EXHIBIT 2

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(12) United States Patent

Lin et al.

(54) SELECTING BEACONS FOR LOCATION INFERENCE

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- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 323 days.
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- (51) Int. Cl.
 G01S 5/02 (2010.01)
 (52) U.S. Cl.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,936,572	A *	8/1999	Loomis et al.	 342/357.29
6,776,334	B1	8/2004	Garg	

(10) Patent No.: US 8,618,984 B2

(45) **Date of Patent: Dec. 31, 2013**

7,397,424	B2	7/2008	Houri
7,474,897	B2 *	1/2009	Morgan et al 455/456.5
7,577,244	B2	8/2009	Taschereau
7,750,848	B2 *	7/2010	Normark et al 342/357.25
2004/0203904	A1*	10/2004	Gwon et al 455/456.1
2007/0001867	A1*	1/2007	Rowe et al 340/825.49
2007/0210961	A1	9/2007	Romijn
2008/0176583	A1 $*$	7/2008	Brachet et al 455/456.3
2008/0238767	A1	10/2008	Zhou
2008/0252511	A1	10/2008	Jacotot
2008/0280624	A1	11/2008	Wrappe
2010/0013704	A1*	1/2010	Coutel et al 342/357.04

OTHER PUBLICATIONS

Olson et al, "Robust Range-Only Beacon Localization," IEEE AUV, 2004.*

(Continued)

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(57) **ABSTRACT**

Location inference using selected beacons. Data is received representing a set of beacons observed by a computing device. The beacons are located within a first geographic area. A subset (e.g., a clique) of the beacons is selected based on a coverage area of each of the beacons, where each of the beacons in the selected subset has a coverage area that overlaps with the coverage area of each of the other beacons in the selected subset. Using known or estimated positions of the beacons, a second geographic area is defined based on the selected subset of beacons and the beacon reference data and the coverage areas associated therewith. The second geographic area, smaller than the first geographic area, represents an approximate location of the computing device. In some embodiments, the computing device is calculated to be within the second geographic area with 95% probability.

20 Claims, 5 Drawing Sheets



(56) **References Cited**

OTHER PUBLICATIONS

Meneses, et al., "Enhancing the Location-Context through Inference over Positioning Data", Retrieved at<<http://ubicomp.algoritmi. uminho.pt/csmu/proc/meneses-135.pdf>>, Jun. 2006, pp. 10. Sinha, et al., "A Beacon Selection Algorithm for Bounded Error Location Estimation in Ad Hoc Networks", Retrieved at <<http:// ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=4127348&isnumber=4127326>>, Mar. 5-7, 2007, pp. 6. Lieckfeldt, et al., An Algorithm for Distributed Beacon Selection, Retrieved at<<hr/>http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=4517414&isnumber=4517341>>, Sixth Annual IEEE International Conference on Pervasive Computing and Communications, Mar. 17-21, 2008, pp. 318-323.

Bahl, et al., "RADAR: An In-Building RF-based User Location and Tracking System", Retrieved at<<htp://www.cs.indiana.edu/~con-nelly/Docs/radar.pdf>>, 2000, pp. 10.

* cited by examiner





FIG. 2

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