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

(10) **Patent No.:** US 7,970,674 B2
(45) **Date of Patent:** Jun. 28, 2011

(54) **AUTOMATICALLY DETERMINING A CURRENT VALUE FOR A REAL ESTATE PROPERTY, SUCH AS A HOME, THAT IS TAILORED TO INPUT FROM A HUMAN USER, SUCH AS ITS OWNER**

(75) Inventors: **David Cheng**, Seattle, WA (US); **Stan Humphries**, Sammamish, WA (US); **Kyusik Chung**, Seattle, WA (US); **Dong Xiang**, Sammamish, WA (US); **Jonathan Burstein**, Seattle, WA (US)

(73) Assignee: **Zillow, Inc.**, Seattle, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1394 days.

(21) Appl. No.: **11/347,024**

(22) Filed: **Feb. 3, 2006**

(65) **Prior Publication Data**

US 2007/0198278 A1   Aug. 23, 2007

(51) **Int. Cl.**
  G06Q 40/10   (2006.01)
(52) **U.S. Cl.** **705/35**; 705/313
(58) **Field of Classification Search** 705/35, 705/313
  See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,361,201 A	11/1994	Jost et al.	
6,178,406 B1 *	1/2001	Cheetham et al.	.... 705/10
6,240,425 B1	5/2001	Naughton	
6,609,118 B1 *	8/2003	Khedkar et al.	.... 705/36 R
6,915,206 B2	7/2005	Sasajima	
7,289,965 B1 *	10/2007	Bradley et al.	.... 705/1
7,461,265 B2	12/2008	Ellmore	
7,487,114 B2	2/2009	Florance et al.	
7,567,262 B1 *	7/2009	Clemens et al.	.... 345/632
2003/0212565 A1	11/2003	Badali et al.	
2004/0073508 A1	4/2004	Foster et al.	
2005/0108084 A1 *	5/2005	Ramamoorti et al.	.... 705/10
2005/0154657 A1 *	7/2005	Kim et al.	.... 705/30
2007/0124235 A1	5/2007	Chakraborty et al.	
2007/0185727 A1	8/2007	Ma et al.	
2007/0185906 A1	8/2007	Humphries et al.	
2008/0077458 A1	3/2008	Andersen et al.	
2009/0043637 A1 *	2/2009	Eder	.... 705/10

OTHER PUBLICATIONS

Vladimir Svetnik et al, Random Forest: A Classification and Regression Tool for compound Classification and QSAR Modleing. J. Chem Info. Computer Science, 2003, vol. 43, pp. 1947-1958.*
U.S. Appl. No. 11/927,623, filed Oct. 29, 2007, Humphries et al.
U.S. Appl. No. 11/971,758, filed Jan. 9, 2008, Humphries et al.
Quinlan, Ross J., "C4.5: Programs for Machine Learning," Machine Learning, 1993, 302 pages, Morgan Kaufmann Publishers, San Francisco, CA, USA.

(Continued)
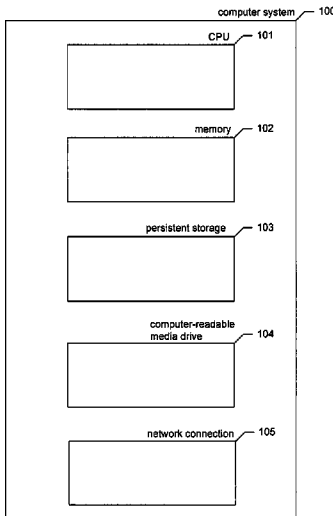
Primary Examiner — Kirsten S Apple
Assistant Examiner — Abdul Basit
(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

(57)   **ABSTRACT**

A facility procuring information about a distinguished property from its owner that is usable to refine an automatic valuation of the distinguished property is described. The facility displays information about the distinguished property used in the automatic valuation of the distinguished property. The facility obtains user input from the owner adjusting at least one aspect of information about the distinguished property used in the automatic valuation of the distinguished property. The facility then displays to the owner a refined valuation of the distinguished property that is based on the adjustment of the obtained user input.

40 Claims, 21 Drawing Sheets

OTHER PUBLICATIONS

Mobasher, B. "Classification Via Decision Trees in WEKA," DePaul University, Computer Science, Telecommunications, and Information Systems, ECT 584-Web Data Mining, 2005, http://maya.cs.depaul.edu/~classes/Ect584/WEKA/classify.html, 5 pages [internet accessed on Dec. 6, 2007].

Bennett, Kristin P., "Support Vector Machines: Hype or Hallelujah?" SIGKDD Explorations, Dec. 2000, pp. 1-12, vol. 2, issue 2, ACM SIGKDD.

Hill, T. and Lewicki, P., "K-Nearest Neighbors," Statistics Methods and Applications, 2007, http://www.statsoft.com/textbook/stknn.html, [internet accessed on [Dec. 6, 2007].

Breiman, L., "Random Forests," Machine Learning, 45, pp. 5-32, 2001, Kluwer Academic Publishers, The Netherlands.

http://www.ics.uci.edu/~mlearn/databases/housing/housing.names, 1 page [accessed Dec. 13, 2005].

StatSoft, Inc., "Classification Trees," http://www.statsoft.com/text-book/stclatre.html, pp. 1-20, © 1984-2003 [accessed Dec. 13, 2005].

Breiman et al., "Random Forest," Classification Description, http://www.stat.berkeley.edu/users/breiman/RandomForests/cc_home.htm, pp. 1-28 [accessed Dec. 13, 2005].

Real-info.com, "What is an AVM," www.real-info.com/products_avm.asp? Internet Archive Date: Oct. 30, 2005, 5 pages [accessed Mar. 21, 2007].

RealEstateABC.com, see paragraph headed "How do I make the estimate more accurate?" www.realestateabc.com/home-values/, Internet Archive Dated: Apr. 5, 2006, 4 pages [accessed Mar. 20, 2007].

Standard & Poors, "Guidelines for the use of Automated Valuation Models for U.K. RMBS Transactions," http://www.rics.org/NR/rdonlyres/8Fcdd20c-7FAC-4549-86FB-3930CD0CBC05/0/StandardandPoorsReportonAVMs.pdf, Published Feb. 20, 2004, 4 pages.

www.r-project.org, "The R Project for Statistical Computing," http://web.archive.org/web/20060102073515/www.r-project.org/main.shtml, 1 page [internet archive date: Jan. 2, 2006].

"Centre for Mathematical Sciences," Lund University, http://web.archive.org/web/20060101005103/http://www.maths.Ith.se/, 1 page [internet archive date: Jan. 1, 2006].

"An Introduction to R," http://web.archive.org/web/20060118050840/http://cran.r-project.org/doc/manuals/R-intro.html, pp. 1-105 [internet archive date: Jan. 18, 2006].

www.cran.r-project.org, "The Comprehensive R Archive Network," http://web.archive.org/web/20050830073913/cran.r-project.org/banner.shtml, pp. 1-2 [internet archive date: Aug. 30, 2005].

Non-Final Office Action for U.S. Appl. No. 11/524,048, Mail Date Apr. 29, 2009, 10 pages.

Non-Final Office Action for U.S. Appl. No. 11/524,047, Mail Date Oct. 28, 2009, 12 pages.

Final Office Action for U.S. Appl. No. 11/524,048, Mail Date Dec. 8, 2009, 12 pages.

Non-Final Office Action for U.S. Appl. No. 11/927,623, Mail Date Dec. 28, 2010, 22 pages.

Non-Final Office Action for U.S. Appl. No. 11/347,000, Mail Date Apr. 9, 2010, 29 pages.

Tay et al., "Artificial Intelligence and the Mass Appraisal of Residential Apartments," Journal of Property Valuation and Investment, Feb. 1, 1992, 17 pages.

Meyer, Robert T., "The Learning of Multiattribute Judgment Policies," The Journal of Consumer Research, vol. 14, No. 2, Sep. 1987, pp. 155-173.

Non-Final Office Action for U.S. Appl. No. 11/347,000, Mail Date Oct. 27, 2010, 25 pages.
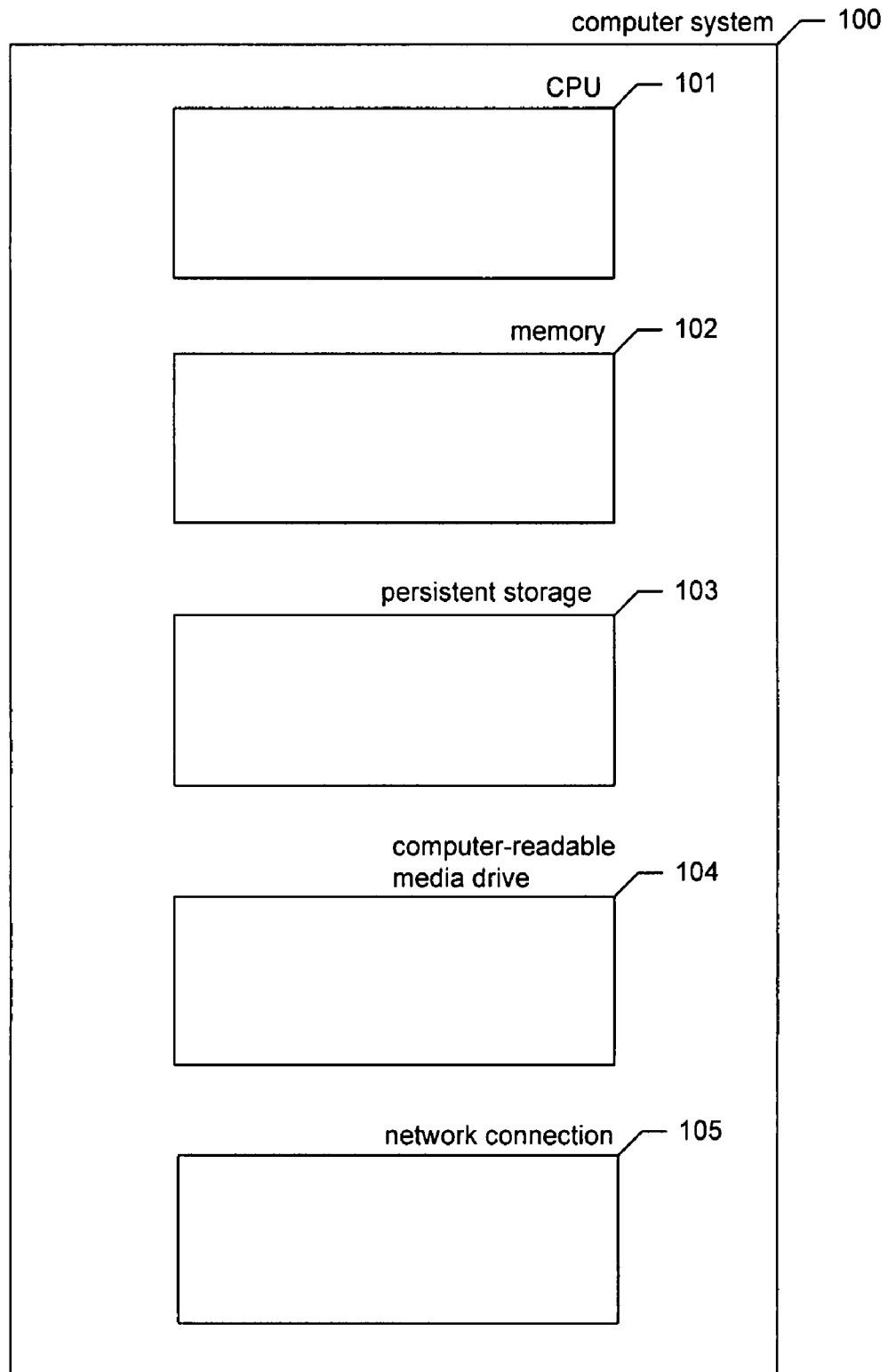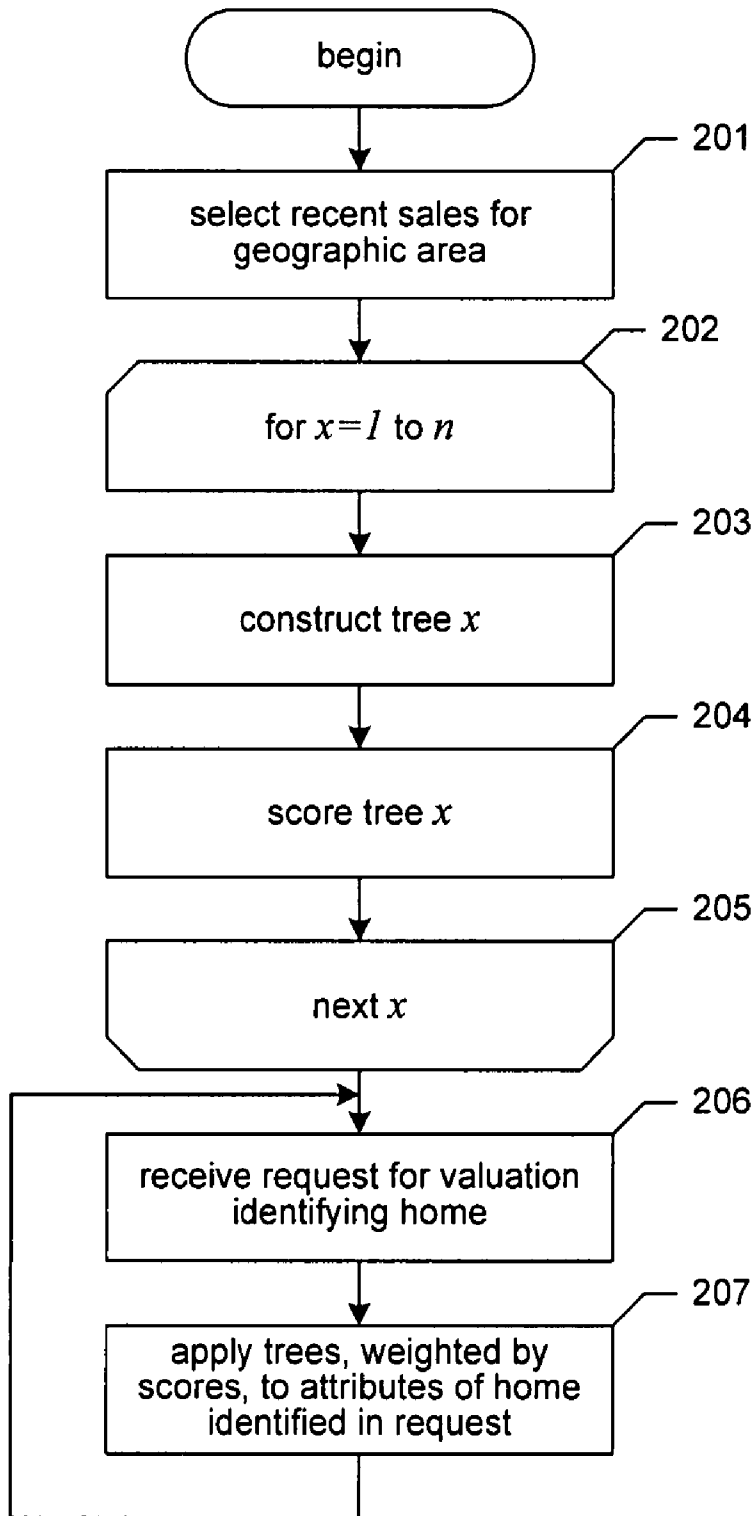
* cited by examiner

computer system ⟋— 100

CPU ⟋— 101

memory ⟋— 102

persistent storage ⟋— 103

computer-readable
media drive ⟋— 104

network connection ⟋— 105

FIG. 1

FIG. 2

```
                    begin
                      |
                      v
        select recent sales for          — 201
            geographic area
                      |
                      v
              for x=1 to n               — 202
                      |
                      v
              construct tree x           — 203
                      |
                      v
               score tree x              — 204
                      |
                      v
                 next x                  — 205
                      |
                      v
        receive request for valuation    — 206
            identifying home
                      |
                      v
         apply trees, weighted by        — 207
      scores, to attributes of home
            identified in request
```

id	address	sq. ft.	bedrooms	bathrooms	floors	view	year	selling price	date
1	111 Main St., Hendricks, IL 62012	1850	4	2	2	no	1953	$132,500	1/3/2005
2	96 Elm St., Hendricks, IL 62014	2220	6	2	3	no	1965	$201,000	1/8/2005
3	140 Cottontail Rd., Baron, IL 62019	1375	3	1	1	no	1974	$98,750	1/11/2005
4	6 Spratt Ln., Baron, IL 62019	1590	2	2	1	no	1973	$106,500	1/14/2005
5	776 Fir St., Hendricks, IL 62014	2280	3	3	2	yes	1948	$251,000	1/26/2005
6	111 Industry Ave., Fenton IL 62017	1950	2	2	1	no	1925	$240,000	2/4/2005
7	105 Elm St., Hendricks, IL 62014	2180	5	2	3	yes	1940	$230,000	2/4/2005
8	110 Muffet St., Baron, IL 62019	1675	4	2	1	no	1975	$74,900	2/14/2005
9	156 Elm St., Hendricks, IL 62014	2400	6	3	2	yes	1938	$253,500	2/15/2005
10	142 Cottontail Rd., Baron, IL 62019	1450	3	1	1	no	1966	$102,000	2/18/2005
11	160 Prospect Bldv., Fenton IL 62017	1952	4	2	1	no	1920	$230,000	2/20/2005
12	36 Spratt Ln., Baron, IL 62019	1475	4	2	1	no	1964	$111,000	2/20/2005
13	118 Main St., Hendricks, IL 62012	2140	5	2	2	no	1935	$211,000	2/21/2005
14	234 Cottontail Rd., Baron, IL 62019	1980	4	3	2	yes	1930	$197,900	2/24/2005
15	677 Fir St., Hendricks, IL 62014	2320	5	3	2	yes	1927	$238,000	2/28/2005

Henderson County recent sales table

321   322   323   324   325   326   327   328   329   33

FIG. 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.

fastcase®
Smarter legal research.