EXHIBIT 23

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/261,898	08/19/2008	7414988	2000319-00124US1	8900

23483 7590 07/30/2008

WILMERHALE/BOSTON
60 STATE STREET
BOSTON, MA 02109

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 337 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Russel K. Jones, Roswell, GA;
Farshid Alizadeh-Shabdiz, Wayland, MA;
Edward J. Morgan, Needham, MA;
Michael G. Shean, Boston, MA;

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/261,898	10/28/2005	Russel K. Jones	2000319-00124US1	8900

23483 7590 05/21/2008

WILMERHALE/BOSTON
60 STATE STREET
BOSTON, MA 02109

EXAMINER	
PATEL, NIMESH	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 05/21/2008

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 337 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 337 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

Notice of Allowability	Application No.	Applicant(s)	
	11/261,898	JONES ET AL.	
	Examiner	Art Unit	
	NIMESH PATEL	2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Feb. 29, 2008*.

2. ☒ The allowed claim(s) is/are *1-3*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date Feb. 29, 2008
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Detailed Action

Allowable Subject Matter

1. Claims 1 – 3 are allowed.

2. The following is an examiner's statement o reasons for allowance.

Beuck teaches, the location finder 102 may receive digital radio signals transmitted by GPS satellites 104-1 through 104-3. The signals may include the satellites' location and the exact time. The location finder 102 calculates the distance and reports information indicative of a location of the location finding device to a server via the wireless access point. Also, the wireless access point 106 may communicate with the location finder 102 using one of a number of wireless communication protocols, such as Wi-Fi, or Bluetooth.
Beuck, US PGPub: US 2005/0164710 A1 Jul. 28, 2005.

Moeglein teaches, when an access point has not been observed for a certain period of time, the access point is removed from the database, similarly, when a new access point is observed, it is added to the database. Thus, the server may update the information about the access point in an ongoing basis.
Moeglein, US PGPub: US 2005/0037775 A1 Feb. 17, 2005.

None of the reference individually or combined teaches, the claimed feature:

Claim 1:

a Wi-Fi location server, comprising:

a database of Wi-Fi access points for at least one target area having a radius on the order of tens of miles, said database being recorded in a computer-readable medium and including database records for substantially all Wi-Fi access points in the target area, each record including identification information for a corresponding Wi-Fi access point and calculated position information for the corresponding Wi-Fi access point, wherein said calculated position information is obtained from recording multiple readings of the Wi-Fi access point at different locations around the Wi-Fi access point so that the multiple readings have reference symmetry relative to other Wi- Fi access points in the target area when and so that the calculation of the position of the Wi-Fi access point avoids arterial bias in the calculated position information; and

computer-implemented logic to add records to the database for newly-discovered Wi-Fi access points said computer logic including logic to recalculate position information for Wi-Fi access points previously stored in the database to utilize the position information for the newly-discovered readings of previously stored Wi-Fi access points.

Any comments considered necessary by applicant must be submitted no later

than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact Information

Any inquiry concerning this communication from the examiner should be directed to Nimesh Patel at (571) 270-1228, normally reached on Mon-Thur. 6:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rafael Perez can be reached on (571) 272-7915.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR of Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Nimesh Patel
May 5, 2008

/Rafael Pérez-Gutiérrez/
Supervisory Patent Examiner, Art Unit 2617

Docket No.: 2000319.124US1
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Russel K. Jones et al.	Confirmation No.:	8900
Application No.:	11/261,898	Art Unit:	2617
Filed:	October 28, 2005	Examiner:	Patel, Nimesh
Title:	SERVER FOR UPDATING LOCATION BEACON DATABASE		

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT

Dear Sir:

INTRODUCTORY COMMENTS

In response to the Office Action dated November 30, 2007, please amend the above-identified U.S. patent application as follows:

Amendments to the Specification begins on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks/Arguments begin on page 5 of this paper.

Amendments to the Specification:

Please replace paragraph [0002] and the three lines that follow paragraph [0002] with the following:

[0002] This application is related to the following U.S. Patent Applications, filed on an even date herewith:

U.S. Patent Application No. 11/261,848, entitled *Location Beacon Database*;

U.S. Patent Application No. 11/261,988, entitled *Location-Based Services that Choose Location Algorithms Based on Number of Detected Access Points Within Range of User Device*; and

U.S. Patent Application No. 11/261,987, entitled *Method and System for Building a Location Beacon Database*.

Amendments to the Claims:

The following listing of the claims will replace all prior versions and listings of claims in the application.

Listing of the Claims;

1. (Currently Amended) A Wi-Fi location server, comprising:

a database of Wi-Fi access points for at least one target area having a radius on the order of tens of miles, said database being recorded in a computer-readable medium and including database records for substantially all Wi-Fi access points in the target area, each record including identification information for a corresponding Wi-Fi access point and calculated position information for the corresponding Wi-Fi access point, wherein said calculated position information is obtained from recording multiple readings of the Wi-Fi access point at different locations around the Wi-Fi access point so that the multiple readings have ~~to provide~~ reference symmetry relative to other Wi-Fi access points in the target area [[when]] and so that the calculation of ~~calculating~~ the position of the Wi-Fi access point ~~and to~~ avoids arterial bias in the calculated position information; and

computer-implemented logic to add records to the database for newly-discovered Wi-Fi access points said computer logic including logic to recalculate position information for Wi-Fi access points previously stored in the database to utilize[[the]] position information for the newly-discovered readings of previously stored Wi-Fi access points.

2. (Original) The server of claim 1 further including computer-implemented clustering logic to identify position information based on error prone GPS information.

3. (Original) The server of claim 2 wherein the clustering logic includes logic to determine a weighted centroid position for all position information reported for an access point and logic to identify position information that exceeds a statistically-based deviation threshold amount away from the centroid position and excludes such deviating position information from the database and from influencing the calculated positions of the Wi-Fi access points.

REMARKS

Claims 1-3 are pending in the application. Applicants respectfully request reconsideration of the application in view of the following remarks.

Rejections under 35 U.S.C. § 103(a)

Claim 1 was rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Pat. Pub. 2005/0164710 of Beuck (herein "Beuck") in view of U.S. Pat. Pub. 2006/0078122 of Moeglein et al. (herein "Moeglein").

Beuck discloses a system for reporting a location of a device when the device is not located within a proximity of a particular point or within a particular area. Beuck describes a system that includes a location finder, GPS satellites, a wireless access point, a network, and a database server. The location finder periodically receives a "Keep Alive" strobe from a nearby wireless transmitter. When the location finder detects an absence of the Keep Alive strobe, the location finder determines the location of itself based on collected GPS signals. The location finder then determines whether a wireless access point is available. If a wireless access point is available, the location finder sends a 911-type request message to the database server via the wireless access point. See Beuck at ¶¶ 4-5, 19, 25.

Beuck is not concerned with a database of location information for Wi-Fi access points in a target area. In fact, Beuck is completely silent regarding any method of determining the location of Wi-Fi access points, but rather, is concerned with determining the location of the location finder device. Beuck merely uses wireless access points to communicate the location of

the location finder device, which, as stated above, is determined by the device using GPS signals. As Beuck does not teach or suggest a database of location information for Wi-Fi access points, Beuck also does not teach or suggest logic for adding newly-discovered Wi-Fi access points and their corresponding location information to a database.

Furthermore, the Office Action states

> [Beuck] is silent on, 'wherein said calculated position information is obtained from recording multiple readings of the Wi-Fi access point to provide reference symmetry when calculating the position of the Wi-Fi access point and to avoid arterial bias in the calculated position information', and 'computer-implemented logic to add records to the database for newly-discovered Wi-Fi access points said computer logic including logic to recalculate position information for Wi-Fi access points previously stored in the database to utilize the position information for the newly-discovered Wi-Fi access points.'

and relies on Moeglein to provide these missing elements. Specifically, the Office Action states, "Moeglein teaches, use of different air interfaces and/or operated by different service provides like, wireless LAN access point, cellular phone base station, satellite etc. for position determination." See Office Action pgs. 5-6. However, the Office Action does not explain how the approach described in Moeglein avoids the problem of arterial bias or attains reference symmetry relative to other Wi-Fi access points in the target area.

In fact, Moeglein is silent regarding any particular route or scheme taken or used by the mobile station to gather location information about the wireless access points. Moreover, Moeglein is completely silent regarding any particular appreciation that the technique or method used to gather Wi-Fi access point observations affects the quality of the calculated position of the

Wi-Fi access points. Specifically, Moeglein does not teach or suggest obtaining multiple readings of the Wi-Fi access point at different locations around the Wi-Fi access point so that multiple readings have reference symmetry relative to other Wi-Fi access points in the target area and so that the calculation of the position of the Wi-Fi access point avoids arterial bias in the calculated position information.

In contrast to the cited references, applicants' claim 1 is directed to a Wi-Fi location server that includes position information for Wi-Fi access points without arterial bias. Specifically, the calculated position information for the Wi-Fi access points is obtained from recording multiple readings of the Wi-Fi access point at different locations around the Wi-Fi access point. These multiple readings have reference symmetry relative to other Wi-Fi access points in the target area. Thus, the calculation of the position of the Wi-Fi access point avoids arterial bias in the calculated position information. This technique of gathering readings from Wi-Fi access points results in higher quality estimates of access point locations and more complete information about the access points in the area. Consequently, devices using the calculated access point locations to determine their position have more accurate estimations of their locations. See Application at ¶¶ 41-44.

As set forth above, none of the cited reference teach or suggest conducting an audit of an area to build a reference database of the locations of Wi-Fi access points in a target area so as to provide reference symmetry and avoid arterial bias. As stated in the application, amateur scanners ("wardrivers") have attempted to collect access point location data for use in location estimation systems. However, the methods employed by wardrivers suffer from several

drawbacks. Namely, as described in the application, the location data collected by the wardrivers is often inaccurate, incomplete, and grows organically rather than being collected in a systematic fashion to purposefully avoid arterial bias. See Application at ¶¶ 15-17.

As explained in greater detail in the application, significant errors in position calculation can result when the reference points used for the calculation lack symmetry around the physical location of the device performing the calculation. Unsymmetrical location data (or "arterial bias") occurs when individuals (e.g., wardrivers) collect location data for Wi-Fi access points without following designated scanning routes. Such data tends to aggregate around heavily traffic areas (or "arteries"). Attempting to use arterially biased data to estimate the location of a mobile device causes a "location pull" towards the main arteries regardless of where the user is currently located. This causes substantial accuracy errors in the location estimation. Figures 5 and 6 of the application illustrate this effect. See Application at ¶¶ 15 and 44.

Collecting multiple readings of Wi-Fi access points in a systematic fashion, as described in the application, provides reference symmetry within the target area. Thus, the distribution of reference points (i.e., Wi-Fi access point locations) is symmetric. By using a collection of location data that is symmetric, a mobile device attempting to calculate its location typically encounters physical locations in which there are numerous access point locations on all sides of the device within range of the device's Wi-Fi radio. Therefore, a position calculation performed by the mobile device will have reduced location bias and will be more accurate as a result. See Application at ¶ 44.

Unlike the cited references and known methods described in the background of the

application, applicants' claim 1 clearly recites the calculated position information is obtained from recording multiple readings of the Wi-Fi access point at different locations around the Wi-Fi access point so that the multiple readings have reference symmetry relative to other Wi-Fi access points in the target area and so that the calculation of the position of the Wi-Fi access point avoids arterial bias in the calculated position information. The application describes the discovery of the arterial bias problem and the advantages of the solutions devised by applicants. Namely, by performing a planned audit, and avoiding arterial bias, applicants at least achieve more complete information about access points in the target area, higher quality estimates of access point locations, and reference symmetry. See Application at ¶¶ 47-51.

None of this is taught or suggested by the cited references. Thus, applicants submit that claim 1 is patentable over the cited references.

Claim 2-3 were rejected under 35 U.S.C. § 103(a) as being obvious over Beuck in view of Moeglein and further in view of U.S.P.N. 5,940,825 to Castelli et al. (herein "Castelli").

Claims 2-3 depend from claim 1 and, therefore, include the combination set forth in claim 1. As explained above, Beuck and Moeglein, either alone or in combination, do not teach or suggest all of the elements of claim 1. Castelli does not supply the missing elements.

Castelli discloses a system for and method of performing similarity searches in a sequence database, which is phase and scale insensitive. Castelli describes a method of parsing a query sequence into multiple segments at multiple resolution levels. The segments are used to compare the query sequence to other sequences in a database. See Castelli at col. 2, line 35-col. 3, line 52.

Castelli is silent regarding calculated positions of Wi-Fi access points. In fact, Castelli is not concerned with Wi-Fi access points at all. Thus, Castelli does not teach or suggest any method of determining the location of Wi-Fi access points. Specifically, Castelli does not teach or suggest obtaining multiple readings of the Wi-Fi access point at different locations around the Wi-Fi access point so that multiple readings have reference symmetry relative to other Wi-Fi access points in the target area and so that the calculation of the position of the Wi-Fi access point avoids arterial bias in the calculated position information.

Thus, claims 2-3 are patentable over the cited references for at least the same reasons set forth for claim 1.

Objection to the Claims

Claim 1 was objected to as allegedly being open ended. Applicants submit that the term "radius on the order of tens of miles" is not opened ended, but rather, clearly communicates that the claimed target area is larger than, for example, a single floor of a building, such as might be found in an indoor positioning system. See Application at ¶ 16. Applicants describe throughout the application an embodiment that includes position information for Wi-Fi access points within a large metropolitan area. Therefore, applicants respectfully request withdrawal of the objection.

Objection to the Specification

The Specification was objected to for the reasons set forth in the Office Action. Applicants have amended the Specification to include the missing serial numbers.

Information Disclosure Statement

Applicants enclose an Information Disclosure Statement (IDS) with this submission. This IDS is being filed after the mailing date of the first Office Action on the merits and before the mailing date of a final Office Action or a Notice of Allowance. Authorization to charge the $180.00 fee to our Deposit Account No. 08-0219 is enclosed. Applicants request that the Examiner initial and return a copy of the enclosed Form PTO SB-08 with the next communication.

Conclusion

Applicants respectfully request an early and favorable reconsideration and issuance of this application as amended herein. The Examiner is encouraged to contact the undersigned to expedite prosecution of this application.

Authorization to charge the $180.00 fee in connection with the IDS submission is enclosed. No other fees are believed to be due in connection with this response. However, please charge any fees due in connection with this application or credit any overpayments to Deposit Acct. No. 08-0219.

Respectfully submitted,

Date: February 29, 2008

/John V. Hobgood/
John V. Hobgood
Registration No. 61,540
Attorney for Applicant

Wilmer Cutler Pickering Hale and Dorr LLP
60 State Street
Boston, MA 02109
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Fax: (617) 526-5000

Docket No.: 2000319.00124US1
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Russel K. Jones et al.	Confirmation No.:	8900
Application No.:	11/261,898	Art Unit:	2617
Filed:	October 28, 2005	Examiner:	N. Patel
Title:	SERVER FOR UPDATING LOCATION BEACON DATABASE		

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT (IDS)

Dear Sir:

This Information Disclosure Statement is being filed after the mailing date of the first Office Action on the merits and before the mailing date of a final Office Action or a Notice of Allowance.

Please charge the $180.00 fee to our Deposit Account No. 08-0219.

Applicants request that the Examiner initial and return a copy of the enclosed Form PTO SB-08 with the next communication.

Respectfully submitted,

Dated: February 29, 2008

/John V. Hobgood/
John V. Hobgood
Registration No.: 61,540
Attorney for Applicant(s)

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UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/261,898	10/28/2005	Russel K. Jones	2000319-00124US1	8900

23483 7590 11/30/2007

WILMERHALE/BOSTON
60 STATE STREET
BOSTON, MA 02109

EXAMINER	
PATEL, NIMESH	
ART UNIT	PAPER NUMBER
2617	

NOTIFICATION DATE	DELIVERY MODE
11/30/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

michael.mathewson@wilmerhale.com
teresa.carvalho@wilmerhale.com
sharon.matthews@wilmerhale.com

Office Action Summary	Application No.	Applicant(s)	
	11/261,898	JONES ET AL.	
	Examiner	Art Unit	
	Nimesh Patel	2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Oct. 28, 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3* is/are rejected.

7)☒ Claim(s) *1* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *Oct. 28, 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *Dec. 7, 2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

Objection to the specification

1. The specification is hereby objected for minor corrections:

- paragraph 0002, line 1, TBA must be replaced with appropriate information.

Objection to the claims

2. Claim 1 is objected to because of the following informalities:

The term "radius on the order of tens of miles" is being found in claim 1.

The exact limitation must be in the claim, as this term leaves the claim open ended.

Appropriate correction is required, in response of this office action.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject

matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Beuck US PGPub: US 2005/0164710 A1 Jul. 28, 2005 and in view of Moeglein US PGPub: US 2005/0037775 A1 Feb. 17, 2005.

Regarding claim 1, Beuck discloses,

a Wi-Fi location server (database server – Fig. 1/110, ABSTRACT, paragraph 0018), comprising:

a database of Wi-Fi access points for at least one target area having a radius on the order of tens of miles (the location finder 102 may receive digital radio signals transmitted by GPS satellites 104-1 through 104-3. The signals may include the satellites' location and the exact time. The location finder 102 calculates the distance and reports information indicative of a location of the location finding device to a server via the wireless access point. Also, the wireless access point 106 may communicate with the location finder 102 using one of a number of wireless communication protocols, such as Wi-Fi, or Bluetooth, and there are more wireless access points located within the network (paragraph 0020). Here, the distance between the GPS satellites and the location finder 102, clearly reads on the claimed feature, on the order of tens of miles (ABSTRACT, Fig. 1, paragraphs 0018, 0019),

said database being recorded in a computer-readable medium (the database server 110 may include a memory 3-8, and memory may include static memory such as ROM for holding machine-readable instructions, and DRAM for working storage. The memory may also include storage devices, such as a floppy disk, CD ROM, CD R/W disc, flash memory as well as other storage devices – Figs. 1, 3, paragraph 0024) and

including database records for substantially all Wi-Fi access points in the target area (database 310 configured to store the information received from location finder 102, such as user id and GPS coordinates - Figs. 1, 3, paragraphs 0024, 0032, 0037),

each record including identification information for a corresponding Wi-Fi access point and calculated position information for the corresponding Wi-Fi access point (database 310 configured to store the information received from location finder 102, such as user id and GPS coordinates. Here, a location finding device reports information indicative of a location of the location finding device to the a server via the wireless transceiver when an absence of signals periodically transmitted from a device is detected by the location finding device, reads on the claimed feature, the database has each record for all the Wi-Fi access points - Figs. 1, 3, paragraphs 0005, 0024, 0032, 0037),

but is silent on, "wherein said calculated position information is obtained from recording multiple readings of the Wi-Fi access point to provide reference symmetry when calculating the position of the Wi-Fi access point and to avoid arterial bias in the calculated position information", and

"computer-implemented logic to add records to the database for newly-discovered Wi-Fi access points said computer logic including logic to recalculate position information for Wi-Fi access points previously stored in the database to utilize the position information for the newly-discovered Wi-Fi access points".

Moeglein teaches, use of different air interfaces and/or operated by different service providers like, wireless LAN access point, cellular phone base station, satellite etc. for position determination (Figs. 2, 3, 5, 6, 8 - 10, 12, 14 and paragraphs 0058 – 0060, 0063, 0065). Also, the advantages of a hybrid approach provides improved redundancy for a more fail-safe operation, higher positioning availability, better accuracy, and faster time to fix (paragraph 0040).

Moeglein teaches, when an access point has not been observed for a certain period of time, the access point is removed from the database, similarly, when a new access point is observed, it is added to the database. Thus, the server may update the information about the access point in an ongoing basis (Figs. 1/115, 2, 7 and paragraph 0056).

It would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the database server 110 of Beuck(Fig. 1/110) such that the newly found access point's position and other access points positions are calculated accordingly (Moeglein, Fig. 1), for improved redundancy for a more

fail-safe operation, higher positioning availability, better accuracy, and faster time to fix, and the server has the updated information about the access points in an ongoing basis (Moeglein, paragraphs 0042, 0056).

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beuck US PGPub: US 2005/0164710 A1 Jul. 28, 2005 and in view of Moeglein US PGPub: US 2005/0037775 A1 Feb. 17, 2005 and further in view of Castelli, US Patent: 5,940,825 Aug. 17, 1999.

Regarding claim 2, Beuck discloses,

the server of claim 1 further including computer-implemented clustering logic to identify position information based on error prone GPS information (the location finder 102 may receive digital radio signals transmitted by GPS satellites 104-1 through 104-3. The signals may include the satellites' location and the exact time. The location finder 102 calculates the distance and reports information indicative of a location of the location finding device to a server via the wireless access point. Here, the database server stores the location information, reads on the claimed feature, computer-implemented clustering logic to identify position information based on error prone GPS information (ABSTRACT, Fig. 1, paragraphs 0018, 0020),

but, is silent on "clustering logic".

Castelli teaches, a generic method for **clustering classified segments** (Figs. 1, 4, 6, 8, 9, column 3, lines 6 – 25, column 4, lines 19 – 40). The target sequence and the stored sequence are correlated first at the lowest level in the hierarchy, and sequences that fails to satisfy the matching criterion are discarded (Castelli, column 2, lines 17 – 28).

Also, in step 701, a seed for clustering is generating using a conventional initialization technique, where the seed is the initial constellation of a cluster centroid (Fig. 7, column 7, lines 15 - 19).

It would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the database server 110 of Beuck(Fig. 1/110) such that the newly found access point's position and other access points positions are calculated accordingly (Moeglein, Fig. 1), for improved redundancy for a more fail-safe operation, higher positioning availability, better accuracy, and faster time to fix, and the server has the updated information about the access points in an ongoing basis (Moeglein, paragraphs 0042, 0056), would have further incorporated clustering logic of Castelli (Castelli, Figs. 1, 4) for performing a search based on a hierarchical correlation in the feature space between the target sequence and the subsequences. The target sequence and the stored

sequence are correlated first at the lowest level in the hierarchy (Castelli, column 2, lines 17 – 28).

Regarding claim 3, Beuck discloses,

the server of claim 2 wherein the clustering logic includes logic to determine a weighted centroid position for all position information reported for an access point (database 310 configured to store the information received from location finder 102, such as user id and GPS coordinates. Here, the database is storing all the received information – including various GPS location information and/or different technologies like CDMA, GSM, satellite communication etc. reads on the claimed feature, clustering logic includes to determine weighted centroid position for all position information reported for an access point - Figs. 1, 3, paragraphs 0024, 0032, 0037) and

but, is silent on, "clustering logic to identify position information that exceeds a statistically-based deviation threshold amount away from the centroid position" and

"clustering logic excludes such deviating position information from the database and from influencing the calculated positions of the Wi-Fi access points".

Castelli teaches, a generic method for clustering classified segments (Figs. 1, 4, 6, 8, 9, column 3, lines 6 – 25, column 4, lines 19 – 40). The target sequence and the stored sequence are correlated first at the lowest level in the hierarchy, and sequences that fails to satisfy the matching criterion are **discarded** (Castelli, column 2, lines 17 – 28).

Also, in step 701, a seed for clustering is generating using a conventional initialization technique, where the seed is the initial constellation of a cluster centroid (Fig. 7, column 7, lines 15 - 19).

It would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the database server 110 of Beuck(Fig. 1/110) such that the newly found access point's position and other access points positions are calculated accordingly (Moeglein, Fig. 1), for improved redundancy for a more fail-safe operation, higher positioning availability, better accuracy, and faster time to fix, and the server has the updated information about the access points in an ongoing basis (Moeglein, paragraphs 0042, 0056), would have further incorporated clustering logic of Castelli (Castelli, Figs. 1, 4) for performing a search based on a hierarchical correlation in the feature space between the target sequence and the subsequences. The target sequence and the stored sequence are correlated first at the lowest level in the hierarchy (Castelli, column 2, lines 17 – 28).

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1. Garahi teaches, movable access points and repeaters for minimizing coverage and capacity constraints in a wireless communication network. US Patent: US 7,206,294 B2 Apr. 17, 2007.

2. Riley teaches creating and using base station almanac information in a wireless communication system having a position location capability. US PGPub: 2003/0125045 A1 Jul. 3, 2005.

3. Krumm teaches, proximity detection using wireless signal strengths. US PGPub: US 2006/0046709 A1 Mar. 2, 2006.

4. Eaton teaches, communication system for location sensitive information. US Patent: US 6,888,811 B2 May 3, 2005.

5. Stanforth teaches, determining relative positioning in ad-hoc networks. US Patent: US 7,167,715 B2 Jan. 23, 2007.

6. Martizano Catalasan teaches, method for creating the clustered logic map solution space. US PGPub: US 2005/0108306 A1 May 19, 2005.

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Express Mail Label No. EV 622196932 US
Date of Deposit: October 28, 2005
Attorney Docket No. 2000319.124 US1

SERVER FOR UPDATING LOCATION BEACON DATABASE

Cross-Reference To Related Applications

[0001] This application claims the benefit under 35 U.S.C. §119(e) of U.S. Provisional Patent Application No. 60/623,108, filed on October 29, 2004, entitled *Wireless Data Scanning Network for Building Location Beacon Database*, which is herein incorporated by reference in its entirety.

[0002] This application is related to the following U.S. Patent Applications (Nos. TBA), filed on an even date herewith, entitled as follows:

Location Beacon Database;

Location-Based Services that Choose Location Algorithms Based on Number of Detected Access Points Within Range of User Device; and

Method and System for Building a Location Beacon Database.

Background

1. Field of the Invention

[0003] The invention generally related to location-base services and, more specifically, to methods and systems of determining locations of Wi-Fi access points and using such information to locate a Wi-Fi-enabled device.

2. Discussion of Related Art

[0004] In recent years the number of mobile computing devices has increased dramatically creating the need for more advanced mobile and wireless services. Mobile email, walkie-talkie services, multi-player gaming and call following are examples of how new applications are emerging on mobile devices. In addition, users are beginning to demand/seek applications that not only utilize their current location but also share that location information with others. Parents wish to keep track of their children, supervisors need to track the location of the company's delivery vehicles, and a business traveler looks to find the nearest pharmacy to pick up a prescription. All of these examples require the individual to know their own current location or that of someone else. To date, we all rely on asking

for directions, calling someone to ask their whereabouts or having workers check-in from time to time with their position.

[0005] Location-based services are an emerging area of mobile applications that leverages the ability of new devices to calculate their current geographic position and report that to a user or to a service. Some examples of these services include local weather, traffic updates, driving directions, child trackers, buddy finders and urban concierge services. These new location sensitive devices rely on a variety of technologies that all use the same general concept. Using radio signals coming from known reference points, these devices can mathematically calculate the user's position relative to these reference points. Each of these approaches has its strengths and weaknesses based on the radio technology and the positioning algorithms they employ.

[0006] The Global Positioning System (GPS) operated by the US Government leverages dozens of orbiting satellites as reference points. These satellites broadcast radio signals that are picked up by GPS receivers. The receivers measure the time it took for that signal to reach to the receiver. After receiving signals from three or more GPS satellites the receiver can triangulate its position on the globe. For the system to work effectively, the radio signals must reach the received with little or no interference. Weather, buildings or structures and foliage can cause interference because the receivers require a clear line-of-sight to three or more satellites. Interference can also be caused by a phenomenon known as multi-path. The radio signals from the satellites bounce off physical structures causing multiple signals from the same satellite to reach a receiver at different times. Since the receiver's calculation is based on the time the signal took to reach the receiver, multi-path signals confuse the receiver and cause substantial errors.

[0007] Cell tower triangulation is another method used by wireless and cellular carriers to determine a user or device's location. The wireless network and the handheld device communicate with each other to share signal information that the network can use to calculate the location of the device. This approach was originally seen as a superior model to GPS since these signals do not require direct line of site and can penetrate buildings better. Unfortunately these approaches have proven to be suboptimal due to the heterogeneous nature of the cellular tower hardware along with the issues of multi-path signals and the lack of uniformity in the positioning of cellular towers.

[0008] Assisted GPS is a newer model that combines both GPS and cellular tower techniques to produce a more accurate and reliable location calculation for mobile users. In this model, the wireless network attempts to help GPS improve its signal reception by transmitting information about the clock offsets of the GPS satellites and the general location of the user based on the location of the connected cell tower. These techniques can help GPS receivers deal with weaker signals that one experiences indoors and helps the receiver obtain a 'fix' on the closest satellites quicker providing a faster "first reading". These systems have been plagued by slow response times and poor accuracy --greater than 100 meters in downtown areas.

[0009] There have been some more recent alternative models developed to try and address the known issues with GPS, A-GPS and cell tower positioning. One of them, known as TV-GPS, utilizes signals from television broadcast towers. (See, e.g., Muthukrishnan, Maria Lijding, Paul Havinga, Towards Smart Surroundings: Enabling Techniques and Technologies for Localization, Lecture Notes in Computer Science, Volume 3479, Jan 2Hazas, M., Scott, J., Krumm, J.: Location-Aware Computing Comes of Age. IEEE Computer, 37(2):95–97, Feb 2004 005, Pa005, Pages 350-362.) The concept relies on the fact that most metropolitan areas have 3 or more TV broadcast towers. A proprietary hardware chip receives TV signals from these various towers and uses the known positions of these towers as reference points. The challenges facing this model are the cost of the new hardware receiver and the limitations of using such a small set of reference points. For example, if a user is outside the perimeter of towers, the system has a difficult time providing reasonable accuracy. The classic example is a user along the shoreline. Since there are no TV towers out in the ocean, there is no way to provide reference symmetry among the reference points resulting in a calculated positioning well inland of the user.

[0010] Microsoft Corporation and Intel Corporation (via a research group known as PlaceLab) have deployed a Wi-Fi Location system using the access point locations acquired from amateur scanners (known as "wardrivers") who submit their Wi-Fi scan data to public community web sites. (See, e.g., LaMarca, A., et. al., Place Lab: Device Positioning Using Radio Beacons in the Wild.) Examples include WiGLE, Wi-FiMaps.com, Netstumbler.com and NodeDB. Both Microsoft and Intel have developed their own client software that utilizes this public wardriving data as reference locations. Because individuals voluntarily supply the data the systems suffer a number of performance and

reliability problems. First, the data across the databases are not contemporaneous; some of the data is new while other portions are 3-4 years old. The age of the access point location is important since over time access points can be moved or taken offline. Second, the data is acquired using a variety of hardware and software configurations. Every 802.11 radio and antenna has different signal reception characteristics affecting the representation of the strength of the signal. Each scanning software implementation scans for Wi-Fi signals in different ways during different time intervals. Third, the user-supplied data suffers from arterial bias. Because the data is self-reported by individuals who are not following designed scanning routes, the data tends to aggregate around heavily traffic areas. Arterial bias causes a resulting location pull towards main arteries regardless of where the user is currently located causing substantial accuracy errors. Fourth, these databases include the calculated position of scanned access points rather than the raw scanning data obtained by the 802.11 hardware. Each of these databases calculates the access point location differently and each with a rudimentary weighted average formula. The result is that many access points are indicated as being located far from their actual locations including some access points being incorrectly indicated as if they were located in bodies of water.

[0011] There have been a number of commercial offerings of Wi-Fi location systems targeted at indoor positioning. (See, e.g., Kavitha Muthukrishnan, Maria Lijding, Paul Havinga, Towards Smart Surroundings: Enabling Techniques and Technologies for Localization, Lecture Notes in Computer Science, Volume 3479, Jan 2Hazas, M., Scott, J., Krumm, J.: Location-Aware Computing Comes of Age. IEEE Computer, 37(2):95–97, Feb 2004 005, Pa005, Pages 350-362.) These systems are designed to address asset and people tracking within a controlled environment like a corporate campus, a hospital facility or a shipping yard. The classic example is having a system that can monitor the exact location of the crash cart within the hospital so that when there is a cardiac arrest the hospital staff doesn't waste time locating the device. The accuracy requirements for these use cases are very demanding typically calling for 1-3 meter accuracy. These systems use a variety of techniques to fine tune their accuracy including conducting detailed site surveys of every square foot of the campus to measure radio signal propagation. They also require a constant network connection so that the access point and the client radio can exchange synchronization information similar to how A-GPS works. While these systems are becoming more reliable for these indoor use cases, they are ineffective in any

wide-area deployment. It is impossible to conduct the kind of detailed site survey required across an entire city and there is no way to rely on a constant communication channel with 802.11 access points across an entire metropolitan area to the extent required by these systems. Most importantly outdoor radio propagation is fundamentally different than indoor radio propagation rendering these indoor positioning algorithms almost useless in a wide-area scenario.

[0012] There are numerous 802.11 location scanning clients available that record the presence of 802.11 signals along with a GPS location reading. These software applications are operated manually and produce a log file of the readings. Examples of these applications are Netstumber, Kismet and Wi-FiFoFum. Some hobbyists use these applications to mark the locations of 802.11 access point signals they detect and share them with each other. The management of this data and the sharing of the information is all done manually. These application do not perform any calculation as to the physical location of the access point, they merely mark the location from which the access point was detected.

[0013] Performance and reliability of the underlying positioning system are the key drivers to the successful deployment of any location based service. Performance refers to the accuracy levels that the system achieves for that given use case. Reliability refers to the percentage of time that the desired performance levels are achieved.

	Performance	*Reliability*
Local Search / Advertising	< 100 meters	85% of the time
E911	<150 meters	95% of the time
Turn-by-turn driving directions	10-20 meters	95% of the time
Gaming	< 50 meters	90% of the time
Friend finders	< 500 meters	80% of the time
Fleet management	<10 meters	95% of the time
Indoor asset tracking	< 3 meters	95% of the time

Summary

[0014] The invention provides a location beacon database and server, method of building location beacon database, and location based service using same.

[0015] Under another aspect of the invention, a Wi-Fi location server includes a database of Wi-Fi access points for at least one target area having a radius on the order of tens of miles, said database being recorded in a computer-readable medium and including database records for substantially all Wi-Fi access points in the target area, each record including identification information for a corresponding Wi-Fi access point and calculated position information for the corresponding Wi-Fi access point, wherein said calculated position information is obtained from recording multiple readings of the Wi-Fi access point to provide reference symmetry when calculating the position of the Wi-Fi access point and to avoid arterial bias in the calculated position information. The server also includes computer-implemented logic to add records to the database for newly-discovered Wi-Fi access points said computer logic including logic to recalculate position information for Wi-Fi access points previously stored in the database to utilize the position information for the newly-discovered Wi-Fi access points.

[0016] Under another aspect of the invention, the server includes computer-implemented clustering logic to identify position information based on error prone GPS information.

[0017] Under another aspect of the invention, the clustering logic includes logic to determine a weighted centroid position for all position information reported for an access point and logic to identify position information that exceeds a statistically-based deviation threshold amount away from the centroid position and excludes such deviating position information from the database and from influencing the calculated positions of the Wi-Fi access points.

Brief Description Of Drawings

[0018] In the drawing,

Figure 1 depicts certain embodiments of a Wi-Fi positioning system;

Figure 2 depicts scanning vehicles including scanning devices according to certain embodiments of the invention;

Figure 3 depicts an example of a scanning scenario to illustrate the problem of arterial bias in data collection;

Figure 4 depicts an example using a programmatic route for a scanning vehicle according to