US006453315B1

(12) **United States Patent**
Weissman et al.

(10) **Patent No.: US 6,453,315 B1**
(45) **Date of Patent: Sep. 17, 2002**

(54) **MEANING-BASED INFORMATION ORGANIZATION AND RETRIEVAL**

(75) Inventors: **Adam J. Weissman**; **Gilad Israel Elbaz**, both of Los Angeles, CA (US)

(73) Assignee: **Applied Semantics, Inc.**, Los Angeles, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/431,760**

(22) Filed: **Nov. 1, 1999**

Related U.S. Application Data

(60) Provisional application No. 60/155,667, filed on Sep. 22, 1999.

(51) **Int. Cl.**[7] **G06F 17/30**; G06F 7/00
(52) **U.S. Cl.** **707/5**; 707/3
(58) **Field of Search** 707/1–5

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,839,853	A *	6/1989	Deerwester et al.	707/5
5,056,021	A *	10/1991	Ausborn	704/9
5,128,865	A *	7/1992	Sadler	704/2
5,680,511	A *	10/1997	Baker et al.	704/257
5,694,523	A *	12/1997	Wical	706/45
5,778,362	A *	7/1998	Deerwester	707/5
5,794,050	A *	8/1998	Dahlgren et al.	717/8
5,873,056	A *	2/1999	Liddy et al.	704/9
5,940,821	A *	8/1999	Wical	707/3
5,953,718	A *	9/1999	Wical	707/5
6,038,560	A *	4/2000	Wical	707/5
6,101,515	A *	8/2000	Wical et al.	707/531
6,247,009	B1 *	6/2001	Shiiyama et al.	707/3

OTHER PUBLICATIONS

Ferri et al. "Toward a Retrieval of HTML Documents Using a Semantic Approach", IEEE International Conference on Multimedia and Expo, vol. 3, 2000, pp. 1571–1574.*

Caudal, P. "Using Complex Lexical Types to Model the Polysemy of Collective Nouns within the Generative Lexicon", Proceedings of the Ninth International Workshop on Database and Expert Systems Applications, 1998, pp. 154–159.*

Fellbaum, C., ed. "WordNet: An Electronic Lexical Database", Cambridge:MIT Press, Mar. 1998. P325.5D38W67 1998.*

Meijs, W. "Inferring Grammar from Lexis: Machine–Readable Dictionaries as Sources of Wholesale Syntactic and Semantic Information", IEEE Colloquium on Grammatical Inference: Theory, Applications and Alternatives, 1993, pp. P3/1–P3/5.*

Budanitsky, A. and Hirst, G. "Semantic Distance in WordNet: An Experimental, Application–Oriented Evaluation of Five Measures", Proc. of the North Amer. Association for Computational Linguistics, WordNet and Other Lexical Reasources Workshop, Jun. 2–7, 2001.*

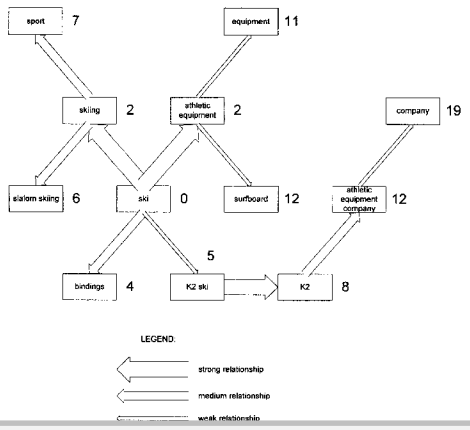
(List continued on next page.)

Primary Examiner—Jean R. Homere
Assistant Examiner—Luke S Wassum
(74) *Attorney, Agent, or Firm*—Pillsbury Winthrop LLP

(57) **ABSTRACT**

The present invention relies on the idea of a meaning-based search, allowing users to locate information that is close in meaning to the concepts they are searching. A semantic space is created by a lexicon of concepts and relations between concepts. A query is mapped to a first meaning differentiator, representing the location of the query in the semantic space. Similarly, each data element in the target data set being searched is mapped to a second meaning differentiator, representing the location of the data element in the semantic space. Searching is accomplished by determining a semantic distance between the first and second meaning differentiator, wherein this distance represents their closeness in meaning. Search results on the input query are presented where the target data elements that are closest in meaning, based on their determined semantic distance, are ranked higher.

24 Claims, 5 Drawing Sheets-



OTHER PUBLICATIONS

Mihalcea, R. and Moldovan, D. "Semantic Indexing using WordNet Senses", Proceedings of the ACL Workshop on IR and NLP Oct. 2000.*

Budanitsky, A. "Lexical Semantic Relatedness and its Application in Natural Language Processing", Technical Report CSRG–390, Computer Systems Research Group, University of Toronto, Aug. 1999.*

Resnick, P. "Semantic Similarity in a Taxonomy: An Information–Based Measure and its Application to Problems of Ambiguity in Natural Language", Journal of Artificial Intelligence Research, vol. 11, Jul. 1999.*

Smeaton, A.F. and Quigley, I. "Experiments on Using Semantic Distances Between Words in Image Caption Retrieval", Proceedings of the 19th International Conference on Research and Development in Information Retrieval, Aug. 1996. pp. 174–180.*

Sutcliffe, R.F.E. et al. "Beyond Keywords: Accurate Retrieval from Full Text Documents", Proceedings of the 2nd Language Engineering Convention, Oct. 16–18, 1995.*

Chakravarthy, A.S. and Haase, K.B. "NetSerf: Using Semantic Knowledge to Find Internet Information Archives", Proceedings of the 18th Annual International ACM SIGIR Conference on Research and Developement in Information Retrieval, Jul. 1995, pp. 4–11.*

Sutcliffe, R.F.E. et al. "The Automatic Acquisition of a Board–Coverage Semantic Lexicon for use in Information Retrieval", Proc of the AAAI Symp 'Representation and Acquisition of Lexical Knowledge: Polysemy, Ambiguity and Generativity, Mar. 27–29, 1995.*

St–Onge, D. "Detecting and Correcting Malapropisms with Lexical Chains", M.S. Thesis, University of Toronto, Mar. 1995.*

Richardson, R., Smeaton, A.F. and Murphy, J. "Using Wordnet for Conceptual Distance Measurement", roc. of the 16th Research Colloquium of the BCS–IRSG, 1994. pp. 100–123.*

Buckley, C. et al. "Automatic Query Expansion Using SMART: TREC–3", Proceedings of the Text Retrieval Conference (TREC3), Nov. 1994, pp. 69–81.*

Voorhees, E.M. "Query Expansion Using Lexical–Semantic Relations", Proceedings of the 17th Annual International ACM–SIGIR Conference on Research and Development in Information Retrieval, Jul. 1994, pp. 61–69.*

Rada, R. et al. "Development and Application of a Metric on Semantic Nets", IEEE Transactions of Systems, Man and Cybernetics, vol. 19, No. 1, Jan./Feb./ 1989, pp. 17–30.*

Brachman, R.J. and Schmolze, J.G. "An Overview of the KL–ONE Knowledge Representation System", Cognitive Science, vol. 9, 1985, pp 171–216.*

Collins, A.M. and Loftus, E.F. "A Spreading–Activation Theory of Semantic Processing", Psychological Review, vol. 82, No. 6, 1975, pp. 407–428.*

* cited by examiner

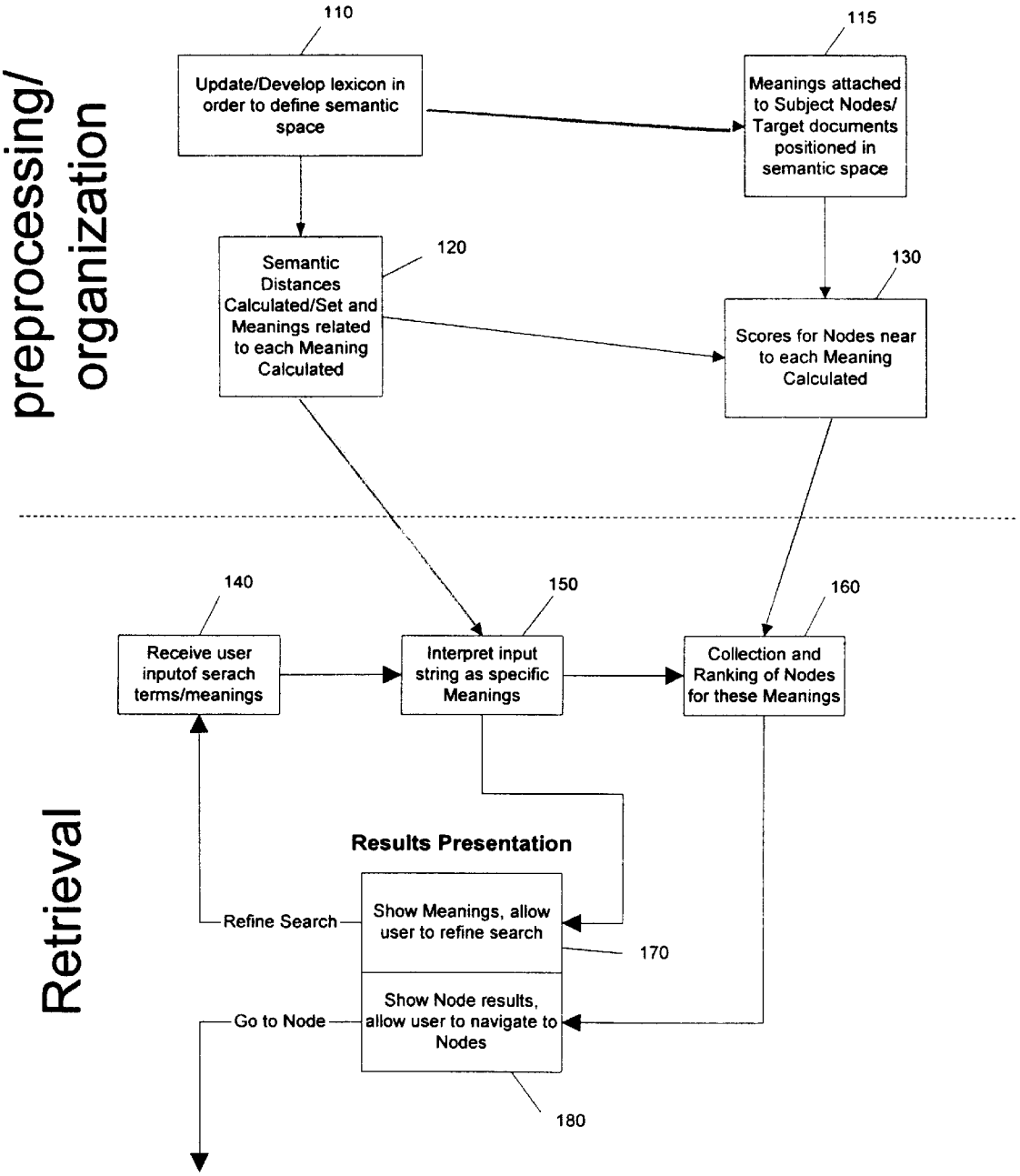


FIGURE 1

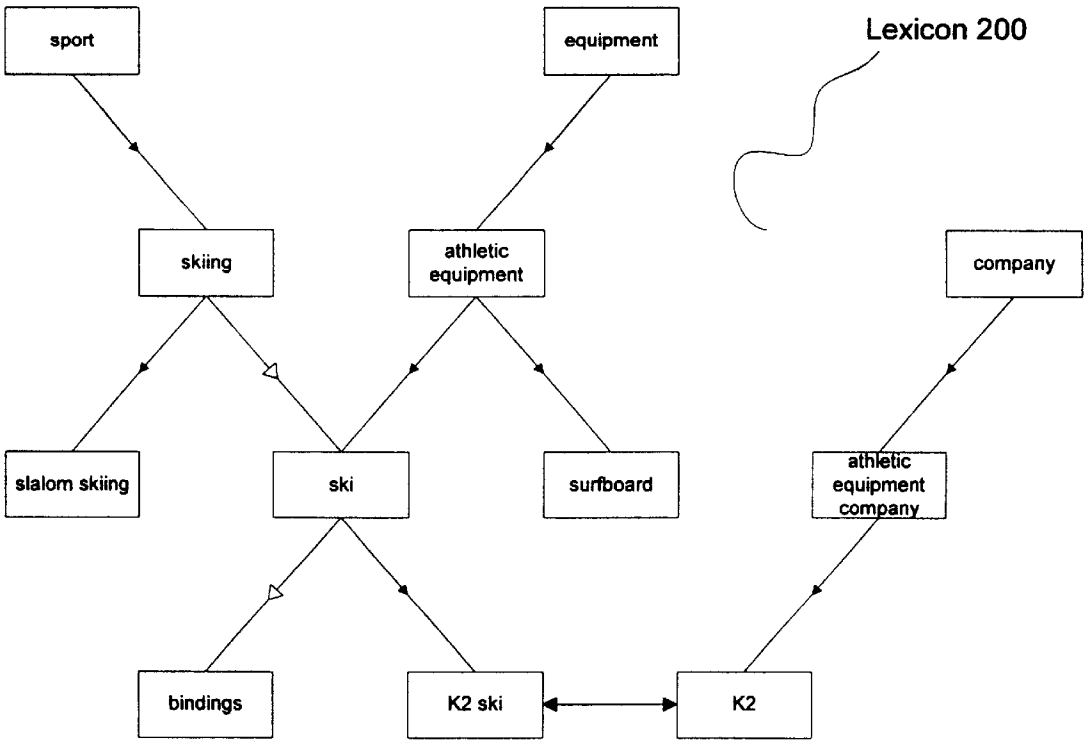


FIGURE 2

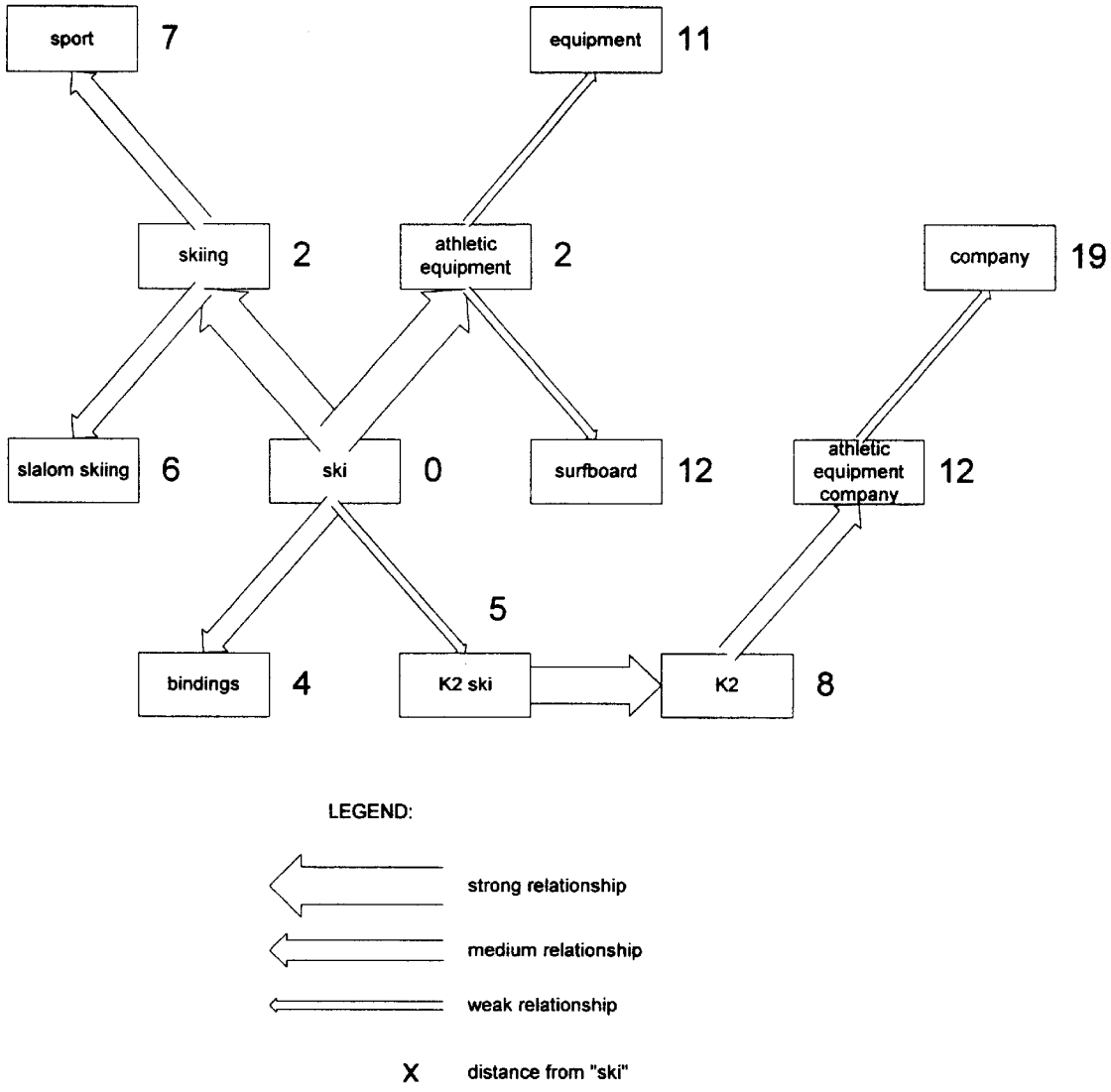


FIGURE 3

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS
Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.