EXHIBIT 2

US008618984B2

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

(10) **Patent No.: US 8,618,984 B2**
(45) **Date of Patent: Dec. 31, 2013**

(54) **SELECTING BEACONS FOR LOCATION INFERENCE**

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(73) Assignee: **Microsoft Corporation**, Redmond, WA (US)

(*) 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.**
CPC ***G01S 5/0252*** (2013.01); ***G01S 5/0278*** (2013.01)
USPC **342/451**; 342/464

(58) **Field of Classification Search**
USPC 342/386, 450, 451, 463, 464
See application file for complete search history.

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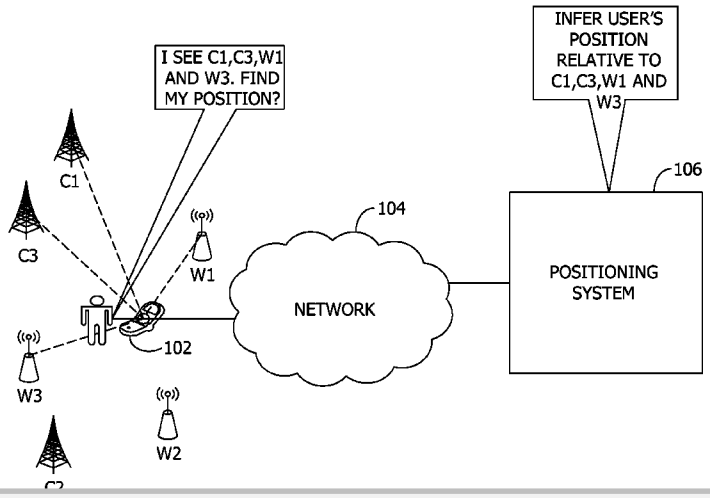
Primary Examiner — Gregory C Issing

(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



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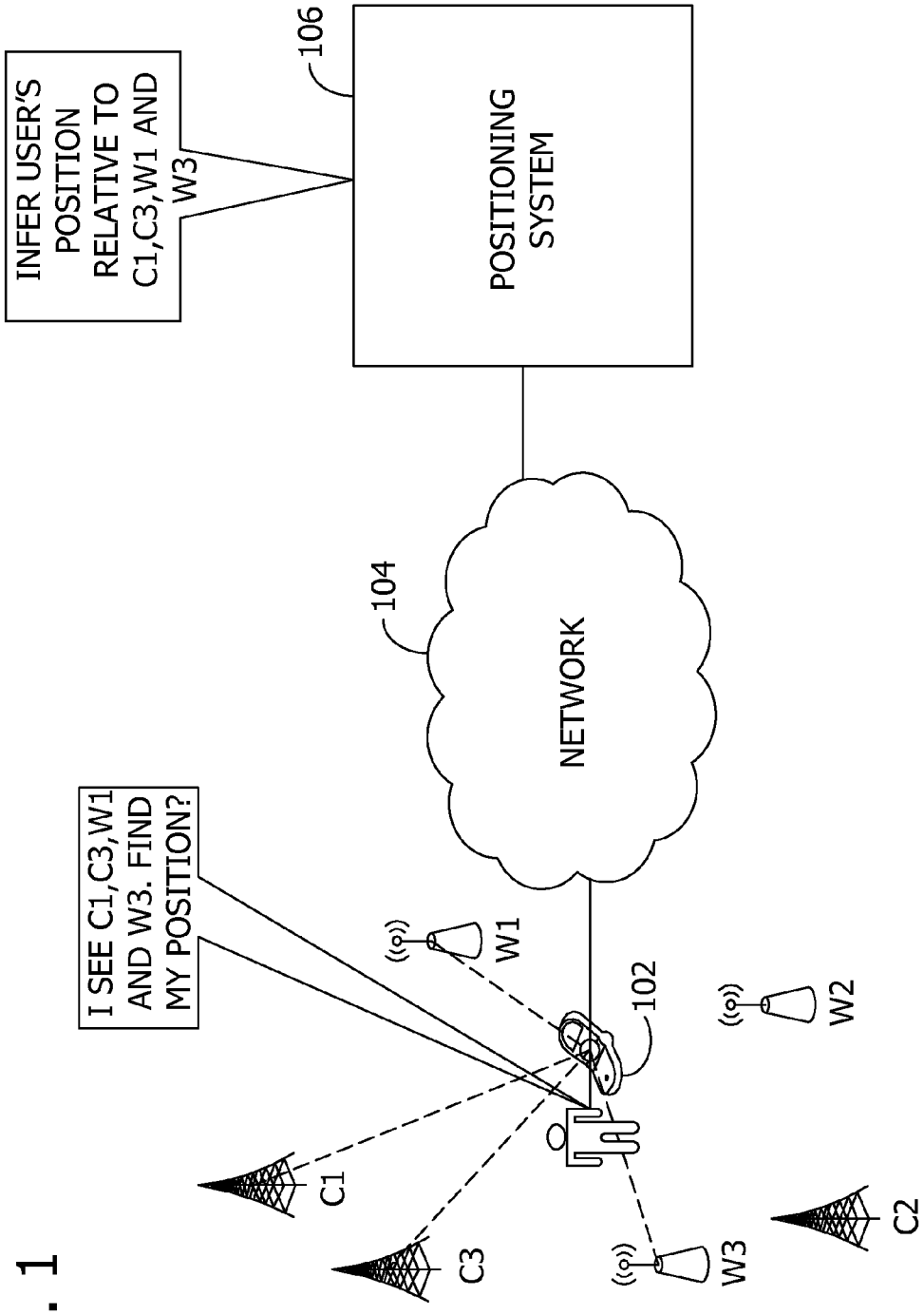

FIG. 1

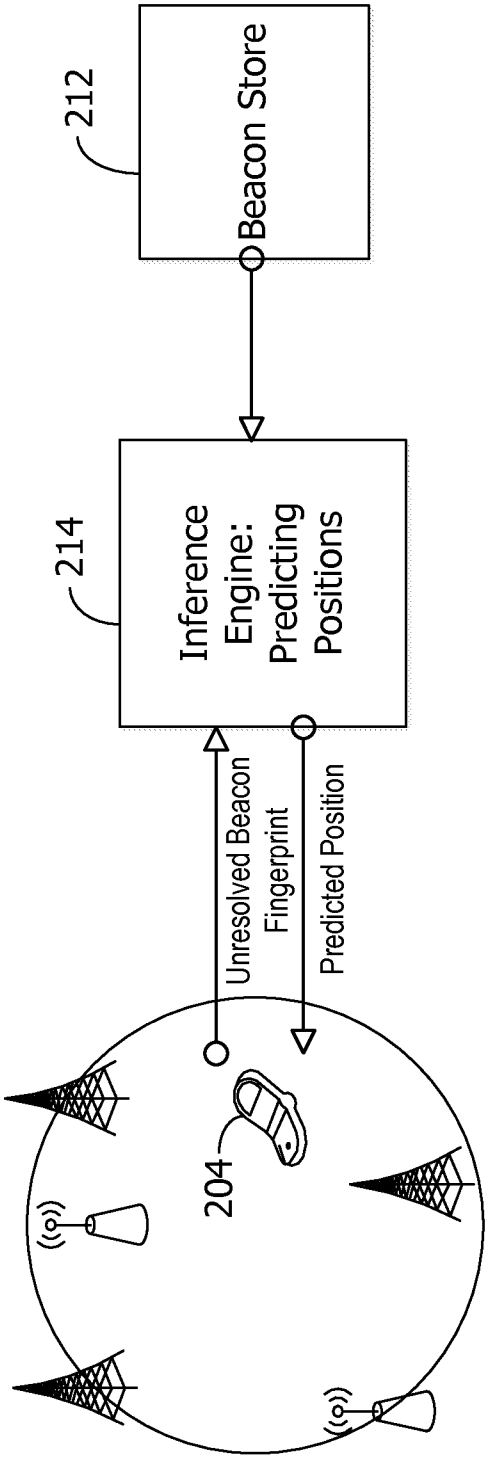

FIG. 2

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