device in order for an access controlled door or the like to be opened. However, a large number of users tend to store their identification device in a bag or wallet which in some instances must be removed in order to be read. This can be frustrating and time consuming for the user. Additionally, as users tend to carry a number of items when travelling through such access controlled doors, it is frustrating that a dedicated device, with no other purpose, needs to be carried with the user when attempting to access the restricted area.

[0007] Monitoring systems for detecting when a user's mobile device is located in a particular room or area is extremely difficult to achieve with significant accuracy. Existing systems include Apple iBeacon™ rely cannot control the distance which a signal propagates with any accuracy. Therefore, a mobile device may determine it is within a particular room or area where in fact the signal emitted by the iBeacon™ may have propagated substantially further than intended thereby providing a false positive detection.

[0008] There is therefore a need to alleviate one or more of the above-mentioned problems or provide a commercial alternative.

[0009] The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as, an acknowledgement or admission or any form of suggestion that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

Summary

[0010] For purposes of summarizing the disclosure, certain aspects, advantages and novel features of the inventions have been described herein. It is to be understood that not necessarily all such advantages may be achieved in accordance with any particular embodiment of the invention. Thus, the invention may be embodied or carried out in a manner that seeks one advantage or group of advantages as taught herein without necessarily seeking other advantages as may be taught or suggested herein.

[0011] In one aspect there is provided a system including:

a plurality of transmitters, each transmitter having associated therewith a reflector antenna configured to substantially reflect signal transmission toward a detection area, wherein the reflector antenna of at least some of the plurality of transmitters face substantially toward each other to thereby define at least some of the detection area located therebetween; and

a mobile device configured to:

one of the entry or exit request is indicative of a positional offset of the mobile device within the detection area, wherein in the event that the controller receives data indicative of a plurality of substantially simultaneous entry or exit requests received from multiple mobile communication devices, the positional offset indicated by at least one of the entry request or exit request is used to at least partially determine which entry or exit request from the plurality of substantially simultaneous entry or exit requests to process.

[0035] In a second aspect there is provided a method including:

transmitting, from a plurality of transmitters, transmitter signals, wherein each transmitter has associated therewith a reflector antenna configured to substantially reflect signal transmission toward a detection area, wherein the reflector of at least some of the plurality of transmitters face substantially toward each other thereby defining at least some of the detection area located therebetween; and

determining, at a mobile device, that the mobile device is located within the detection area based on received signal strengths of at least two transmitter signals of the plurality of transmitter signals.

[0036] In certain embodiments, the determination that the mobile device is located within the detection area is based on a mean value of the received signal strengths.

[0037] In certain embodiments, the mean value is one of:

a harmonic mean value; and

a geometric mean value.

[0038] In certain embodiments, the method includes the mobile device determining a mask value using the received signal strengths for the least some of the transmitters, wherein the mobile device uses the mean value and the mask value to determine if the mobile device is located in one of a plurality of detection areas associated with the plurality of transmitters.

[0039] In certain embodiments, the method includes the mobile device:

determining a first mask value based on a discrepancy between a first mean value of the received signal strength for signals received from a first pair of the transmitters of the plurality of transmitters and a second mean value of the received signal strength for signals received from a second pair of the transmitters of the plurality of transmitters;

determining a second mask value based on a discrepancy between the second mean value the first mean value;

the event that the controller receives data indicative of a plurality of substantially simultaneous entry or exit requests received from multiple mobile communication devices, the method includes the controller using the one or more connected wireless devices indicated by at least one of the entry request or exit request to at least partially determine which entry or exit request from the plurality of substantially simultaneous entry or exit requests to process.

[0046] In certain embodiments, the mobile communication device is configured to determine, using the received signal strengths of the at least some of the transmitter signals, a positional offset of the mobile device within the detection area, wherein at least one of the entry or exit request is indicative of a positional offset of the mobile device within the detection area, wherein in the event that the controller receives data indicative of a plurality of substantially simultaneous entry or exit requests received from multiple mobile communication devices, the method includes the controller using the positional offset indicated by at least one of the entry request or exit request to at least partially determine which entry or exit request from the plurality of substantially simultaneous entry or exit requests to process.

[0047] In a third aspect there is provided a system including:

a plurality of transmitters, each transmitter having associated therewith a reflector antenna configured to substantially reflect signal transmission toward a detection area, wherein the reflector of at least some of the plurality of transmitters face substantially toward each other to thereby define at least some of the detection area located therebetween; and

a non-transitory computer readable medium including a computer program executable by a mobile device associated with an entity, wherein execution of the computer program configures the mobile device to:

receive transmitter signals from at least two transmitters from the plurality of transmitters; and

determine that the mobile device is located within the detection area based on received signal strengths of the at least some of the transmitter signals.

[0048] Other aspects and embodiments will be appreciated throughout the detailed description.

Brief Description of the Figures

[0049] Example embodiments should become apparent from the following description, which is given by way of example only, of at least one preferred but non-limiting embodiment, described in connection with the accompanying figures.

CLAIMS

1. A system including:

a plurality of transmitters, each transmitter having associated therewith a reflector antenna configured to substantially reflect signal transmission toward a detection area, wherein the reflector antenna of at least some of the plurality of transmitters face substantially toward each other to thereby define at least some of the detection area located therebetween; and

a mobile device configured to:

receive transmitter signals from at least two transmitters from the plurality of transmitters; and

determine that the mobile device is located within the detection area based on received signal strengths of the at least some of the transmitter signals.

2. The system according to claim 1, wherein each reflector antenna is a corner reflector antenna.

3. The system according to claim 2, wherein the respective reflecting walls of each reflector antenna are walls of a bollard housing the respective transmitter.

4. The system according to claim 3, wherein a dipole driven element of each transmitter is spaced from the corner reflector antenna by a spacing bracket mounted within the respective bollard.

5. The system according to claim 3 or 4, wherein each bollard includes a cutout section to enable transmission of the respective transmitter signal by the respective transmitter.

6. The system according to any one of claims 1 to 5, wherein the plurality of transmitters includes:

two transmitters;

three transmitters, wherein the plurality of transmitters are spaced apart from each other in a triangular configuration; or

four transmitters, wherein the plurality of transmitters are spaced apart from each other in a quadrilateral configuration.

7. The system according to any one of claims 1 to 6, wherein the plurality of transmitters are Bluetooth devices.

8. The system according to any one of claims 1 to 7, wherein the determination that the mobile device is located within the detection area is based on a mean value of the received signal strengths.

9. The system according to claim 8, wherein the mean value is one of:
a harmonic mean value; and
a geometric mean value.

10. The system according to claim 8 or 9, wherein the mobile device is configured to determine a mask value using the received signal strengths for the least some of the transmitters, wherein the mobile device uses the mean value and the mask value to determine if the mobile device is located in one of a plurality of detection areas associated with the plurality of transmitters.

11. The system according to any one of claims 8 or 9, wherein the mobile device is configured to:

determine a first mask value based on a discrepancy between a first mean value of the received signal strength for signals received from a first pair of the transmitters of the plurality of transmitters and a second mean value of the received signal strength for signals received from a second pair of the transmitters of the plurality of transmitters;

determine a second mask value based on a discrepancy between the second mean value the first mean value;

determine if the mobile device is located in a first detection area in the event that one or more first criteria are satisfied based on masking the mean value using the first mask value; and

determine if the mobile device is located in a second detection area in the event that one or more second criteria are satisfied based on masking the mean value using the second mask value.

12. The system according to claim 8 or 9, wherein the mobile device is configured to determine that the mobile device is located within the detection area in response to the mobile device determining that the mean value of the received signal strengths is greater than or equal to a signal strength threshold over a threshold period of time.

13. The system according to claim 8 or 9, wherein the mobile device is configured to determine that the mobile device is located within the detection area in response to the mobile device determining that the mean value of the received signal strengths is greater than or equal to a first signal strength threshold over a threshold period of time starting when the mean value of the received signal strengths is greater than a second signal strength threshold, wherein the second signal strength threshold is greater than the first signal strength threshold.

14. The system according to any one of claims 1 to 13, wherein the mobile device is configured to transfer data indicative of the determination that the mobile device is within the detection area to a monitoring system.

15. The system according to claim 14, wherein the monitoring system includes a controller with an associated communication device, wherein the data indicative of the determination is an access request generated and transferred by the mobile device which is received by the controller via the communication device, wherein the controller is configured to facilitate, based on the request, instructing an access control system to allow the entity to travel through an entry or exit point.

16. The system according to claim 15, wherein the entry or exit points are associated with a vehicular parking facility.

17. The system according to claim 15 or 16, wherein at least one of the entry request and the exit request generated by the mobile communication device is indicative of one or more wireless devices which the mobile communication device is currently connected thereto, wherein in the event that the controller receives data indicative of a plurality of substantially simultaneous entry or exit requests received from multiple mobile communication devices, the one or more connected wireless devices indicated by at least one of the entry request or exit request is used to at least partially determine which entry or exit request from the plurality of substantially simultaneous entry or exit requests to process.

18. The system according to any one of claims 15 to 17, wherein the mobile communication device is configured to determine, using the received signal strengths of the at least some of the transmitter signals, a positional offset of the mobile device within the detection area, wherein at least one of the entry or exit request is indicative of a positional offset of the mobile device within the detection area, wherein in the event that the controller receives data indicative of a plurality of substantially simultaneous entry or exit requests received from multiple mobile communication devices, the positional offset indicated by at least one of the entry request or exit request is used to at least partially determine which entry or exit request from the plurality of substantially simultaneous entry or exit requests to process.

19. A method including:

transmitting, from a plurality of transmitters, transmitter signals, wherein each transmitter has associated therewith a reflector antenna configured to substantially reflect signal transmission toward a detection area, wherein the reflector of at least some of the plurality of transmitters face substantially toward each other thereby defining at least some of the detection area located therebetween; and

determining, at a mobile device, that the mobile device is located within the detection area based on received signal strengths of at least two transmitter signals of the plurality of transmitter signals.

20. A system including:

a plurality of transmitters, each transmitter having associated therewith a reflector antenna configured to substantially reflect signal transmission toward a detection area, wherein the reflector of at least some of the plurality of transmitters face substantially toward each other to thereby define at least some of the detection area located therebetween; and

a non-transitory computer readable medium including a computer program executable by a mobile device, wherein execution of the computer program configures the mobile device to:

receive transmitter signals from at least two transmitters from the plurality of transmitters; and

determine that the mobile device is located within the detection area based on received signal strengths of the at least some of the transmitter signals.

21. The system according to claim 1, wherein the mobile device is an on-board processing system of a vehicle.

22. The method according to claim 19, wherein the mobile device is an on-board processing system of a vehicle.

23. The system according to claim 20, wherein the mobile device is an on-board processing system of a vehicle.