the first step is to identify the section in which chairs would be classified. As it is a human need, the Section is obviously “A”. As chair is a furniture, the class is A47. In A47, one then drills down to the subclass of chairs which is 47C. Then one proceeds to the groups of “Chairs adapted for special purposes” which can be identified from the main group A47C 1/00 followed by the various subgroups as indicated in the presentation. Targeted searches for the relevant patents can be done using the appropriate subgroup if properly identified.

Similarly, in the other example of method of splicing or joining rope two different subcategories were identified. Therefore, searches have to be done in both the subcategories to obtain the patents dealing with this technical subject.

The simplest way to get the IPC codes for the subject you are intending to search is to go to the IPC home page on:


Then click on search, enter the words in the search box and you will get all the relevant IPC codes for the subject you have entered. In the present case, we typed reclining chair and obtained all the relevant IPC codes for this subject.
Each one of the IPC codes is ordered by relevance, each one representing a specific aspect of “Special Purpose Chairs”. A47C 1/02 deals with reclining chairs. A47C1/028 deals with “arrangements for changing a straight chair into an easy chair”.


When we click on the scheme and then on the left-hand side input this “IPC” we get the following window:
Please note that the patent in question is dealing with Super structure subunits in vehicles and the groups provide the finer distinctions in the technology with regard to the parts, etc.

The IPC covers practically every field of technology and is regularly revised as new technologies evolve. For example, when nanotechnology and its applications became a reality, the IPC introduced a new IPC code for this technology namely B82Y with a set of subclasses and groups as is illustrated in the Box below:

<table>
<thead>
<tr>
<th>IPC Patent Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>B82Y5</td>
<td>Nanobiotechnology or nano-medicine</td>
</tr>
<tr>
<td>B82Y10</td>
<td>Nanotechnology for information processing, storage and transmission</td>
</tr>
<tr>
<td>B82Y15</td>
<td>Nanotechnology for interacting, sensing and actuating</td>
</tr>
<tr>
<td>B82Y20</td>
<td>Nanotechnology for optics</td>
</tr>
<tr>
<td>B82Y25</td>
<td>Nanomagnetism</td>
</tr>
<tr>
<td>B82Y30</td>
<td>Nanotechnology for materials and surface science</td>
</tr>
<tr>
<td>B82Y35</td>
<td>Methods or apparatus for measurement or analysis of nanostructures</td>
</tr>
<tr>
<td>B82Y40</td>
<td>Manufacture or treatment of nanostructures</td>
</tr>
</tbody>
</table>

However, if you are interest to study the IPC in more details, go to the IPC Training material available in [https://www.wipo.int/classifications/ipc/en/training/](https://www.wipo.int/classifications/ipc/en/training/)

In the training material WIPO has presented examples pertain to different technical fields (mechanics, electricity and chemistry) and address a variety of different aspects of increasing complexity which are related to the use of the IPC for classification. They are primarily based on examples of real patent applications having family members in different languages, or, in some cases, on artificial examples.

Cooperative Patent Classification (CPC)
[https://www.cooperativepatentclassification.org/index](https://www.cooperativepatentclassification.org/index)

The CPC has been jointly developed by the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO). The CPC is substantially based on the previous European classification system (ECLA), which itself was a more specific and detailed version of the International Patent Classification (IPC) system. The CPC system has over 250,000 categories of subjects related to diverse technologies. CPC has come into force in the EPO and USPTO from February 1, 2020.
The migration to CPC was developed based in large part on the existing European Classification System (ECLA) modified to ensure compliance with the International Patent Classification system (IPC) standards administered by the World Intellectual Property Organization (WIPO).

The Cooperative Patent Classification (CPC) is an extension of the IPC, divided into nine sections, A-H (as in IPC), and Y (extra in CPC), which in turn are subdivided into classes, subclasses, groups and sub-groups.

<table>
<thead>
<tr>
<th>The nine CPC sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>E</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td>H</td>
</tr>
<tr>
<td>Y</td>
</tr>
</tbody>
</table>

**CPC  COOPERATIVE PATENT CLASSIFICATION**

**Y  GENERAL TAGGING OF NEW TECHNOLOGICAL DEVELOPMENTS; GENERAL TAGGING OF CROSS-SECTIONAL TECHNOLOGIES SPANNING OVER SEVERAL SECTIONS OF THE IPC; TECHNICAL SUBJECTS COVERED BY FORMER USPC CROSS-REFERENCE ART COLLECTIONS [XRACs] AND DIGESTS**

**NOTES**

1. In this section, classes Y02 and Y04 are only to be used for tagging documents which are already classified or indexed elsewhere and which relate in a broad sense to specific major technical fields, these fields being defined by the notes following the title of the subclasses of this section.

2. As the primary purpose of the tagging according to Note (1) is to monitor new technological development and to tag cross-sectional technologies that do not fit in a single other section of the IPC, the tagging codes of this section do not in any way replace the classification or indexing codes of the other sections.

3. Class Y10 has been introduced in July 2012 in view of the CPC to accommodate for technical subjects formerly covered by USPC cross-reference art collections [XRACs] and digests.

**Y02  TECHNOLOGIES OR APPLICATIONS FOR MITIGATION OR ADAPTATION AGAINST CLIMATE CHANGE**

**NOTES**

1. This class cover selected technologies, which control, reduce or prevent anthropogenic emissions of greenhouse gases [GHG], in the framework of the Kyoto Protocol and the Paris Agreement, and also technologies which allow adapting to the adverse effects of climate change.

2. If appropriate, a document can receive more than one indexing code of this class.

**Y02A  TECHNOLOGIES FOR ADAPTATION TO CLIMATE CHANGE**

**NOTE**

This subclass cover technologies for adaptation to climate change, i.e. technologies that allow adapting to the adverse effects of climate change in human, industrial (including agriculture and livestock) and economic activities.
The “Y” Section in CPC therefore specifically addresses the emerging technologies so that patents related to these fields can be easily searched.
## Searching Patent Databases

The commonly searched free patent databases are:

<table>
<thead>
<tr>
<th>Database</th>
<th>URL</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Espacenet European Patent Office (EPO)</td>
<td><a href="https://worldwide.espacenet.com/">https://worldwide.espacenet.com/</a></td>
<td>Patent database covering over 100 countries. Also, Possible to access patent prosecution history in the EPO On-line Translation also available</td>
</tr>
<tr>
<td>WIPO Patentscope</td>
<td><a href="https://patentscope.wipo.int/search/en/search.jsf">https://patentscope.wipo.int/search/en/search.jsf</a></td>
<td>PCT Publications Online translation also available</td>
</tr>
<tr>
<td>Indian Patent Office</td>
<td><a href="http://ipindia.nic.in/patents.htm">http://ipindia.nic.in/patents.htm</a></td>
<td>Patent Applications made in India and granted patents in India. Possible to access the patent prosecution history.</td>
</tr>
<tr>
<td>Google Patents</td>
<td><a href="https://patents.google.com/">https://patents.google.com/</a></td>
<td>Covers patent publications and granted patents in Japan, China, WIPO(PCT), Europe, Germany, Canada.</td>
</tr>
</tbody>
</table>
These databases allow searches using:

- Keywords
- Patent classification (IPC)
- Dates (e.g., priority date, application date, publication date, grant date)
- Patent reference or identification numbers (application number, publication number, patent number)
- Names of applicants/assignees or inventors

Though the general principles of searching are applicable in all the databases, it is to be appreciated that each database has its own search engine with their respective nuances. Hence it is advisable to go to the website and first familiarise on their respective nuances. Each website has a help desk and/or has a familiarisation video to hand-hold the users.

Practical Exercises: Searching Patent Databases

Espacenet:

https://worldwide.espacenet.com/ [home page]
https://www.epo.org/searching-for-patents.html

It is advisable for each user of Espacenet to see the video online and take the patent information tour which consists of four learning units. Each of them has an introductory video and two or three theory chapters. At the end of each chapter there are exercises for you to test what you have learnt. [https://e-courses.epo.org/wbts/pi_tour/index.html]

To search go to https://worldwide.espacenet.com/?locale=en_EP
On the left side of the screen there are three options, namely “smart search”, “advanced search” and “classification search”.

Let’s define a problem and then conduct a patent search in Espacenet.

**Problem:** What is the prior art for conversion of sugar to ethanol by fermentation?

First using the “advanced search” option, we can input the following key words: Ethanol production from sugar fermentation.

We get 28 hits as shown in the screen.

Then we refine the search with the keywords: ethanol production from sugar and yeast.

We get 10 hits as shown in the screen.
We then click on the classification search and input the word yeast to find out the classification. The search gives a result shown in the screen.

Note that the classification search was done under the Cooperative Patent Classification (CPC) which is followed by the European Patent Office. Going down the screen, under preparation of oxygen containing compounds (ethanol is an oxygen containing compound), the classification is C12P 7/00.

We now combine the classification and the key word sugar in title or abstract with C12P7/00 in the CPC (in the advanced search).

We get 8 targeted hits from over 100 million documents from over 100 countries.

These can be marked, saved and downloaded. Further, on options bar next to the quick help, one can compact the results, export them in the form of on the top of there is an option to download the results in the form of CSV/XLX report.

You can click on the document to download it. One can also use the patent translate facility in the ESPACENET.

US Patent and Trademark Office (USPTO):

https://www.uspto.gov/


https://www.uspto.gov/patents-application-process/search-patents

The home page on the top left presents the various options for search in PaFT Patents (granted patents) and AppFT (published patent applications). Further the options for quick search and advanced search are possible.
The screen shots of the quick search. Also note below the multiple fields that are supported by the quick search. Search can be conducted using the terms and Boolean operators in any of the fields selected for the search.
The adjacent screenshot is for the advanced search in which a string of terms can be combined using Boolean Operators in a manner indicated in the right half of window. Search can be done using the field codes as indicated.

We shall now illustrate how searches are done in the USPTO both for simple search and advance search.

**Problem:** What is the prior art for conversion of xylose sugar to ethanol using a yeast strain?

We use the quick search option by inputting xylose and ethanol as two terms and search in the field “abstract”.

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**USPTO Patent Full-Text and Image Database**

**Data current through March 31, 2020.**

**Query [Help]**

**Term 1:** in Field 1: Abstract

**Term 2:** in Field 2: Abstract

**Select years [Help]**

We shall now illustrate how searches are done in the USPTO both for simple search and advance search.

**Problem:** What is the prior art for conversion of xylose sugar to ethanol using a yeast strain?
The result is given in the screenshot below:

Clicking on the relevant title / patent number retrieves the patent specification as indicated.

Note that the Abstract mentions **Saccharomyces cerevisiae for the fermentation.**

Using this information, we can now do an advanced search using Xylose and Saccharomyces

**We now proceed to illustrate the features of Advanced Search.**
List of codes for various fields:

<table>
<thead>
<tr>
<th>Field Code</th>
<th>Field Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABST</td>
<td>Advanced Search Query</td>
</tr>
<tr>
<td>ABST/</td>
<td>ABST/(xylose AND ethanol AND Saccharomyces)</td>
</tr>
</tbody>
</table>

**Advanced Search Query**

ABST/(xylose AND ethanol AND Saccharomyces)

The Result of the advanced search is given in the Screen Shot Below
We need to explore how to use Cooperative Patent Classification (CPC) for such a search in the USPTO


At first, we have to identify the CPC Code for Fermentation using microorganisms. Further in earlier simple search we have also identified Saccharomyces cerevisiae as the microorganism for the fermentation. One can type fermentation in the search and on clicking the search icon, a window with all the CPC Codes for fermentation opens. C12P is the code for fermentation. C12P can be further examined for the subgroups in the CPC as shown in the screenshot.

CPC Definition - C12C BEER; PREPARATION OF BEER BY FERMENTATION (ageing or ripening by storing C... https://www.uspto.gov/web/patents/classification/cpc/html/defC12C.html

CPC Definition - C12P FERMENTATION OR ENZYME- USING PROCESSES TO SYNTHESISE A DESIRED CHEMICAL COM...
https://www.uspto.gov/web/patents/classification/cpc/html/defC12P.htmlLast Updated Version: 2020.01 C12P FERMENTATION OR ENZYME- USING PROCESSES TO SYNTHESISE...amplification reactions C12Q 1/6844; fermentation processes ...

CPC Definition - C12F RECOVERY OF BY-PRODUCTS OF FERMENTED SOLUTIONS (removal of yeast from wine... https://www.uspto.gov/web/patents/classification/cpc/html/defC12F.html...02 C12F RECOVERY OF BY-PRODUCTS OF FERMENTED SOLUTIONS (removal of yeast from...rectification or recovery of by-products of fermented solutions ...

Note that C12P 7/00 is the code for preparation of oxygen containing compounds and C12P 7/065 is code for preparation of these compounds using microorganisms other than yeasts.
An advanced search carried out using this CPC as C12P7 in combination with keywords xylose and ethanol in the abstract does not give any hits.

No hits for C12P7

This means that the CPC Code has not been entered correctly. Adding the digits of the specific subgroups is necessary. By correcting the CPC code, we get 5 hits as indicated below.

One needs to add more digits for specific subgroups eg C12P7/00 OR C12P7/10
However, if there is need to search for any of the subgroups, then we can make use of truncation operator ‘$’.

Using this operator will return patents having IPC codes with any of the subgroups under that specific group eg If C12P7$ is used in search query, it will return patents with C12P7/00 OR C12P7/02 OR C12P7/06 OR C12P7/10 etc.

However, one has to use the patent classification scheme with caution as inappropriate use may result in very restricted results, which could be misleading.

**PATENTSCOPE**


The PATENTSCOPE database provides access to international Patent Cooperation Treaty (PCT) applications in full text format on the day of publication, as well as to patent documents of participating national and regional patent offices. It is to be appreciated that the PCT Patent Applications are published 18 months after the priority date (i.e. date on which the patent application was first filed in any PCT Country).

The information may be searched by entering keywords, names of applicants, international patent classification and many other search criteria in multiple languages.

Further, the PATENTSCOPE provides access to more than 83 million patent documents with options for Simple Search, Advanced Search, Field Combination, Cross Lingual Expansion and Chemical Compounds Structure (with login). Clicking on the Tool one gets options such as WIPO translate (to obtain machine translation of the patent documents in a wide range of languages), WIPO Pearl (to conduct a linguistic search giving access to scientific and technical terms derived from patents), IPC Green (facilitates searches for patent information relating to Environmentally Sound Technologies (ESTs)), Patent Register Portal which acts as a gateway to online patent registers and gazettes and to legal-status-related information from over 200 jurisdictions and patent information collections.

We now proceed to familiarise ourselves with the searching options and process in the PATENTSCOPE database.

The URL https://patentscope.wipo.int/search/en/search.jsf presents the Simple Search Window as default with options for use of key words and search in a variety of fields, such as, front page, full text.

We shall conduct a search on the production of ethanol from Xylose.

The search terms are Xylose and Ethanol. The search is conducted in the field “Front Page”.

The search yields 997 hits as is shown in the screenshot. Each document can be opened by clicking on the publication number.
It is possible to filter the results based on the Countries, Applicants, inventors, and the results can be presented in the form of charts as histograms, per charts, etc.

The search can be targeted using the IPC or CPC code identified from the opened document.

Tabs can be used to read specific sections of the document.

1. **1. WO1982004068 - DIRECT FERMENTATION OF D-XYLOSE TO ETHANOL BY A XYLOSE-FERMENTING YEAST MUTANT**

   **Abstract**

   A process for obtaining ethanol directly from D-xylose through fermentation of D-xylose by yeasts was discovered. The process is used to obtain ethanol from renewable raw materials. The process is particularly useful for obtaining ethanol from D-xylose. Moreover, the process also provides for obtaining ethanol from D-xylose, fermentation process is performed using a yeast strain selected from the following: **Saccharomyces cerevisiae**, **Baker's yeast**, and **Komagataeae sp.**

   A patent publication on **WO2012/020551** is described in this document.

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### Filters

<table>
<thead>
<tr>
<th>Countries</th>
<th>Applicants</th>
<th>Inventors</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States of America</td>
<td>156</td>
<td>Zhang Mei</td>
</tr>
<tr>
<td>China</td>
<td>187</td>
<td>Zhang Mei</td>
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<tr>
<td>PCT</td>
<td>342</td>
<td>Zhang Mei</td>
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<tr>
<td>European Patent Office</td>
<td>93</td>
<td>Zhang Mei</td>
</tr>
<tr>
<td>Canada</td>
<td>75</td>
<td>Zhang Mei</td>
</tr>
</tbody>
</table>

### Analysis

- **Targets**: Applicants, inventors, IPC code, publication date
- **Changes**: Chart type, data visualization, interactive elements

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26
Advanced Search: Key word search can be done in all patent offices or in specific country patent offices.

The search can be done in specific country patent offices as illustrated in the screen shot.

The results of the advance search using the key words may be viewed as in the SIMPLE SEARCH as shown in the screen shot.
ADVANCED SEARCHES can be conducted by combining the key words with various fields including the IPC. The Boolean Operators can be used to combine the search terms.

Combining Xylose in Front page and Ethanol in abstract results in 972 hits.

Combining Xylose in Front page, Ethanol in abstract and the IPC Code for Fermentation C12P7/00 results in 697 hits.
Note the output of 697

Xylose in Front page, Ethanol in abstract, IPC for fermentation C12P7/00 and IPC Code C12R1/85 for Saccharomyces are now combined

The result of the above search results in 96 hits

By clicking on each publication number, the complete document can be downloaded and read.

The systematic reduction in the number of hits and its relevance has to be assessed in the context of the problem to be solved. Narrowing the search with too much of specificity, one may lose out on some relevant patents. Search strategies have to be prepared and searches are to be carried out after defining the focal point and the contours of the problem to be researched.

The users’ guide may be used to understand further details of how to use all the features of the PATENTSCOPE.

Further regular webinars are conducted by the World Intellectual Property Organisation (WIPO). The details can be accessed at the URL: https://www.wipo.int/patentscope/en/webinar/

WIPO also publishes PATENTLANDSCAPES on various technologies from time to time that can be freely accessed at the URL https://www.wipo.int/patentscope/en/programs/patent_landscapes/

A formal WIPO ppt presentation on PATENTSCOPE titled: “Discover all the features and functionalities PATENTSCOPE has to offer”, can be downloaded from https://www.wipo.int/meetings/en/doc_details.jsp?doc_id=431712

The Indian Patent Office Database (inPASS)

https://ipindia.nic.in

This is the home page of the Office of the Controller General of Patents, Designs, Trademarks. It also covers Geographical Indications.

When you click on Patents, the next screen opens as shown

The screenshot shows options for search of Patent Applications Published, Patents granted, Application Status and comprehensive e-services for patents.

This website covers patents filed and granted only in India.
Searches can be conducted using key words in combination with various fields using the Boolean Operators.

**We now proceed to search patents for the production of Ethanol from Xylose**

Key words Xylose and Ethanol in Abstract and fermentation in complete specification....Search in published patent applications gives 544 hits; Clicking on the application number will open the document

Key words Xylose and Ethanol in Abstract and Saccharomyces in complete specification fields ....Search in published patent applications gives 235 hits
Key words Xylose and Ethanol in Abstract … Search in granted patents gives 133 hits

Clicking on the patent application number, the document opens. Further, clicking on the e-register gives the details entered in the e-register.

Key words Xylose and Ethanol in Abstract and Saccharomyces in complete specification … Search in granted patents gives 53 hits.

Keywords Xylose and Ethanol in Abstract and C12P in IPC fields … Search in published patent applications gives 9 hits.
Concluding remarks:

From this exercise, one will have to study the patent documents obtained from the searches yielding the least number of hits such as 5 and 9, to access the relevance of those documents in the context of the problem at hand.

After doing this assessment, one will then get to the results with higher number of hits and select the most relevant documents based on a reading of the abstracts and the independent claims to assess their relevance before reading the corresponding complete specifications.

Such an exercise will minimise the possibilities of missing out the most relevant documents in the context of the problem at hand.

Based on the searches made in various databases, and accounting for the common documents found in various countries, one can prepare a report on the prior art from the available patent literature.

These results will have to be merged with the results of the general literature search in books, journals and other academic and commercial literature to construct the technology landscape for the creation of a “research strategy” in the context of the problem at hand.

This process will have to be repeated from time to time and midcourse corrections in the research strategy will have to be done based on the prior art at that point in time.