Patents and Innovation: Changing Methods of Search

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2016

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IEEE Client Services/University Partnership Program Manager

Agenda

- The Rise in University Patenting
- Challenges Facing Academic Inventors
- The Changing Face of Prior Art Search- Semantic Search

The Rise in University Patenting

Why Patent? Reasoning Behind Invention

- Protect your products
- Increase organization value
- Defend your portfolio
- Revenue from licensing opportunities
- Market yourself and your organization
- Restrict competitors

Why Universities Patent?

- 民國八十七年十二月由 法院通過科學技術基本法(以下簡稱科技基本法)，並於去(八十八)年一月公布施行，賦予各研究機構將國有研發成果加以運用之法源依據.
- "Universities continue to encourage and sometimes push scientists to produce transferable technology and reap income from license agreements and start-up successes"
  - -- Amy Yancey & C Neal Stewart Jr. **Are university researchers at risk for patent infringement?** Nature Biotechnology 25, 1225 - 1228 (2007)
- "高校科技成果轉移轉化工作，既要注重以技術交易、作價入股等形式向企業轉移轉化科技成果；又要加大產學研結合的力度，支援科技人員面向企業開展技術開發、技術服務、技術諮詢和技術培訓..."
  - --教育部/科技部關於加強高等學校科技成果轉移轉化工作的若干意見

Are university researchers at risk for patent infringement?

- "Academic researchers have regularly ignored patents on key technologies as a strategy to maneuver around patent thickets and freedom-to-operate issues, but they may be more at risk than they realize."
- "An earlier report to the National Academy of Sciences suggests …**regular infringement of patents by university researchers**, which is neither a sustainable nor a desirable solution."

  – Amy Yancey & C Neal Stewart Jr. **Are university researchers at risk for patent infringement?** Nature Biotechnology 25, 1225 - 1228 (2007)

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Challenges Facing Academic Inventors

Patenting: Not Without Drawbacks

- Costs involved
  - Length of time to patent
  - Cost involved to get the patent
  - Maintenance fees for the life of the patent

- Liability
  - Lawsuits could become associated with a patent
  - Possibility that a granted patent might not be valid
  - A competitor might try and invalidate your patent if the price to do so is reasonable
  - NOTE: The patent owner is responsible for enforcing their own patents

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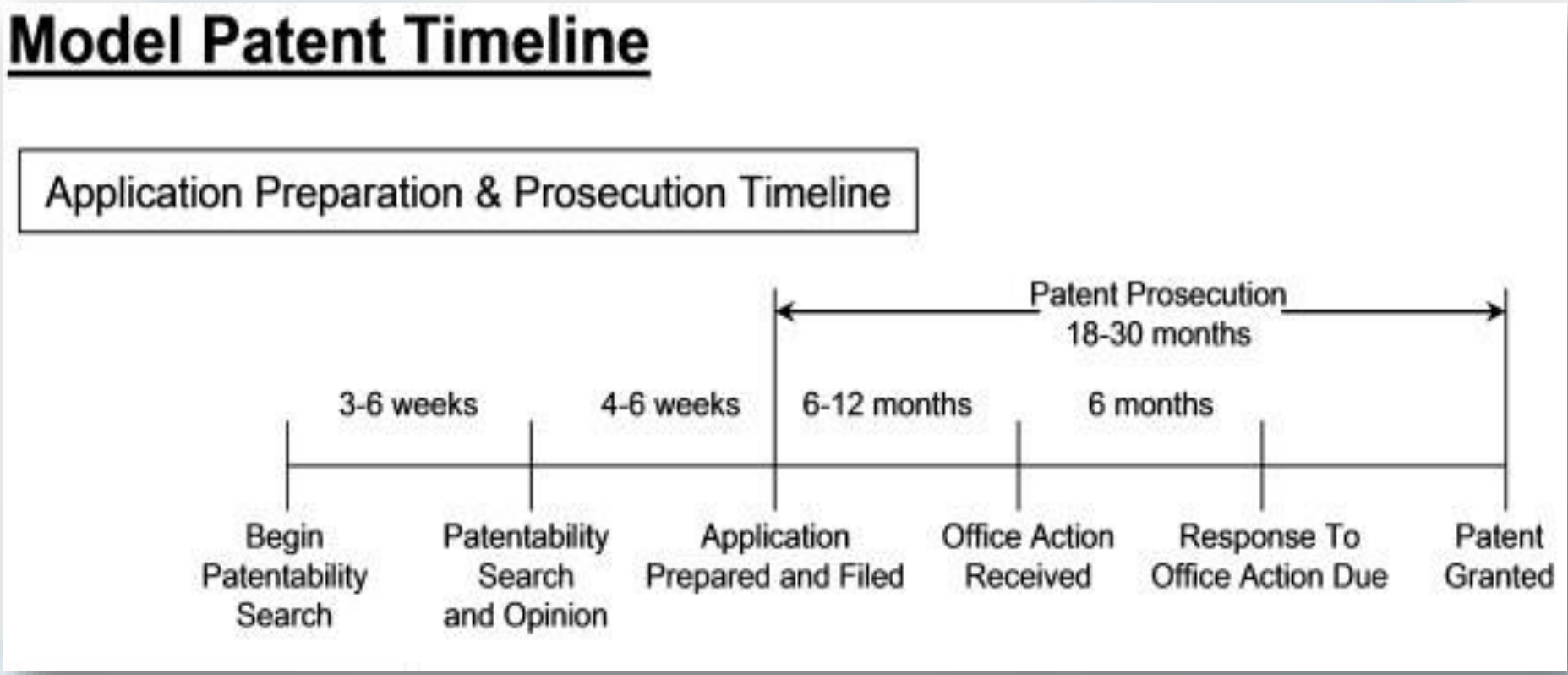
From Idea to US Patent



Source: HepnerLaw.com

Improving Patent Quality

- Current backlog of over 600,000 patent applications at the US Patent and Trademark Office
- Of these applications, over 40% are repeat filings
- After two years of validity reviews, 77% of patents granted are determined invalid

Reasoning For Prior Art Searching

- Ensure the idea is new
- Increase awareness of the product
- Prepare for legal consultation
- Reduce patent attorney and patent agent fees
- Prepare for the application process

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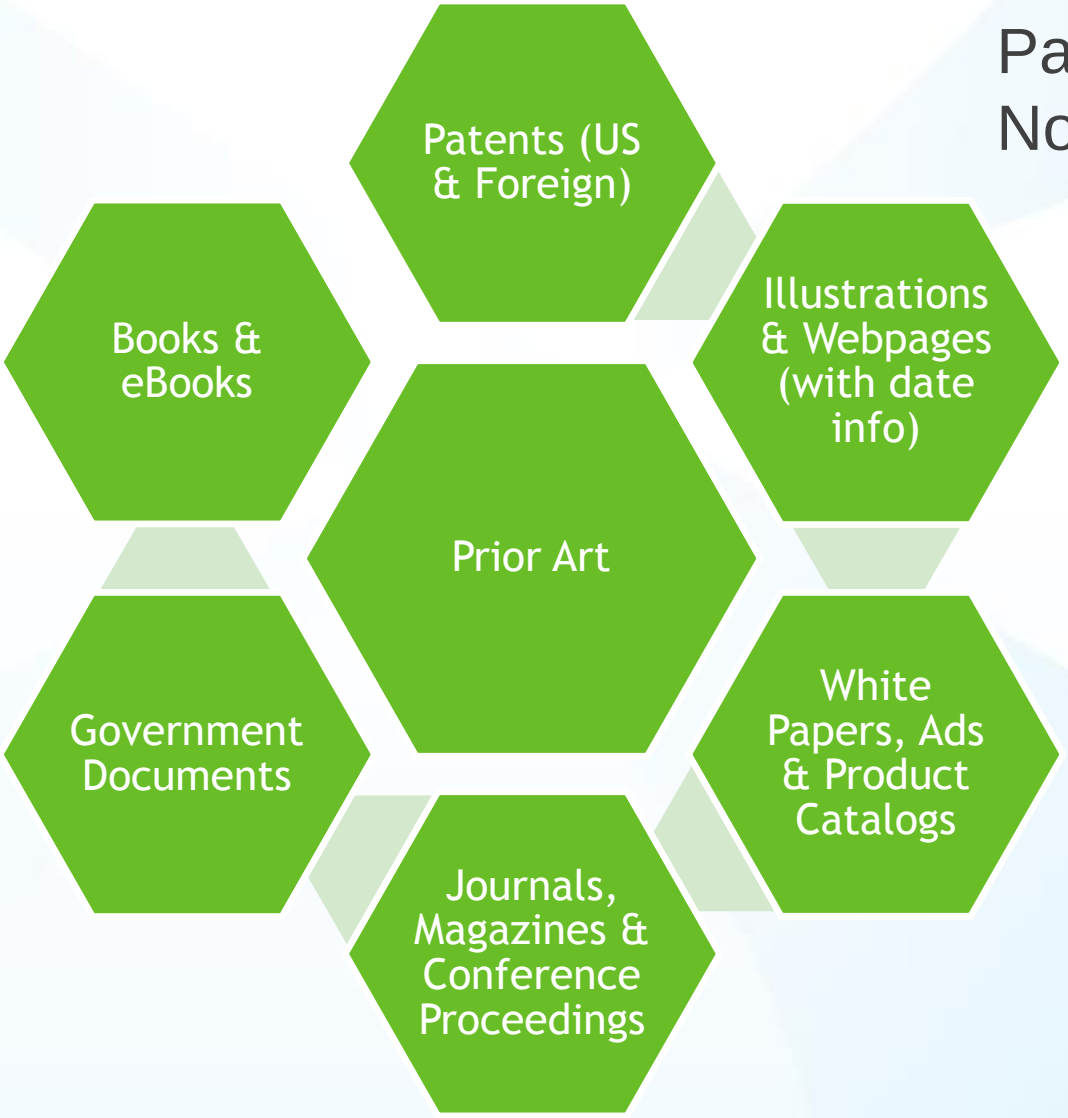
Examples of Prior Art



Patents
Non-Patents

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Patents vs. Non-Patents

Valuable content is typically buried deep within complex patent and technical documents

Source: http://wallscope.co.uk/

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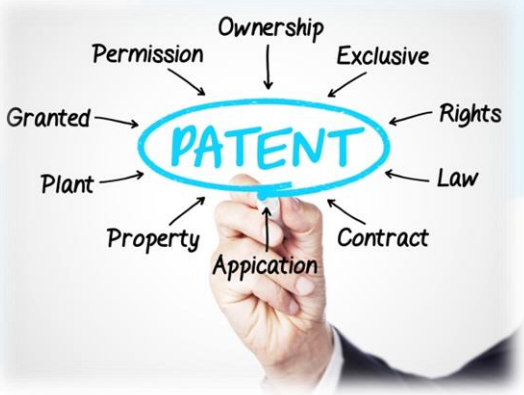
How Can Libraries Help?



- Librarians as experts of searching non-patent literature

- "In patent litigation cases, NPL can help invalidate a patent by uncovering prior work created by someone else. It can also help an inventor build on another person's research to perfect their invention"
  - Outsell Insights, Oct 11, 2016

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Figure 1 – Front Page of Patent # 5,591,372

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"Modeling 1-3 Composite Piezoelectrics: Thickness-Mode Oscillations", W A Smith, B A Auld, IEEE Trans. on Ultrasonics Ferroelectrics and Frequency Control, vol. 38, No. 1, Jan. 1991.
"Properties of Composite Piezoelectric Materials for Ultrasonic Transducers", W A Smith, et al., 1984 Ultrasonics Symposium, IEEE 1984, pp. 539-544. no month.
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"Development of 1-3 Ceramic-Air Composite Transducers", C. Oakley, et al., SPIE vol. 1733 (1992) pp. 274-283. no month.
"Freeze-formed Silica Fibers", W. Hahler, et al., May 1980, Central Research & Development Dept., E.I. duPont de Nemours & Company, Wilmington, Delaware.

Primary Examiner: Bonner; Melissa
Attorney, Agent or Firm: Johnson; Noreen C., Pittman; William H.

"Freeze-formed Silica Fibers", W. Hahler, et al., May 1980, Central Research & Development Dept., E.I. duPont de Nemours & Company, Wilmington, Delaware.

Primary Examiner: Bonner; Melissa
Attorney, Agent or Firm: Johnson; Noreen C., Pittman; William H.

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The Changing Role of Library in University Patenting

- Trends among university libraries in China
  - Information resource provider → Patent service provider
  - Reference librarians → Patent Specialist
  - Non-patent collections → More patent collections

Jun Feng, NaiXuan Zhao. A New Role of Chinese Academic Librarians—The Development of Embedded Patent Information Services at Nanjing Technology University Library, China. The Journal of Academic Librarianship. 41(3), May 2015, P292–300

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The Changing Face of Prior Art Search-Semantic Search

Boolean Search: Traditional Prior Art Searching

Boolean search has been the mainstay of patent research for years:

- Controlled language search
- Ability to combine sets
- Can refine search set by limiters such as AND, OR & NOT
- Some databases support nesting (combining long search strings)

However, Boolean is not without its flaws:

- Requires lengthy training or expert searchers to effectively employ
- Limited to the words included in the query and variations thereof
- Lengthy search strings may be cut off by term limits in some databases

Example of Boolean Search

ALL=(surgical OR curve OR segment) AND suture AND
(((intervertebral OR cutting OR member OR arcuate OR guide)
NEAR5 (bone OR seal)) SAME (tissure OR jaw*)) AND (Instrument OR cannula*1) AND DP>=(19930101) AND IC=(H01L 39/02 OR H01L 39/12 OR H01F 38/14)

Semantic Search: Less is More

A surgical cannula with curved segments used to guide a medical instrument through a curved or bowed path

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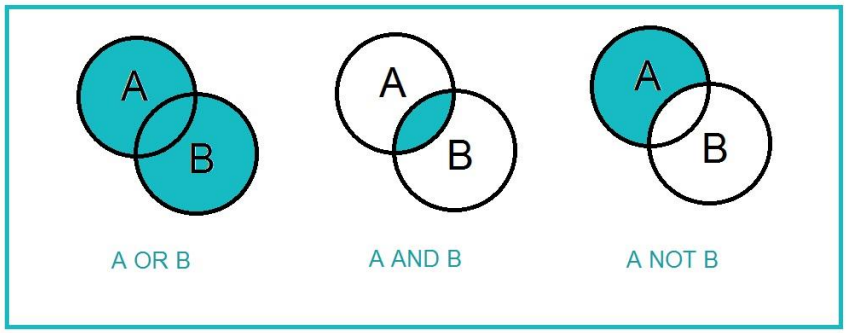
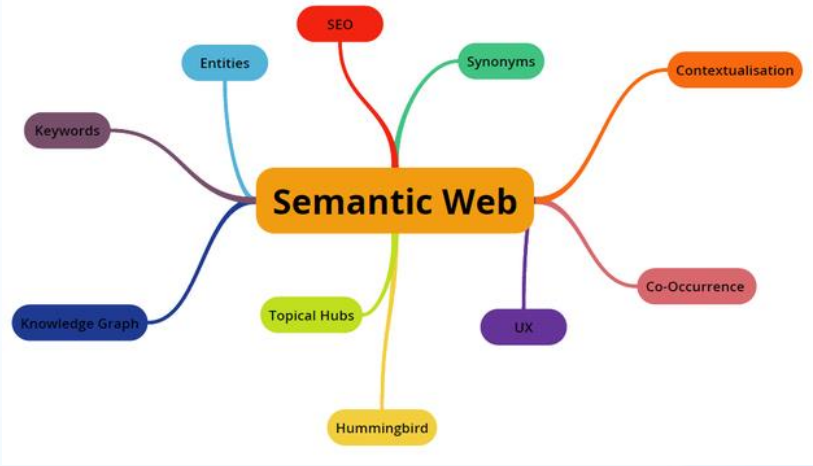
From Boolean to Semantic





A More Comprehensive Search

Boolean Search:
Autonomous vehicle

Discover deeply buried information!

Semantic Search:

Autonomous vehicle	Navigation	Accelerator
Car	Network	Van
Automobile	Locomotive	Pilot
Driver	Fuel	Self driving
Truck	Transport	Wheels
Robot	Route	Tram
GPS	Passenger	Train
Transport	Brake	Bus
Satellite	Engine	Taxi

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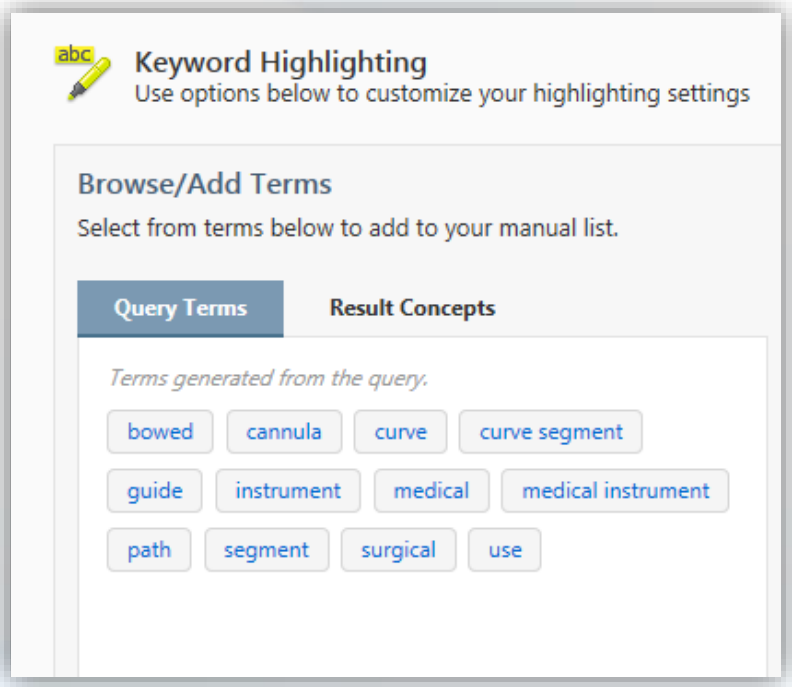
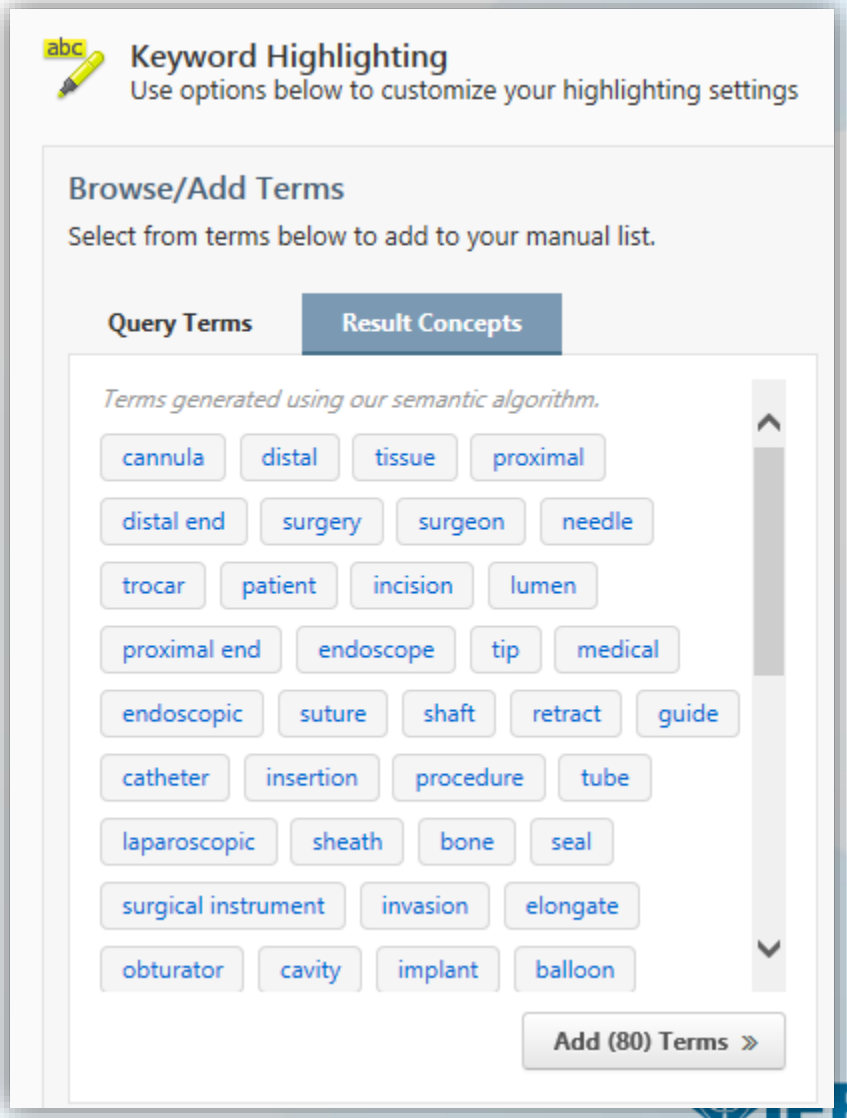
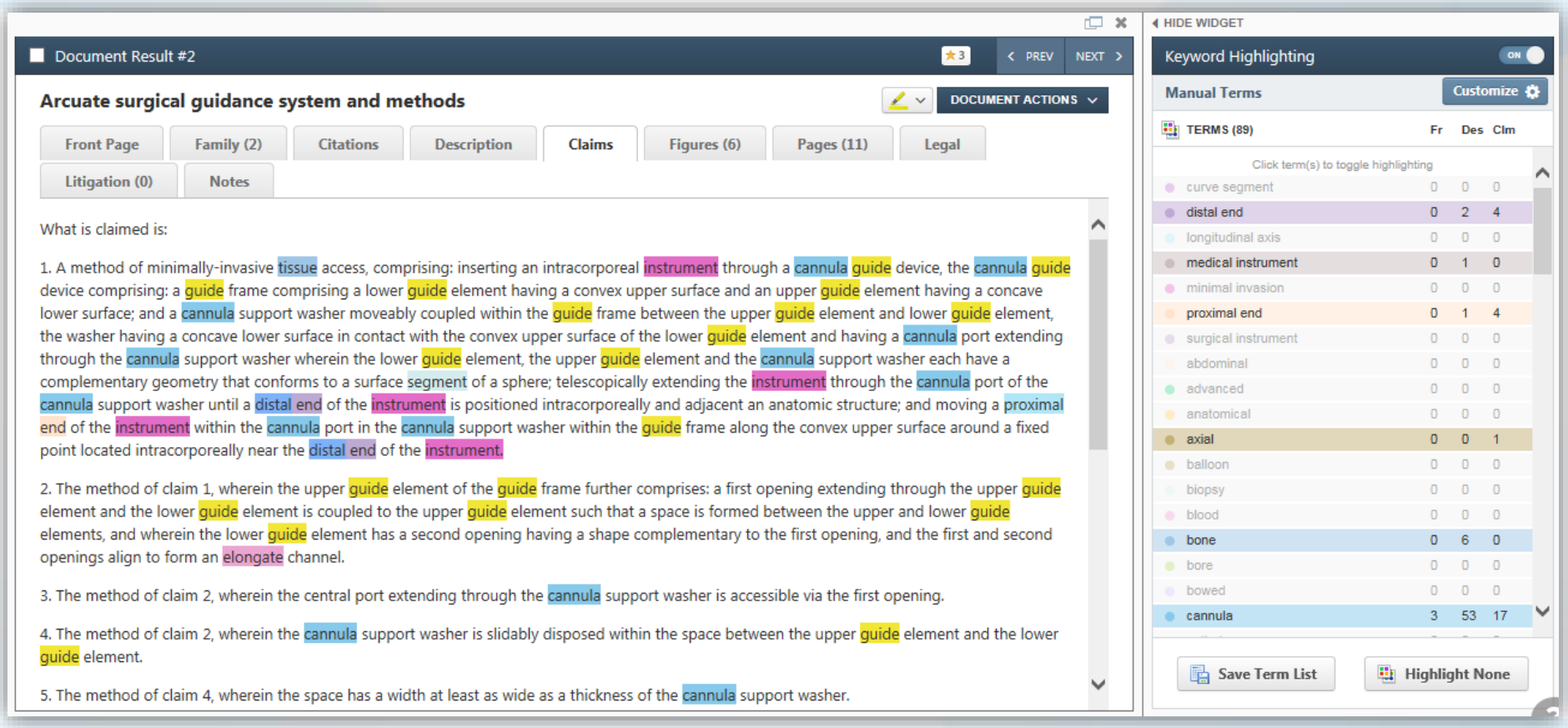
A Example –from Queries to Concepts





A Example- Term Highlighting



The proximity of the query terms to each other is a good indicator of applicability to the invention being searched.

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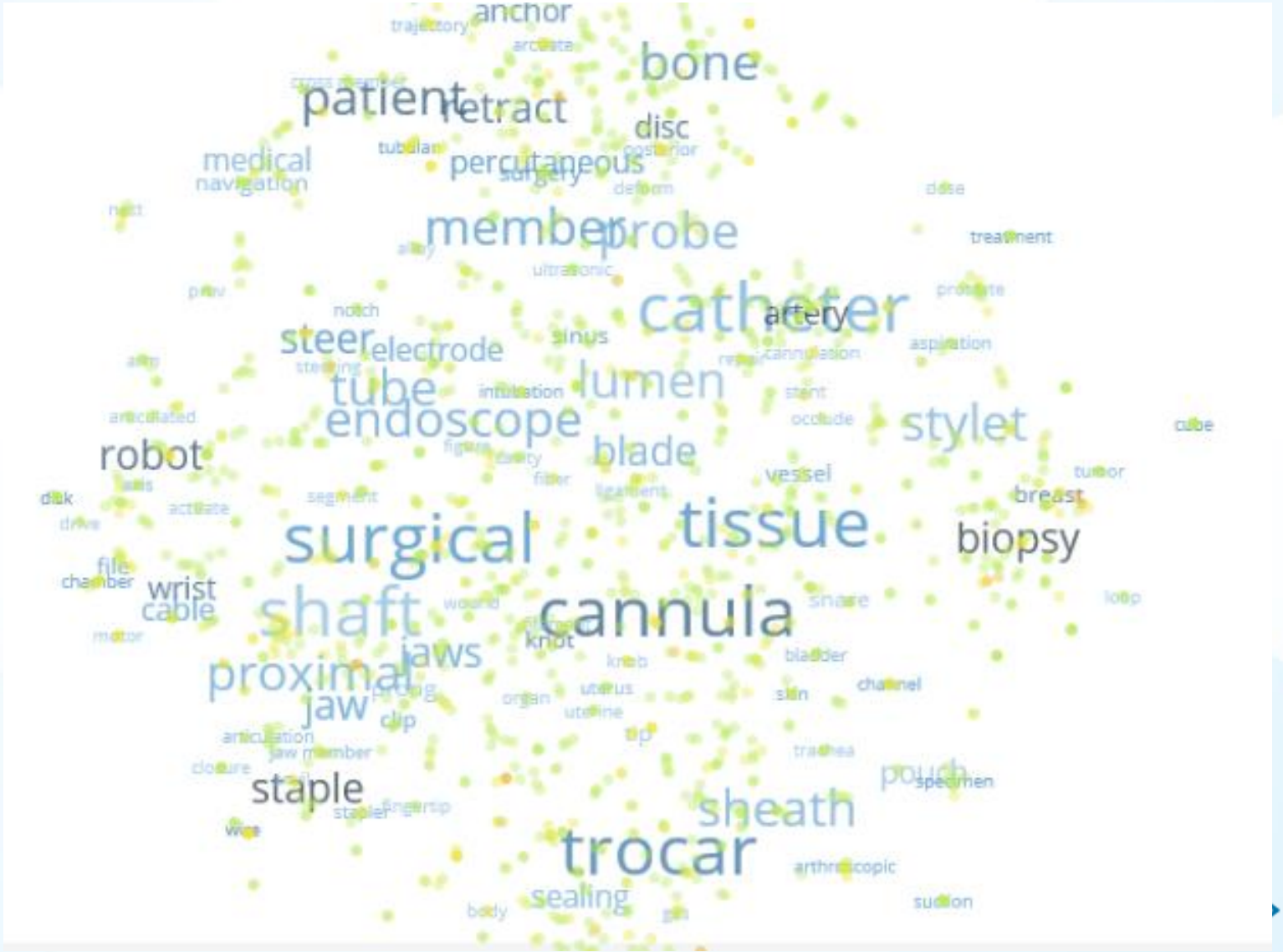
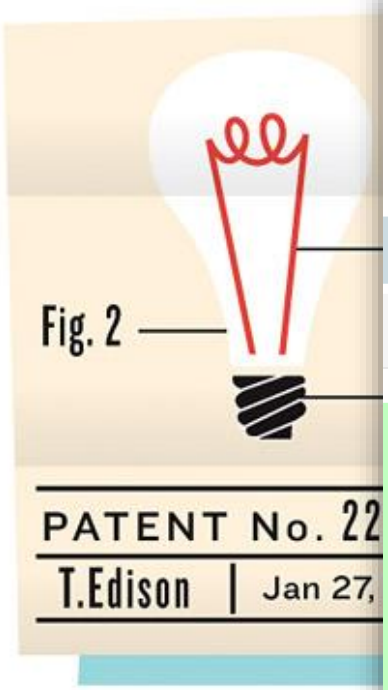
A Example-Map of Concepts



Ways to Start Semantic Searching

- Anything!



Higher Order Compensation for Converters With Constant-Voltag Output Combating Transformer

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5 Author(s)

Xiaohui Qu ; Yanyan Jing ; Hongdou Han ;

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Abstract:
Compensation is crucial for improving performance o frequencies, an IPT converter can achieve load-indep power switches simultaneously, resulting in simplified However, constant output voltage or current depends converter design hard to optimize. To free the design higher order compensation circuits for IPT converters reactive power and soft switching. Detailed derivation transformer parameters. Prototypes of CC IPT config different output specifications.

Published in: IEEE Transactions on Power Electroni

A New Method for pHEMT Noise-Parameter Determination Based on 50-Ω Noise Measurement System

Jianjun Gao, Choi Look Law, Hong Wang, Sheel Aditya, and Georg Boeck, *Senior Member, IEEE*

***Abstract*—A new method for determining the four noise parameters of pseudomorphic high electron-mobility transistors (pHEMT) based on 50-Ω noise measurement system without a microwave tuner is presented. The noise parameters are determined based on the noise correlation matrix technique by fitting the measured noise figure of the active device. On-wafer experimental verification up to 26 GHz is presented and a comparison with a tuner-based method is given. The scaling rules for noise parameters have also been determined. Good agreement is obtained between simulated and measured results for 2 × 20 μm, 2 × 40 μm, and 2 × 60 μm gatewidth (number of gate fingers × unit gatewidth) 0.25-μm double-heterojunction δ-doped pHEMTs.**

***Index Terms*—Correlation noise matrix, noise measurement, noise parameter.**

I. Introduction

THE COMPLETE characterization of the transistor in terms of noise and scattering parameters is necessary for the computer-aided design (CAD) of a low-noise amplifier. The S-parameters are measured by a vector network analyzer (VNA), whereas the noise parameters cannot be measured directly by an instrument. The full noise characterization of a pseudomorphic high electron-mobility transistor (pHEMT) requires the determination of four noise parameters, i.e., minimum noise figure F_{min}, noise resistance R_n, and optimum source reflection coefficient Γ_{opt} (magnitude and phase). The determination of the noise parameters is typically performed by analyzing the variation of the measured noise figure as a function of the source impedance. A minimum of four independent measurements is required. However, for increasing accuracy, more than four measurements are performed usually and curve-fitting techniques are used then to determine the noise parameters [1]–[4]. Although this method gives accurate results, it is time consuming and requires expensive automatic broad-band microwave tuners that involves complex calibration procedures.

Some authors proposed improved methods that are using the equivalent transistor noise model to provide additional information to reduce complexity in the measurement procedure [5]–[9]. Other successful techniques are based on match source reflection 50-Ω measurements system (F_{50}) without an automatic tuner [10]–[12]. Tasker *et al.* [10] assume no correlation between noise source and input temperature T_g, which is simply equal to the ambient temperature, only the unknown output temperature T_d must be determined to extract the noise parameters. Alternatively, the correlation coefficient C is assumed to be purely imaginary and related to P, R by the approximate expression $C \approx \sqrt{R/P}$ to determine noise parameters using F_{50} measurements [11]. A complex mathematical method for determining the noise matrix of active devices based on F_{50} measurements by assuming a linear frequency dependency of elements of an intrinsic noise matrix is proposed by Lazaro *et al.* [12], the calibration procedures are very complex and need to determine the intrinsic parameter C_{gd} and the whole parasitic elements.

In this paper, a new method to determine the four noise parameters of pHEMTs based on a 50-Ω measurement system (F_{50}) without an automatic tuner is proposed. In contrast with previous publications [10]–[12], this method has the following advantages.

1) It needs no complex noise deembedding techniques and calibration procedures.
2) No restrictions are imposed on the noise sources and noise matrix elements.
3) Only the determination of pad capacitances C_{pg}, C_{pd}, and C_{pdg}, series inductances L_g, L_s, and L_d, and drain parasitic resistance R_d is needed, not the determination of the other extrinsic and intrinsic elements.
4) The whole parasitic elements are determined by using a pinchoff condition.
5) An improved method for determination of the initial values of the four noise parameters based on [11] is given; the iterative calculation is very fast.

II. Noise-Parameter Extraction Based on 50-Ω Measurement System (F_{50})

A. Equivalent Noise Circuit Model

From the circuit point-of-view, the FET device can be treated as a black box of a noisy two-port. As is well known, the noise

Manuscript received December 9, 2002; revised April 11, 2003.
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C. L. Law and S. Aditya are with the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore 639798.
H. Wang is with the Microelectronics Centre, Nanyang Technological University, Singapore 639798.
G. Boeck is with the Institute of High-Frequency and Semiconductor System Technologies, Technische Universität Berlin, 10587 Berlin, Germany.
Digital Object Identifier 10.1109/TMTT.2003.817680

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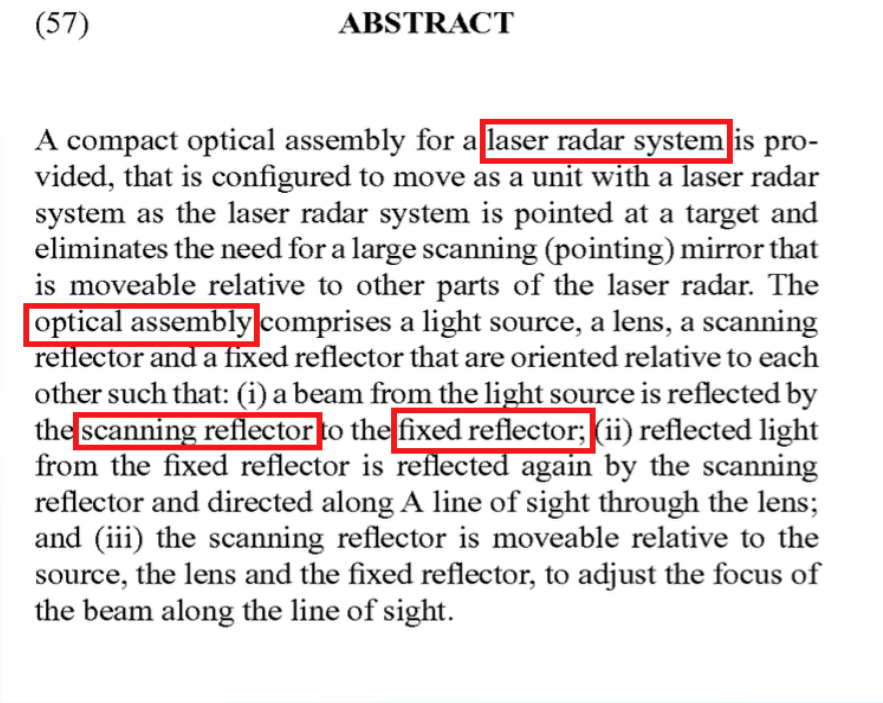
Tips: Identifying key concepts of the invention

- Patents
  - Abstract and claims
  - Last sentence of the abstract
  - Independent claims
- NPL
  - Text that broadly summarizes the invention
  - Text in Abstract, Introduction/Background, Results and Conclusion

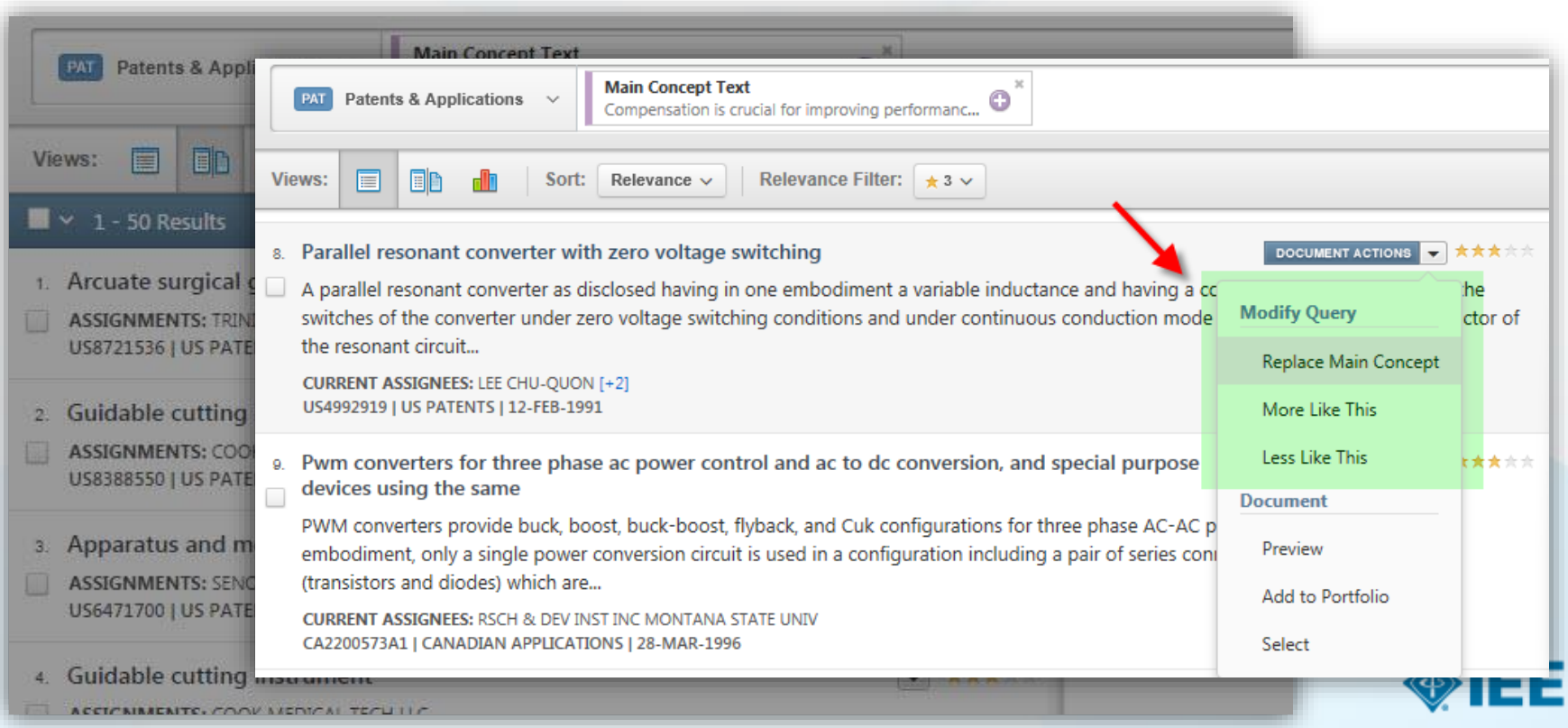


(57) **ABSTRACT**

A compact optical assembly for a laser radar system is provided, that is configured to move as a unit with a laser radar system as the laser radar system is pointed at a target and eliminates the need for a large scanning (pointing) mirror that is moveable relative to other parts of the laser radar. The optical assembly comprises a light source, a lens, a scanning reflector and a fixed reflector that are oriented relative to each other such that: (i) a beam from the light source is reflected by the scanning reflector to the fixed reflector; (ii) reflected light from the fixed reflector is reflected again by the scanning reflector and directed along A line of sight through the lens; and (iii) the scanning reflector is moveable relative to the source, the lens and the fixed reflector, to adjust the focus of the beam along the line of sight.

Ways to Refine Search

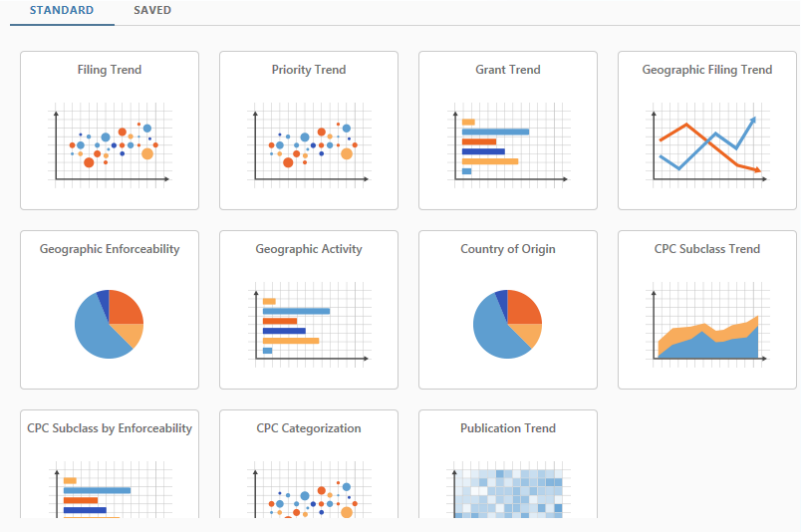
- Be mindful of synonyms
- Refine search with concept modifiers



Build a Patent Portfolio

Technical Intelligence:

1. Knowledge of the "art" (subject matter)
2. Prior Art searching
3. Technology trends
4. Technology applications (old, current and future)



Competitive Intelligence:

1. Who (organizations) are in this tech space? (assignee/applicant)
2. Who (people) are the professionals? (author/inventor)
3. Who are they collaborating with?
4. What are they doing?
5. How are they doing it? (patent claims)
6. How can I track these alliances or competitors? (search alerts)
7. Where are they interested in doing business?

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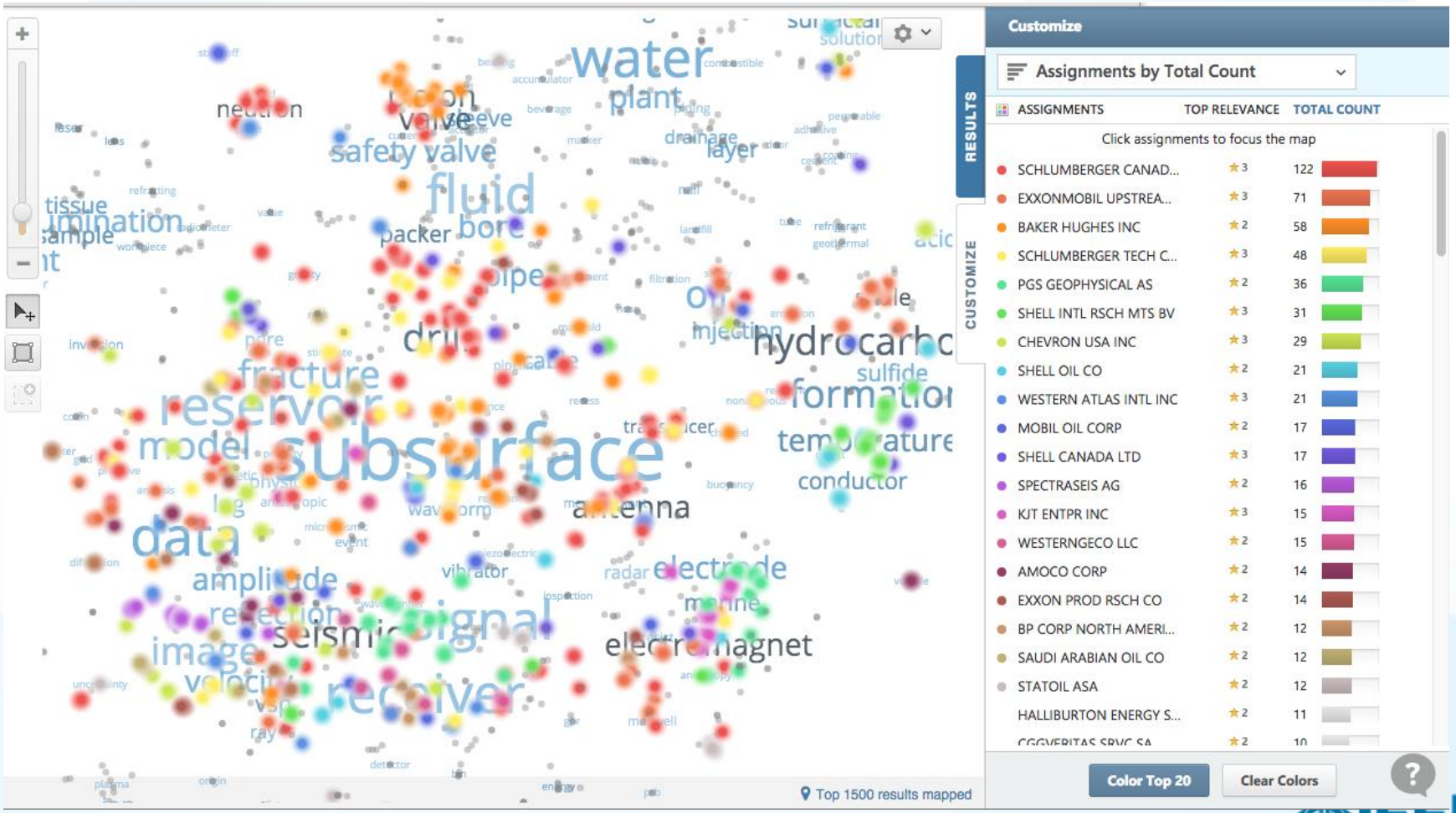
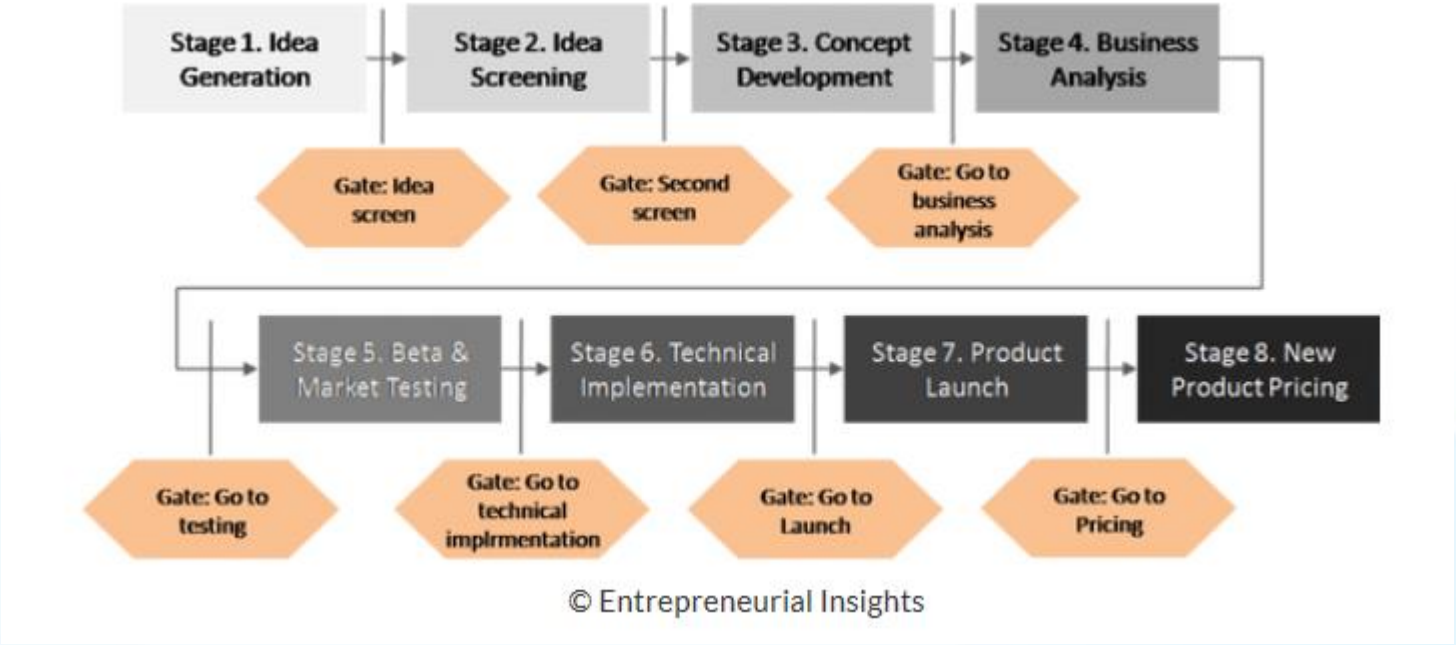
Discover What You Don't Know



When to Start Prior Art Search? The earlier, the better!

- It is important to conduct prior art searching in the early stage, instead of the final stage of idea development!



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Librarians should play a bigger role in the process of university patenting!

Thank you!

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