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**Fernandez et al.**

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(54) **LOCATION VERIFICATION BASED ON ENVIRONMENTAL SENSOR DATA**

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(58) **Field of Classification Search**  
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See application file for complete search history.

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(56) **References Cited**

U.S. PATENT DOCUMENTS

8,031,085 B1 10/2011 Anderson  
9,510,357 B1 \* 11/2016 Egner ..... **H04W 48/18**  
2008/0114501 A1 5/2008 Wu  
(Continued)

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This patent is subject to a terminal disclaimer.

OTHER PUBLICATIONS

Mujibiya, “Haptic Feedback Companion f or Body Area Network Using Body-Carried Electrostatic Charge,” Rakuten Institute of Technology, Rakuten Inc., Tokyo, Japan, 2015, pp. 571-572.

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(57) **ABSTRACT**

Techniques are described for determining and/or verifying the location of a device based on environmental data. A device may provide location information describing its location, e.g., determined using a satellite-based navigation system. Environmental context data (e.g., temperature, air pressure, air quality, pollen count, ambient light, etc.) may also be received from the device, having been generated by sensor(s) incorporated into the device. The environmental context data may be compared to corresponding elements of other context data that is generated independently of the device. Based on the comparison, a confidence metric may be determined that indicates a level of confidence that the device's communicated location is its actual location. The confidence metric may be employed to make a security determination regarding a user of the device.

**20 Claims, 5 Drawing Sheets**

