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(54) Abstract Title: **Competitor monitor**

(57) A tracking system (200) for tracking competitors in a sporting event (eg yachts) comprises a plurality of GPS locator devices (202a-f) each associated with a respective competitor (204a-f), a plurality of first wireless transceivers (206a-f) each in communication with a respective locator device (202a-f). The system also comprises a central processor (208) having a second wireless transceiver. Each of the plurality of first transceivers (206a-f) receives the same signals from the same remote sources (102a-d) and passes said signal to the respective locator device (202a-f). Each of the locator devices (202a-f) is arranged to execute the same location determination algorithm upon said signal in order to determine the location of the competitor (204a-f) and generate a location data set including a competitor identifier. This data set is passed to the central processor (208) via the respective first transceivers (206a-f) and second wireless transceiver means. The central processor (208) processes each location data set in order to generate a log of relative location data detailing the relative locations of competitors within the event and stores the log of relative location data.

The invention also comprises a competitor registration system.

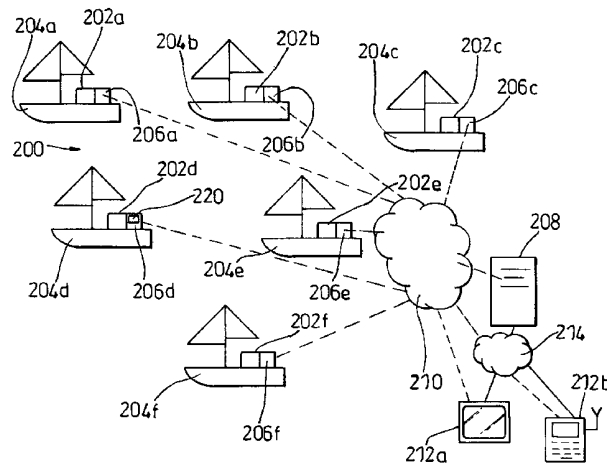


Fig. 2



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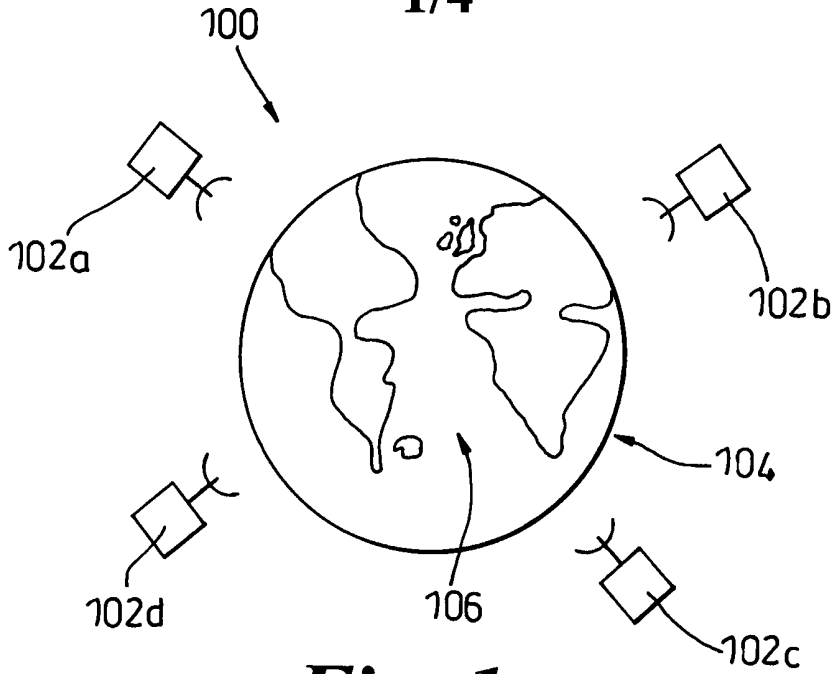


Fig. 1

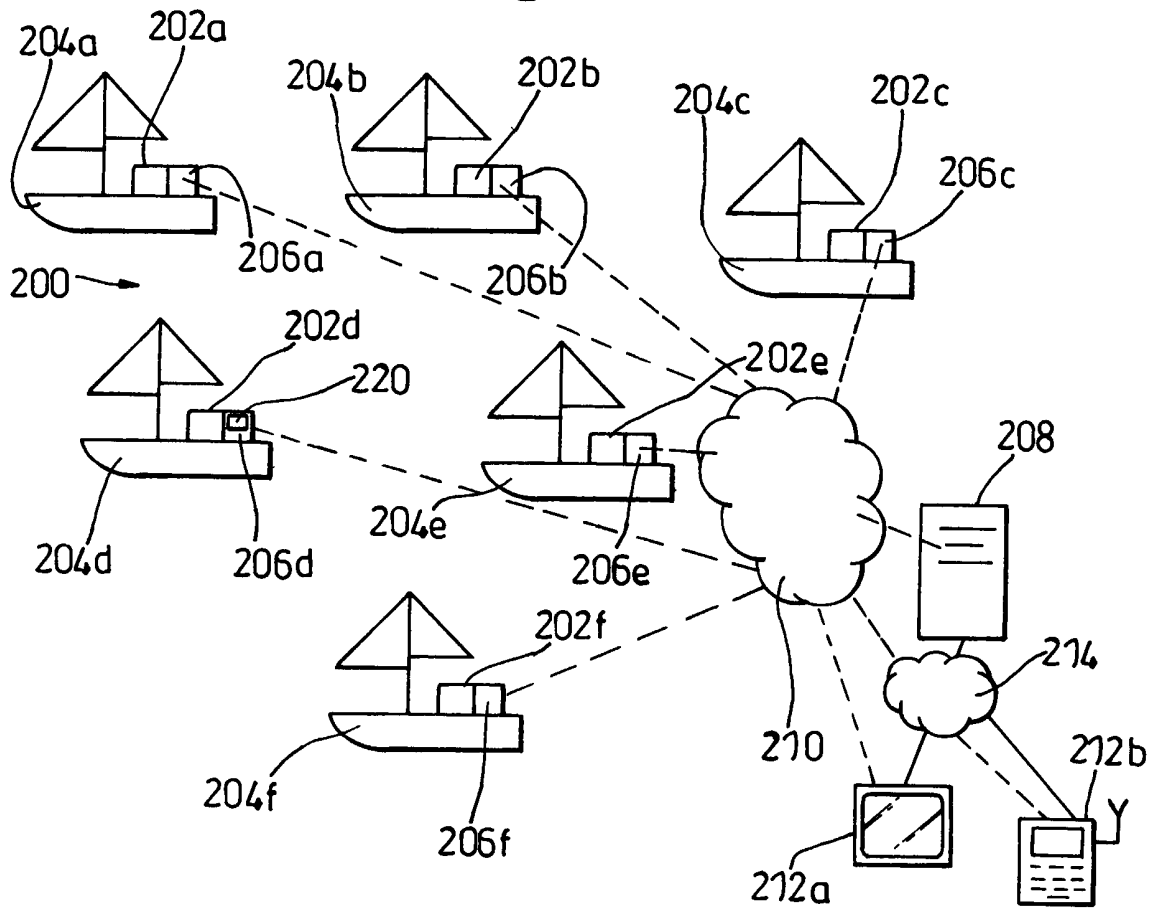


Fig. 2

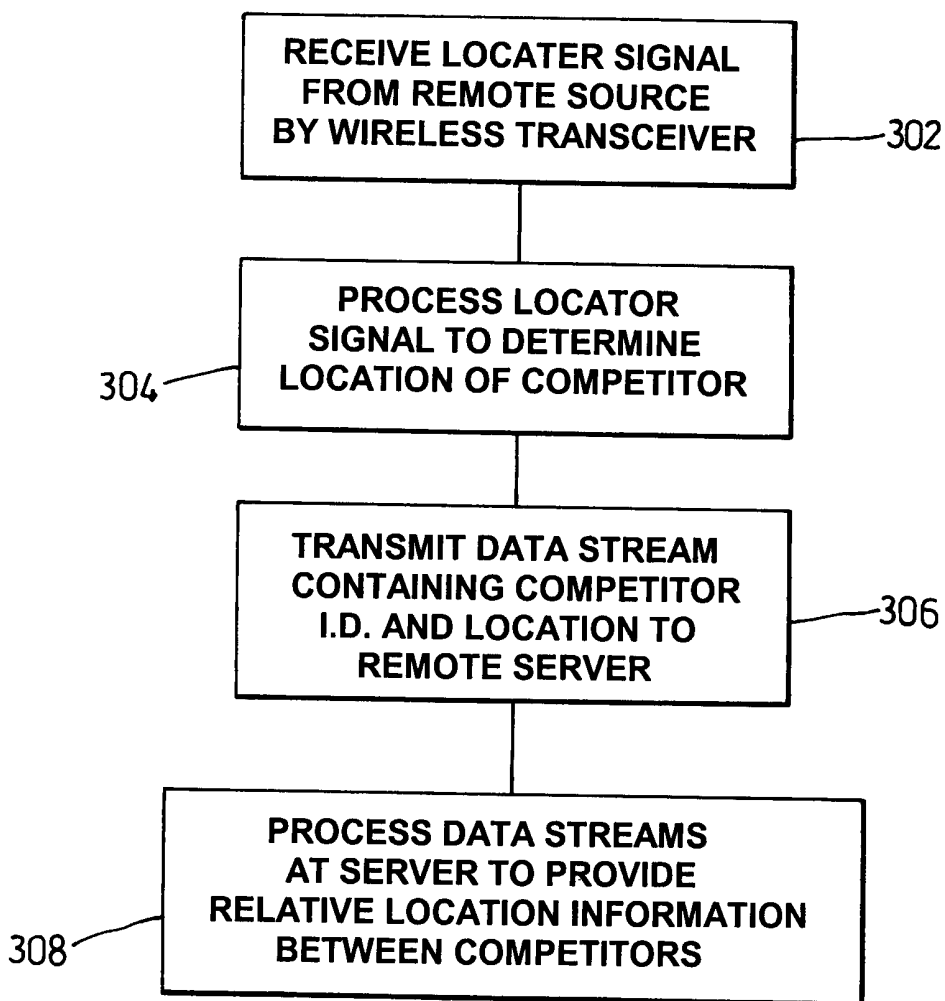


Fig. 3

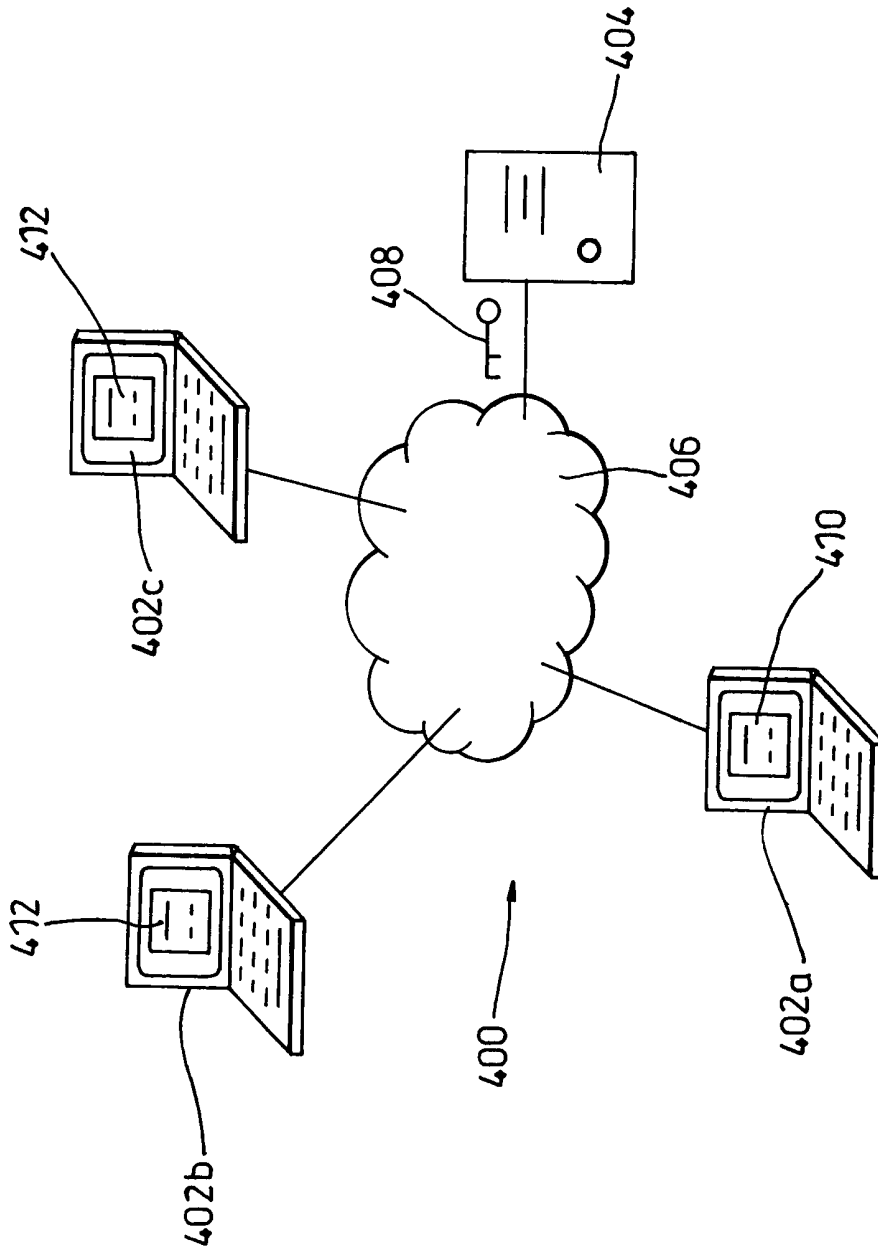


Fig. 4

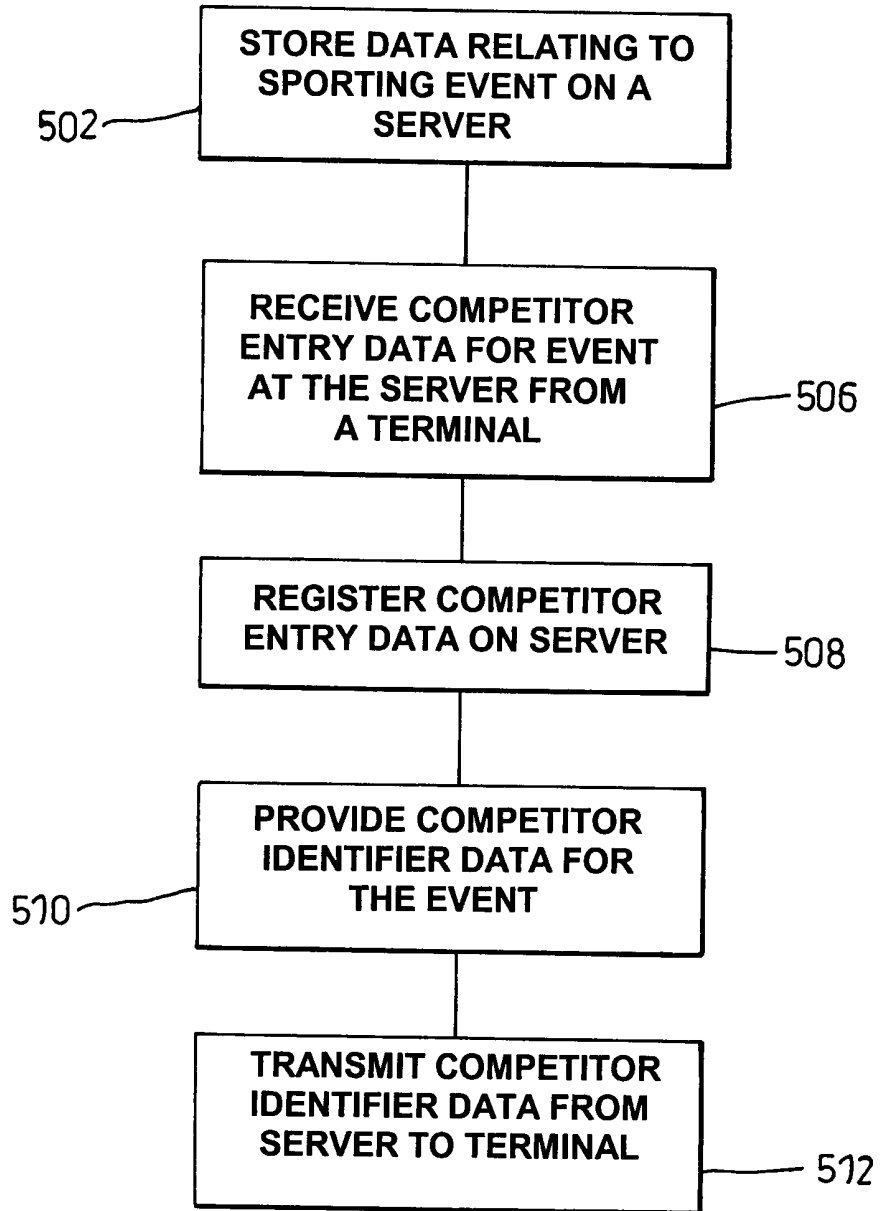


Fig. 5

MONITORING SYSTEM AND METHOD

This invention relates to a monitoring system and method of monitoring. More particularly, but not exclusively, it relates to a system and method
5 for monitoring competitors in a sporting event.

The accurate tracking of the relative positions of competitors in a sporting event, for example a yacht race, is important as it allows definitive judgements to be made regarding the placings of competitors. Tracking
10 also allows, for example, false starts, where a competitor crosses a start line prior to the official start of the event, to be monitored and identified.

Another important use of tracking of relative positions of competitors is in post race performance analysis, for example, in a yacht race a
15 competitor can analyse their course about a buoy, or waymarker, relative to another competitors course in order to determine where time was lost or gained.

Current systems for monitoring the relative positions of competitors in
20 sporting events use very accurate, expensive Global Positioning Systems (GPS) equipment that is beyond the reach of most amateur competitors, and indeed usually beyond the reach of all but a top few professional competitors.

25 The control of event entries and identification of competitors is another area where monitoring is important.

Current competitor entry and identification systems rely upon an event organiser either having to supply each competitor with special equipment
30 prior to the event, or having to arrange in advance for each competitor to provide details of their existing equipment or its configuration and then

registering this information. Clearly this is undesirable as it relies on either the provision of special equipment, which can be expensive, and requires the long term planning of events thereby limiting the scope for spontaneous events at short notice. The use of a service provider to
5 broadcast a start signal also incurs expense and limits spontaneous event creation.

According to a first aspect of the present invention there is provided a tracking system for tracking objects, generally competitors in a sporting
10 event, comprising a plurality of locator means each associated with a respective competitor, a plurality of first transceiver means each in communication with a respective locator means, and a central processing means, the central processing means having a second transceiver means associated therewith, each of the plurality of first transceiver means being
15 arranged to periodically receive the same locator signal from the same remote source and to pass said locator signal to the respective locator means, each of the locator means being arranged to execute the same location determination routine upon the locator signal in order to determine the location of the object and generate a location data set,
20 including an object identifier, to be passed to the central processing means via the respective first transceiver means and second transceiver means, and the central processing means being arranged to process each location data set to generate a log of relative location data detailing the relative locations of objects within the event.

25

It will be appreciated that the term 'the same' is used herein to describe the use of signals, sources and routines within system having variations therebetween that have minimal effect upon relative position measurements between tracked objects.

30

The use of the same locator signal transmitted by the same remote source and the execution of the same location determination routine by each locator means results in the minimisation, and in an ideal system elimination, of the relative error between determined locations of competitors irrespective of any absolute error in the location determination. This allows cheaper locator means with lower absolute accuracy to be used compared to existing systems obtaining accurate relative location determination comparable to that of the more expensive systems making the systems affordable to amateur sports competitors.

10

All of locator means may be arranged to obtain locator signals from the same pre-determined sub-set of remote sources, for example a specific sub-group of possible GPS satellites. All of locator means may be arranged to triangulate and/or trilaterate the locator signals using the same location determination routine in order to determine the location of each respective object.

15

The locator means may be arranged to store a plurality of location data sets for later upload to the processing means. Thus, location information can be downloaded to the processing means from the locator means at the end of an event, typically for post event analysis. Alternatively, the locator means may be arranged to transmit individual location data sets to the processing means in real time. This allows for a real time stream of data to flow to the processing means for in event, or subsequent post event, analysis to be carried out

25

The processing means may include a third transceiver means arranged to output the relative location data for display upon a display means, typically via a data network, for example the Internet. The display means may be integrally formed with the locator means. Alternatively, the display means may be remote from the locator means. The processing

30

means may be arranged to output the log of relative location data during the event or at any time following the completion of the event. Thus, the system allows real time analysis of race progress and also retrospective performance analysis.

5

The processing means may be arranged to generate a patch and/or a location determination routine update and/or a change of remote source command. The second transceiver means may be arranged transmit the patch and/or update and/or command to all locator means in an event
10 simultaneously, via the respective first transceiver means. This results in all of the location means being updated at the same time thereby ensuring that all location means are using the same remote sources and algorithms. Alternatively, or additionally, each of the plurality of locator means may be arranged to be synchronised to sample at a particular phase of a
15 broadcast signal, for example, either, or both, of a phase of the information being broadcast or to a carrier signal. Each of the plurality of locator means may be arranged to be synchronised to sample at the same phase of a pseudo random code and/or the same phase of a carrier signal. The processing means may be arranged to transmit, via the second
20 transceiver means, a synchronisation signal to all locator means in an event. The synchronisation signal typically ensures synchronisation to within a few ns. This synchronisation signal ensures that, in particular for GPS based systems, the signal from the remote source is clocked at the same time by every locator means.

25

The remote source may be a GPS satellite or a sub-set of available GPS satellites. Alternatively, or additionally, the remote source may be a radio transmitter.

30 In a preferred embodiment, at least one of the plurality of first transceiver means may be arranged to receive data from at least one

sensor sensing at least one of the following: pitch, yaw, body temperature of a competitor. Said at least some of the plurality of first transceiver means may be arranged to transmit the input data from the at least one sensor to the processing means via the second transceiver means. The
5 processing means may be arranged to create a log of the input data.

Each of the plurality of first transceiver means may be a mobile telecommunications device, typically a mobile telephone. The mobile telecommunications device may employ any one, or combination, of the
10 following telecommunications protocols: GSM, GPRS, UTMS, 3G.

The second transceiver means may be a mobile telecommunications device, typically a mobile telephone. The mobile telecommunications device may employ any one, or combination, of the following
15 telecommunications protocols: GSM, GPRS, UTMS, 3G.

The processing means may be a server, typically a webserver. The processing means may incorporate any one, or combination, of the following data storage devices, upon which the relative location data may
20 be stored: CD, DVD, magnetic hard disc, magnetic tape.

The processing means may be operable to determine the relative positions of objects in more than one event at any given time from incoming data.

25 According to a second aspect of the present invention there is provided a locator device comprising transceiver means and processing means, the transceiver means being arranged to receive a signal from a remote source, the processing means being operable to execute a location determination routine upon said signal in order to determine the location
30 of the locator device, wherein the same remote source and the same location determination algorithm are also employed by at least one further

locator device in order to reduce a relative error between determined locations of the locator device and the at least one further locator device.

According to third aspect of the present invention there is provided a method of tracking objects, generally competitors in a sporting event, comprising the steps of:

- i) receiving a locator signal from a remote source by a transceiver associated with each competitor;
- ii) processing of the locator signal by a processor associated with each object to determine a location of each object, each processor using the same location determination routine;
- iii) transmitting data streams containing an object identifier and the location to a remote server from each of the processors via respective transceivers; and
- iv) processing the data streams at the server to provide relative location information between objects.

The method may include obtaining signals from the same pre-determined sub-set of remote sources for all transceivers, for example a specific sub-group of possible GPS satellites. The method may include triangulating and/or trilaterating the signal using the same location determination algorithm in order to determine the location of each respective object in the event.

The method may include outputting the log of relative location data during the event or at any time following the completion of the sporting event. Thus, the system allows real time analysis of race progress and also retrospective performance analysis.

The method may include generating a patch and/or a location determination algorithm update and/or a change of remote source

command. The method may include transmitting the patch and/or update and/or command to all locator means in an event simultaneously, via the respective first transceiver means. This results in all of the location means being updated at the same time thereby ensuring that all location means are using the same remote sources and algorithms.

The method may include transmitting a synchronisation signal to all objects in the event. The synchronisation signal typically ensures synchronisation to within a few ns. This synchronisation signal ensures that, in particular for GPS based systems, the signal from the remote source is clocked at the same time by every locator means.

The method may include providing the remote source in the form of a GPS satellite or a sub-set of available GPS satellites. Alternatively, or additionally, the method may include providing the remote source in the form of a radio transmitter.

In a preferred embodiment, the method may include receiving data from at least one sensor sensing at least one of the following: pitch, yaw, body temperature of a competitor. The method may include transmitting the input data from the at least one sensor to the processing means via the second transceiver means. The method may include creating a log of the input data.

According to a fourth aspect of the present invention there is provided a machine readable medium encoded with a set of instructions which, when executed upon a device, cause the device to operate as the locator device of the first or second aspects of the present invention.

According to a fifth aspect of the present invention there is provided a registration system for a sporting event comprising a terminal and a

server arranged to be in mutual communication via a network, the server arranged to store data relating to a sporting event and to receive competitor entry data for the event from the terminal, the server being arranged to register the competitor entry data, to provide competitor
5 identifier data for the event and transmit the competitor identifier data to the terminal.

This new approach allows an event organiser to create an event simply, tell all competitors the event code (and possibly password) and then each
10 competitor can easily register as and when they want, thereby allowing the creation of spontaneous, ad-hoc, events at short notice as well as large scale pre-planned events.

It will be appreciated that the applicant reserves the right to claim
15 protection for the terminal or the server independently of being in communication with each other.

The server may be arranged to receive the data relating to the sporting event from a, or the, terminal. The data relating to the sporting event
20 may include any one, or combination, of the following: location of the event, start time of the event, date of the event, maximum number of competitors, identity of a race controller.

A, or the, terminal may be operable by the race controller to remotely
25 start the sporting event.

The server may be a common public secure system, typically accessed via the Internet. The common public secure system may be arranged to encrypt transmitted data and to generate a key to the transmitted data
30 which is accessible by a user at the terminal. The server may generate a

password associated with the event that allows a user to access the data relating to the sporting event via a, or the, terminal.

The terminal may be arranged to display a graphical user interface (GUI) suitable for entering data relating to either, or both, of the sporting event or, and, the competitor. The GUI may be an Internet web page. The terminal may be a mobile telecommunications device, for example a mobile telephone, which may have a unique identifier associated therewith. The server may be arranged to require device's unique identifier to register the competitor entry data.

The server may be arranged to compare competitor identifiers within an event in order to determine if either multiple registration by a single competitor or a single competitor identifier has been allocated to more than one competitor. The server may be arranged to allocate a unique extra identifier to each competitor with the same identifier and may be arranged to transmit the unique extra identifier to each of competitors with the same identifier.

The server may be arranged to allow access thereto upon payment of a fee. The fee may be paid on an event basis or may be paid as a subscription, typically monthly, quarterly, or yearly.

According to a sixth aspect of the present invention there is provided a method of registering competitors for a sporting event comprising the steps of:

- i) storing data relating to a sporting event upon a server;
- ii) receiving competitor entry data for the event at the server from a terminal;
- iii) registering the competitor entry data upon the server;
- iv) providing competitor identifier data for the event; and

v) transmitting the competitor identifier data to the terminal from the server.

5 The method may include receiving the data relating to the sporting event from a, or the, terminal at the server.

The method may include starting of the sporting event remotely by a race controller.

10 The method may include encrypting transmitted data and generating a key to the transmitted data which is accessible by a user at the terminal. The method may include generating a password associated with the event that allows a user to access data relating to the sporting event via a, or the, terminal.

15 The method may include displaying a graphical user interface (GUI) suitable for entering data relating to either, or both, of the sporting event or, and, the competitor. The method may include providing the GUI in the form of an Internet web page. The method may include providing the terminal may be a mobile telecommunications device, for example a
20 mobile telephone, which may have a unique identifier associated therewith. The method may include the server requiring device's unique identifier to register the competitor entry data.

25 The method may include comparing competitor identifiers within an event in order to determine if either multiple registration by a single competitor or a single competitor identifier has been allocated to more than one competitor by the server. The method may include allocating a unique extra identifier to each competitor with the same identifier and
30 transmitting the unique extra identifier to each of competitors with the same identifier.

The method may include allowing access to data stored upon the server upon payment of a fee. The fee may be paid on an event basis or may be paid as a subscription, typically monthly, quarterly, or yearly.

5

The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram of a GPS satellite system;

10

Figure 2 is a schematic representation of a tracking system according to at least an aspect of the present invention;

Figure 3 is a flow chart detailing a method of tracking according to at least an aspect of the present invention;

15

Figure 4 is a schematic representation of a registration system according to at least an aspect of the present invention; and

Figure 5 is a flow chart detailing a method of registration according to at least an aspect of the present invention.

20

Referring now to Figure 1, a GPS satellite system 100 comprises a constellation of satellites 102a-d located in geostationary orbits above the Earth 104. The location of a GPS receiver 106 upon the Earth's surface is determined by trilateration of signals from the satellites 102a-d at the receiver 106. The GPS signal comprises a carrier signal and a pseudo-random code, which gives each a predictable but different pattern of values that the GPS receiver can track.

25

30

Referring now to Figure 2, a competitor tracking system 200 comprises a locator device 202a-f, typically a GPS receiver, for each competitor 204a-f in an event, a wireless transceiver 206a-f associated with each locator device 202a-f, an application engine 208, typically a personal computer (PC) or a server, and a wireless communication network 210 connecting the wireless transceivers 206a-f with the application engine 208. The application engine 208 is typically connected to display clients 212a,b via either the wireless communication network 210 or via a data network 214.

Each locator device 202a-f determines the position of a respective competitor 204a-f by trilaterating signals from GPS satellites, as described hereinbefore with reference to Figure 1. The locator devices 202a-f are synchronised to trilaterate simultaneously, this synchronisation is typically achieved by locking the locator devices 202a-f to trilaterating at exactly the same phase of the carrier signal or the pseudo-random code. All of the locator devices 202a-f are arranged to use the same satellites for location determination and also to use the same location determination algorithm for location determination. This maintains a set absolute error in location determination that translates to a zero, or near zero, relative error in location determination between competitors 204a-f.

Each locator device 202a-f then transfers data detailing the location of the respective competitor 204a-f to the respective wireless transceiver 206a-f. The locator devices 202a-f may be integrally formed with the wireless transceivers 206a-f, for example, in the form of a mobile telephone with an integral GPS receiver. Alternatively, the locator devices 202a-f may be separate from the wireless transceivers 206a-f and data passed therebetween over an external link, which may itself be wireless or may be hardwired.

Each wireless transceiver 206a-f passes the data across the wireless telecommunication network 210 to the application engine 208, typically varying from every second, or minute to only at the end of the event. The wireless telecommunications network 210 typically employs a known
5 telecommunications data transfer standard such as GSM, GPRS, UTMS or other standard.

The data transferred across the network 210 comprises a unique competitor identifier assigned to each competitor, either manually as
10 described hereinbefore or automatically by a registration system to be described hereinafter, and the location of the competitor and in some embodiments further information such as pitch, yaw, direction, speed, body temperature, a security certificate or other identifier.

15 The application engine 208, typically a software package running upon a commercially available server such as a Web server, processes the data received from the transceivers 206a-f, via the network 210, to produce a real time progress report of the locations of each competitor 204a-f. The progress report can be stored upon the application engine 208 for analysis
20 in the future and/or the progress report can be output via either of the networks 210, 214 to a display client 212a,b in real time, either graphically or as text. It will be appreciated that the progress report can be output to more than one display client 212a,b simultaneously.

25 It will be appreciated that in at least one embodiment of the invention the locator devices 202a-f may retain the location data therein for subsequent upload to the application engine 208, typically following the finish of an event. The upload may take place via the wireless transceiver 208, or alternatively via a hard wired data connection, for example a serial cable.

In one embodiment of the present invention the progress report may be output via the telecommunications network 210 to the transceivers 206a-f and where the progress report can be displayed either graphically or as text upon a screen 220. This allows a competitor in a race to be kept
5 informed of their progress relative to other competitors in the event.

Following the completion of an event each competitor can access the data stored upon the application server 208 remotely, typically over the data network 214. This data may be freely available to all competitors in the
10 event or a password may be required to access each competitor's historical data. In the case where a password is required the password is typically generated during the event registration procedure and is either manually passed to the competitor or logged within their locator device 202a-f. Thus, it is possible to prevent unauthorised access of sensitive
15 training data by competitors.

The past-event analysis of, for example, trajectory, speed and location allows a competitor to attempt to improve their performance for future events.
20

Referring now to Figure 3, a method of tracking competitors in a sporting event comprises receiving a locator signal from a remote source by a wireless transceiver associated with each competitor (Step 302). A processor associated with each competitor to determine a location of each
25 competitor processes the locator signal, each processor uses the same location determination algorithm (Step 304). Data streams containing a competitor identifier and the location are transmitted to a remote server from each of the processors via respective transceivers (Step 306). The data streams are processed at the server to provide relative location
30 information between competitors (Step 308).

Referring now to Figure 4, a competitor registration system 400 for a sporting event comprises a number of terminals 402a-c and a server 404, which are connected by a network 406, typically the Internet.

5 The server 404 receives the data relating to the sporting event from the, terminal 402a. This data typically includes the location of the event, the start time of the event, the date of the event, the maximum number of competitors and the identity of a race controller. It will be appreciated that the race controller may be a competitor in the sporting event.

10

Typically, the server 404 is a common public secure system which is accessed via the Internet, and encrypts transmitted data transmitted to the terminals 402a-c. An encryption key 408 to the transmitted data is generated that is accessible by a user at the terminal 402. Additionally the
15 server 404 typically generates a password associated with the event that allows a user to access the data relating to the sporting event via one of the terminals 402a-c.

The terminal 402a displays a graphical user interface (GUI) 410 for
20 entering data relating to the sporting event and each of the terminals 402a-c can display a GUI 412 for entering data relating to the competitor, typically these GUIs are Internet web pages. In most instances the terminals 402a-c are mobile telecommunications devices, for example a mobile telephone. Where the terminals 402a-c are telecommunications
25 devices each terminal 402a-c has a unique identifier associated with it, which is required by the server in order to register the competitor entry data.

This system allows an ad-hoc approach to event organisation as well as a
30 highly efficient and effective system for highly organised sporting events, such as a large scale event, for example a marathon with many thousands

of competitors. For example, the ad-hoc nature of the event organisation allows two people who have decided to have a race to organise the race on-line only a short time, possibly only minutes, prior to starting the race. This can be achieved by one of the people entering, for example,
5 "New Event" in a dialogue box of the GUI and a unique event number being sent to the person acting as race controller. The race controller can then pass the unique event number to their co-competitor, typically via a mobile telecommunications link, for example using Bluetooth between two mobile telephones and the event is ready to start and, possibly be tracked.

10

In a preferred embodiment, the server 404 compares competitor identifiers in order to determine if a multiple registration by a single competitor has taken place. Also a comparison is carried out in order to determine if single competitor identifier has been allocated to more than
15 one competitor. If the server 404 determines that either of the above mentioned situations has arisen the sever 404 allocates a unique extra identifier to each competitor with the same identifier in order that they can be tracked individually during the event. The server 404 can also be configured to inform the competitors that either of the above mentioned
20 situations has arisen and to pass their extra identifier to the respective competitors.

It is envisaged that the registration system will be a subscription based system where access to the system for post event analysis is dependent
25 upon payment of a fee. This fee will be payable on an event by event basis or alternatively on a subscription basis where the subscription is due at regular intervals, typically weekly, monthly, quarterly or yearly. Payment of the fee can be effected either via bank transfer, cheque or via credit card payment over the Internet using known techniques.

30

In a preferred embodiment the initial set up of a race and registration of competitors will be free to encourage competitors to use the system. This is because the more users who register for a race the more useful information there is available for those competitors wishing to carry out
5 post event performance analysis.

Referring now to Figure 5, a method of registering competitors for a sporting event comprises storing data relating to a sporting event upon a server (Step 502), typically on a hard disc drive of the server. Competitor
10 entry data for the event is received at the server from a terminal (Step 506). The competitor entry data is registered at the server (Step 508). Competitor identifier data for the event is provided based upon the registered competitor data entry (Step 510). The competitor identifier data is transmitted to the terminal (Step 512).

15

CLAIMS

1. A tracking system for tracking objects, generally competitors in a sporting event, comprising a plurality of locator means each associated
5 with a respective competitor, a plurality of first transceiver means each in communication with a respective locator means, and a central processing means, the central processing means having a second transceiver means associated therewith, each of the plurality of first transceiver means being
10 arranged to periodically receive the same locator signal from the same remote source and to pass said signal to the respective locator means, each of the locator means being arranged to execute the same location determination routine upon the locator signal in order to determine the location of the object and generate a location data set, including an object identifier, to be passed to the central processing means via the respective
15 first transceiver means and second transceiver means and the central processing means being arranged to process each location data set to generate a log of relative location data detailing the relative locations of objects within the event.
- 20 2. A system according to Claim 1 wherein the locator means arranged to store a plurality of location data sets for later upload to the processing means.
3. A system according to either Claim 1 or Claim 2 wherein the
25 locator means is arranged to transmit individual location data sets to the processing means in real time.
4. A system according to any preceding claim wherein each of the
30 plurality of locator means is arranged to be synchronised to sample at a particular phase of a broadcast signal, the particular phase being either,

or both, of a phase of the information being broadcast or to a carrier signal.

- 5 5. A system according to any preceding claim wherein all of locator means are arranged to obtain signals from the same pre-determined subset of remote sources.
- 10 6. A system according to any preceding claim wherein all of locator means are arranged to triangulate and/or trilaterate the signals using the same location determination algorithm in order to determine the location of each respective object.
- 15 7. A system according to any preceding claim wherein the processing means comprise a third transceiver means arranged to output the relative location data for display upon a display means.
- 20 8. A system according to any preceding claim wherein the processing means is arranged to output the log of relative location data during the sporting event or at any time following the completion of the event.
9. A system according to any preceding claim wherein the processing means is arranged to generate a patch and/or a location determination algorithm update and/or a change of remote source command.
- 25 10. A system according to Claim 9 wherein the second transceiver means is arranged transmit the patch and/or update and/or command to all locator means in an event simultaneously, via the respective first transceiver means.

11. A system according to any preceding claim wherein the processing means is arranged to transmit, via the second transceiver means, a synchronisation signal to all locator means in an event.
- 5 12. A system according to any preceding claim wherein the remote source is a GPS satellite or a sub-set of available GPS satellites.
13. A system according to any preceding claim wherein at least one of the plurality of first transceiver means is arranged to receive data from at least one sensor sensing at least one of the following: pitch, yaw, body
10 temperature of a competitor.
14. A system according to Claim 13 wherein said at least some of the plurality of first transceiver means is arranged to transmit the input data
15 from the at least one sensor to the processing means via the second transceiver means.
15. A system according to either of Claims 13 or 14 wherein the processing means is arranged to create a log of the input data.
20
16. A system according to any preceding claim wherein the processing means is a webserver
17. A system according to any preceding claim wherein the processing
25 means is operable to determine the relative positions of objects in more than one event at any given time from incoming data.
18. A locator device comprising transceiver means and processing
30 means, the transceiver means being arranged to receive a signal from a remote source, the processing means being operable to execute a location determination algorithm upon said signal in order to determine the

location of the locator device, wherein the same remote source and the same location determination routine are also employed by at least one further locator device in order to reduce a relative error between determined locations of the locator device and the at least one further
5 locator device.

19. A method of tracking objects, generally competitors in a sporting event, comprising the steps of:

- 10 i) receiving a locator signal from a remote source by a transceiver associated with each object;
- ii) processing of the locator signal by a processor associated with each competitor to determine a location of each object, each processor using the same location determination routine;
- 15 iii) transmitting data streams containing an object identifier and the location to a remote server from each of the processors via respective transceivers; and
- iv) processing the data streams at the server to provide relative location information between objects.

20 20. The method of Claim 19 including obtaining signals from the same pre-determined sub-set of remote sources for all transceivers, for example a specific sub-group of possible GPS satellites.

21. The method of either of Claims 19 or 20 including triangulating
25 and/or trilaterating the signal using the same location determination algorithm in order to determine the location of each respective object in the event.

22. The method of any one of Claims 19 to 21 including outputting the
30 log of relative location data during the sporting event or at any time following the completion of the sporting event.

23. The method of any one of Claims 19 to 22 including generating a patch and/or a location determination algorithm update and/or a change of remote source command.
- 5
24. The method of Claim 23 including transmitting the patch and/or update and/or command to all locator means in an event simultaneously, via the respective first transceiver means.
- 10
25. The method of any one of Claims 19 to 24 including transmitting a synchronisation signal to all objects in an event.
26. The method of any one of Claims 19 to 25 including providing the remote source in the form of a GPS satellite or a sub-set of available GPS
- 15
- satellites.
27. The method of any one of Claims 19 to 26 including providing the remote source in the form of a radio transmitter.
- 20
28. The method of any one of Claims 19 to 27 including receiving data from at least one sensor sensing at least one of the following: pitch, yaw, body temperature of a competitor.
29. The method of Claim 28 including creating a log of the input data.
- 25
30. A machine readable medium encoded with a set of instructions which, when executed upon a device, cause the device to operate as the locator means of any one of Claims 1 to 17 or the locator device of Claim 18.
- 30

31. A registration system for a sporting event comprising a terminal and a server arranged to be in mutual communication via a network, the server arranged to store data relating to a sporting event and to receive competitor entry data for the event from the terminal, the server being
5 arranged to register the competitor entry data, to provide competitor identifier data for the event and transmit the competitor identifier data to the terminal.
32. A system according to Claim 31 wherein the server is arranged to
10 receive the data relating to the sporting event from a, or the, terminal.
33. A system according to either of Claims 31 or 32 wherein the data relating to the sporting event includes any one, or combination, of the following: location of the event, start time of the event, date of the event,
15 maximum number of competitors, identity of a race controller.
34. A system according to Claim 33 wherein a, or the, terminal is operable by the race controller to remotely start the sporting event.
- 20 35. A system according to any one of Claims 31 to 34 wherein the server is a common public secure system, typically accessed via the Internet.
- 25 36. A system according to Claim 35 wherein the common public secure system is arranged to encrypt transmitted data and to generate a key to the transmitted data which is accessible by a user at the terminal.
- 30 37. A system according to any one of Claims 31 to 36 wherein the server is arranged to generate a password associated with the event that allows a user to access the data relating to the sporting event via a, or the, terminal.

38. A system according to any one of Claims 31 to 37 wherein the terminal is arranged to display a graphical user interface (GUI) suitable for entering data relating to either, or both, of the sporting event or, and,
5 the competitor.

39. A system according to Claim 38 wherein the GUI is an Internet web page.

10 40. A system according to any one of Claims 31 to 39 wherein the terminal is a mobile telecommunications device having a unique identifier associated therewith.

41. A system according to Claim 40 wherein the server is arranged to
15 require device's unique identifier to register the competitor entry data.

42. A system according to any one of Claims 31 to 41 the server is arranged to compare competitor identifiers within an event in order to determine if either multiple registration by a single competitor or a single
20 competitor identifier has been allocated to more than one competitor.

43. A system according to Claim 42 wherein the server is arranged to allocate a unique extra identifier to each competitor with the same identifier and is arranged to transmit the unique extra identifier to each of
25 competitors with the same identifier.

44. A method of registering competitors for a sporting event comprising the steps of:

- i) storing data relating to a sporting event upon a server;
- 30 ii) receiving competitor entry data for the event at the server from a terminal;

- iii) registering the competitor entry data upon the server;
- iv) providing competitor identifier data for the event; and
- v) transmitting the competitor identifier data to the terminal from the server.

5

45. The method of Claim 44 including receiving the data relating to the sporting event from a, or the, terminal at the server.

10 46. The method of either of Claims 44 or 45 including encrypting transmitted data and generating a key to the transmitted data which is accessible by a user at the terminal.

15 47. The method of any one of Claims 44 to 46 including generating a password associated with the event that allows a user to access data relating to the sporting event via a, or the, terminal.

20 48. The method of any one of Claims 44 to 47 including displaying a graphical user interface (GUI) suitable for entering data relating to either, or both, of the sporting event or, and, the competitor.

25 49. The method of any one of Claims 44 to 48 including providing the terminal may be a mobile telecommunications device the server and requiring device's unique identifier to register the competitor entry data.

30 50. The method of any one of Claims 44 to 49 including comparing competitor identifiers within an event in order to determine if either multiple registration by a single competitor or a single competitor identifier has been allocated to more than one competitor by the server.

51. The method of Claim 50 including allocating a unique extra identifier to each competitor with the same identifier and transmitting the unique extra identifier to each of competitors with the same identifier.
- 5 52. The method of any one of Claims 44 to 51 including allowing access to data stored upon the server upon payment of a fee.
53. The method of Claim 52 including paying the fee on a per event basis or as a regular subscription.
- 10 54. A tracking system substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.
- 15 55. A locator device substantially as hereinbefore described with reference to Figure 2 of the accompanying drawings.
56. A method of tracking objects substantially as hereinbefore described with reference to Figure 3 of the accompanying drawings.
- 20 57. A registration system substantially as hereinbefore described with reference to Figure 4 of the accompanying drawings.
- 25 58. A method of registering competitors for a sporting event substantially as hereinbefore described with reference to Figure 5 of the accompanying drawings.



INVESTOR IN PEOPLE

Application No: GB 0313577.9
 Claims searched: Common matter of 1 & 19 at least
 Examiner: Dr E.P. Plummer
 Date of search: 15 December 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X	1, 19 at least	EP1271177A3	Turftrax whole document, in particular column 3 lines 48 to 55, column 8 lines 3 to 6, column 10 lines 20, 21, 38 and 39
X	19 at least	US5524081	Paul Abstract, column 8 lines 26 to 32, column 10 lines 31 to 36
X	19 at least	WO02/01754A1	Sportvision Abstract, page 48 lines 23 to 29, page 50 lines 2, 3, 26, 27
X	19 at least	US2002/0010544	Rudow et al Abstract, paragraphs 390 to 440
X	19 at least	GB2339504A	Murray whole document
X	19 at least	GB2337385A	Lyden whole document
X	19 at least	US5731788	Trimble whole document, in particular column 9 lines 18 to 20 and 54 to 56, column 14 lines 66 and 67, column 15 lines 7 to 11.
A		GB2359699A	Motorola
A		EP0589645A	Hughes
A		EP0547637A	Hughes
A		GB2380882A	Mitchell
A		GB2380080A	E-Lead
A		GB2367965A	Formalski
A		US6020851	Busack
A		GB2373658A	Harris



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Application No: GB 0313577.9 **Examiner:** Dr E.P. Plummer
Claims searched: Common matter of 1 & 19 at least **Date of search:** 15 December 2003

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A		GB2257864A Franz Plasser

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^v:

H4D

Worldwide search of patent documents classified in the following areas of the IPC⁷:

G01S

The following online and other databases have been used in the preparation of this search report:

Online: WPI, PAJ, EPODOC, INSPEC