RACING MANAGEMENT AND INFORMATION SYSTEM

ABSTRACT

A system that automates the resetting of race field running order following a caution period by collecting data from existing race timing and scoring systems and communicating field reordering instructions directly to racing participants.
Audio Scoring System

Race Manager

Communications Network

Racer Control
Racer Visual Interface
Racer Audio Interface

Race Control

100

110

120

200

400

300

310

330

340

FIG. 1
Start

12 Collect Scoring Data

Field Reset Requested?

14 Yes

15 Execute Field Reset Step (FIG. 3)

No

FIG. 2
From FIG. 2

20

Get Current Field Reset Order

21

Compare Field To Request

22

Update Reset Status Indicator

23

Compute Field/Request Deltas

24

Send Field Position Change Requests

25

Update Disable Controls

26

Field Reset Complete?

27

No

Yes

28

Return To FIG. 2

FIG. 3
RACING MANAGEMENT AND INFORMATION SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS


BACKGROUND OF THE INVENTION

[0002] In many forms of closed-circuit racing, there are times during a race when the field of race participants (sometimes generally referred to hereinafter as “racers”) is slowed or stopped to observe a “caution” period, usually attributed to a racing accident, debris on the racing surface, weather conditions, or some other condition that necessitates that racing activity pauses or at least slows temporarily. Often, the calling of a caution during a race can result in some jumbling of the field order as it slows or halts. And, sometimes there may be penalties assessed against particular racers due to rule infractions which necessitates that they change their position in the field, usually by moving to the rear of the field or by changing lanes.

[0003] Therefore, after a caution period, there is often a need to rearrange the running order of the field before resuming the race. This activity is sometimes known as “resetting the field”. This activity is often done manually by race officials, who communicate with racers via hand signals or voice via radio communications to re-order the field. This activity can be time consuming, and can also be dangerous to race officials in the cases where they are required to occupy the racing surface in order to direct the resetting of the field.

[0004] Furthermore, there is sometimes controversy amongst racers as to final running order prior to the restarting of the race, and this must also be addressed by the race officials before racing can resume. Although this activity can be dramatic and interesting to race spectators in its own right, in some cases the lengthy delays required to reset the field as well as the potential for injury to race officials necessitates that a faster and safer approach be found to reset the field. Additionally, in some cases, racers do not heed the instructions given to them by race officials, and, in the heat of the moment, continue to occupy an incorrect position on the track in opposition to direct instruction from race officials.

[0005] Thus, a need exists for a racing event management system which improves the speed and safety of the field resetting process by combining the information available from automatic scoring and lap timing systems, which are in use at many closed-circuit race courses, as well as the widely used wireless racing communications systems that link race officials, race team members, and racers themselves into a system that automatically informs racers of their position in the field prior to a restart and continues to guide them until the field has been completely reset into a correct order for restarting the race.

[0006] In the case where a racer is willingly or inadvertently ignoring the instructions of race officials, the need also exists for a mechanism that can temporarily disable or slow a racer under race management control in order to effect disciplinary action, ensure the safety of race officials or other racers, or as a warning to a racer.

SUMMARY OF THE INVENTION

[0007] The present invention includes many aspects and features. Moreover, while many aspects and features relate to, and are described in, the context of racing reset management and control, the present invention is not limited to use only in racing reset management and control, as will become apparent from the following summaries and detailed descriptions of aspects, features, and one or more embodiments of the present invention.

[0008] Accordingly, one aspect of the present invention relates to a method of resetting the order of participants in a racing field. The method includes: during a closed-circuit racing event, repeatedly and automatically collecting, at a race manager subsystem, data representative of real-time information regarding the running order of participants in a racing field, participating in the racing event, from at least one automated timing and scoring system located at the racing event; and in response to a reset instruction, controlling the order of the race participants. The controlling step includes receiving data, entered by a race official, representative of a preferred running order for the race participants; comparing, at the race manager subsystem, a current running order to the preferred running order; based on the comparison, computing, at the race manager subsystem, a sequence of racing field reorder requests; and automatically transmitting the resulting racing field reorder requests directly from the race manager subsystem to respective user interfaces, perceptible by the race participants, using wireless communications.

[0009] In a feature of this method, the automatically computed reorder requests are displayed as visual indicators.

[0010] In another feature of this method, the automatically computed reorder requests are transmitted as automatically created audio on a voice communications network. In further features, the automatically created audio reorder requests are created by automatically converting reorder requests into an audio format by means of matching textual command phrases and subsequences to pre-recorded audio clips which are combined and then transmitted on the racers audio channel; the audio reorder requests are automatically created by converting textual representations of reorder requests into audio recordings of simulated human speech by an automated text-to-speech processor; and/or the voice communications network is a pre-existing installation and is shared with human speakers.

[0011] In another feature of this method, the method further includes a step of allowing for the automatic, continuous real-time recomputation of optimal running order reordering requests as running order changes on the track are sensed, or as updates are made to the preferred final running order.

[0012] In another feature of this method, the method further includes a step of automatically notifying race participants and race officials whenever the actual running order matches the requested running order, as well as when the actual running order ceases to match the requested running order.

[0013] In another feature of this method, the method further includes a step of allowing for the configuration of the optimization of running order reorganization steps, as well as the timing of their transmission to racers, based on the specific requirements of particular racing formats.

[0014] In another feature of this method, the running order reorganization requests are automatically computed so as to
minimize disruption of the racing event. In further features, the running order reorganization requests are automatically computed so as to minimize the physical change in position of the racing participants; the running order reorganization requests are automatically computed so as to minimize the time necessary to implement them by the racing participants; and/or the running order reorganization requests are automatically computed so as to minimize safety risk to racing participants and race officials.

In another feature of this method, the method further includes a step of allowing for manual modification of automatically computed running order requests before they are sent to the race participants.

In another feature of this method, the method further includes a step of disabling or limiting the performance of a racer in order to bring the racer into compliance with the requirements of the system or its operators. In a further feature, disabling or limiting action is carried out by transmitting commands to a remote actuator attached to the racing participant or their equipment.

A second aspect of the present invention relates to a racing management system adapted to reset the order of participants in a racing field. The racing management system includes: a scoring system interface configured to repeatedly and automatically receive, during a closed-circuit racing event, data representative of real-time information regarding the running order of participants in a racing field, participating in the racing event, from at least one automated timing and scoring system located at the racing event; a user interface adapted to receive a reset instruction from a race official and configured to receive data, entered by a race official, representative of a preferred running order for the race participants; a respective racing I/O subsystem for each race participant, each racing I/O subsystem including a user interface perceptible by the respective race participant; and a race manager subsystem. The race manager subsystem is configured to compare a current running order to the preferred running order, and based on the comparison, compute a sequence of racing field reorder requests, and automatically transmit the resulting racing field reorder requests directly to the racing I/O subsystems for presentation to the race participants via the respective user interfaces.

A third aspect of the present invention relates to a racing management system adapted to reset the order of participants in a racing field. The racing management system includes: a scoring system interface configured to repeatedly and automatically receive, during a closed-circuit racing event, data representative of real-time information regarding the running order of participants in a racing field, participating in the racing event, from at least one automated timing and scoring system located at the racing event; a user interface adapted to detect the initiation of a field reset sequence, receive data, entered by a race official, representative of a preferred running order for the race participants, and detect the completion of the field reset sequence; a respective racing I/O subsystem for each race participant, each racing I/O subsystem including a user interface perceptible by the respective race participant; and a race manager subsystem configured to compare a current running order to the preferred running order, based on the comparison, compute a sequence of racing field reorder requests, and automatically transmit the resulting racing field reorder requests directly to the racing I/O subsystems for presentation to the race participants via the respective user interfaces.

In a feature of this system, the user interface is adapted to detect the completion of a field reset sequence by either receiving a manually entered field reset complete instruction from a race official or automatically detecting the completion of a field reset sequence based on information received from the scoring system interface.

In another feature of this system, the user interface is adapted to receive instructions, entered by a race official, to limit or disable a racing participant, each racing I/O subsystem includes a racer limiting or disabling control, and the race manager subsystem is configured to transmit requests for racer limiting or disabling control to the racing I/O subsystem.

In addition to the aforementioned aspects and features of the present invention, it should be noted that the present invention further encompasses the various possible combinations and subcombinations of such aspects and features.

BRIEF DESCRIPTION OF THE DRAWINGS

Further aspects, features, embodiments, and advantages of the present invention will become apparent from the following detailed description with reference to the drawings, wherein:

FIG. 1 is a simplified block diagram of a racing management system, in accordance with a preferred embodiment of the present invention;

FIG. 2 is a top-level flow chart illustrating the operation of the racing management system, in accordance with a preferred embodiment of the present invention;

FIG. 3 is a flow chart illustrating the operation of a race field reset computation sub-routine within the racing management system, in accordance with a preferred embodiment of the present invention;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As a preliminary matter, it will readily be understood by one having ordinary skill in the relevant art ("Ordinary Artisan") that the present invention has broad utility and application. Furthermore, any embodiment discussed and identified as being "preferred" is considered to be part of a best mode contemplated for carrying out the present invention. Other embodiments also may be discussed for additional illustrative purposes in providing a full and enabling disclosure of the present invention. Moreover, many embodiments, such as adaptations, variations, modifications, and equivalent arrangements, will be implicitly disclosed by the embodiments described herein and fall within the scope of the present invention.

Accordingly, while the present invention is described herein in detail in relation to one or more embodiments, it is to be understood that this disclosure is illustrative and exemplary of the present invention, and is made merely for the purposes of providing a full and enabling disclosure of the present invention. The detailed disclosure herein of one or more embodiments is not intended, nor is it to be construed, to limit the scope of patent protection afforded the present invention, which scope is to be defined by the claims and the equivalents thereof. It is not intended that the scope of patent protection afforded the present invention be defined by reading into any claim a limitation found herein that does not explicitly appear in the claim itself.
Thus, for example, any sequence(s) and/or temporal order of steps of various processes or methods that are described herein are illustrative and not restrictive. Accordingly, it should be understood that, although steps of various processes or methods may be shown and described as being in a sequence or temporal order, the steps of any such processes or methods are not limited to being carried out in any particular sequence or order, absent an indication otherwise. Indeed, the steps in such processes or methods generally may be carried out in various different sequences and orders while still falling within the scope of the present invention. Accordingly, it is intended that the scope of patent protection afforded the present invention is to be defined by the appended claims rather than the description set forth herein.

Additionally, it is important to note that each term used herein refers to that which the Ordinary Artisan would understand such term to mean based on the contextual use of such term herein. To the extent that the meaning of a term used herein—as understood by the Ordinary Artisan based on the contextual use of such term—differs in any way from any particular dictionary definition of such term, it is intended that the meaning of the term as understood by the Ordinary Artisan should prevail.

Furthermore, it is important to note that, as used herein, “a” and “an” each generally denotes “at least one,” but does not exclude a plurality unless the contextual use dictates otherwise. Thus, reference to “a picnic basket having an apple” describes “a picnic basket having at least one apple” as well as “a picnic basket having apples.” In contrast, reference to “a picnic basket having a single apple” describes “a picnic basket having only one apple.”

When used herein to join a list of items, “or” denotes “at least one of the items,” but does not exclude a plurality of items of the list. Thus, reference to “a picnic basket having cheese or crackers” describes “a picnic basket having cheese without crackers”, “a picnic basket having crackers without cheese”, and “a picnic basket having both cheese and crackers.” Finally, when used herein to join a list of items, “and” denotes “all of the items of the list.” Thus, reference to “a picnic basket having cheese and crackers” describes “a picnic basket having cheese, wherein the picnic basket further has crackers,” as well as describes “a picnic basket having crackers, wherein the picnic basket further has cheese.”

System Components

Referring now to the drawings, in which like numerals represent like components throughout the several views, the preferred embodiments of the present invention are next described. The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

FIG. 1 is a simplified block diagram of a racing management system, in accordance with a preferred embodiment of the present invention. In this implementation the system 10 divided into Race Control 100, Race Manager 200, and Racer I/O subsystems 300 as well as a Communications Network 400.

Basic Terms

Throughout this disclosure, the following terms will generally have the meanings set forth below.

“racer”: Any combination of one or more persons and equipment that compete as a unit against other racers. Common examples would be a single person in a footrace, a person plus a horse in a horse race, one or more persons plus a vehicle in a motorsports competition, one or more persons plus a boat in a rowing or sailing competition, and so forth.

“race”: A competition event during which racers compete against each other.

“circuit”: The course upon which racers compete during a race. This disclosure focuses on “closed” circuits where racers navigate the circuit multiple times during a single race.

“field”: All of the racers in a race.

“venue”: The physical location where the race is held.

“Racer Director”: The race official in charge of running the race and managing all competitive aspects such as rules, scoring, timing, field position, fairness, etc. In some cases this may be a group of persons rather than an individual. The Racer Director is anticipated to be a primary user of the described invention.

“race officials”: The Racer Director and additional persons who assist the Racer Director in the fair and safe running of a racing competition.

“caution”: Periods during a race where the field is slowed or stopped for safety or other reasons.

The Race Control Subsystem

Race Control 100 comprises the racing venue equipment which interfaces to the system 10. The racing venue will often include a permanently or temporarily installed Scoring System 110, which is responsible for automatically tracking the speed and position of the racers on the circuit during the race. Typically, the Scoring System 110 is implemented as one or more race position sensors located at key positions around the circuit. In lower-cost implementations there may be only one sensor located at the start/finish line of the circuit.

As racers pass the sensors, their time and position is logged and collected by the Scoring System 110 which is then able to communicate a real-time report of the field’s running order. A common implementation is to attach electronic transponders to the racers which can be accurately tracked as they pass the sensors, often referred to as the “scoring loops”. Another common implementation is to attach an RFID tag to each racer, which is then sensed as the racer moves around the circuit. The output of the Scoring System 110 is interfaced directly to the Race Manager 200 using standard data communications links and protocols and is used by the Race Manager 200 for use in determining the current positions of each racer on the circuit as well as their running order. An example of a suitable timing and scoring system is the TranX Pro Timing System, available from AMBi.T B.V. of Haarlem, The Netherlands (http://www.ambi-it.com/). Other suitable systems are available from Innovative Timing Systems of Chesterfield, Mo. (http://www.innovativetime.com/), and ROC Timing Systems LTD of Guildford, United Kingdom (http://www.roctiming.com/).

Often, a racing series will allow the use of audio communication between racers, racing team members, and race officials, typically using 2-way radios. It may be desirable to allow the Race Manager 200 to automatically generate and transmit its own audio prompts to the racers and their teams over these shared channels. To this end, the Race Control 100 subsystem incorporates an Audio Transmitter 120 to which the Race Manager 200 interfaces directly using standard data or audio communications protocols in order to
transmit audio prompts directly to race officials, individual racers, groups of racers, racing team members, or the entire racing field.

The Racer I/O Subsystem

[0046] Still referring to FIG. 1, we now consider the Racer I/O subsystem 300, of which there are multiple copies, with one copy each being carried by each racer in an event. The Racer I/O subsystem 300 contains the Racer Audio Interface 340, which receives audio from the Race Control Audio Transmitter 120. Although use of a separate audio channel is possible, a preferred implementation would simply use a pre-existing audio headset or speaker system already used by racers for team and official communication. Suitable racing audio communication systems incorporating both an Audio Transmitter 120 and Racer Audio Interface 340 are available from Racing Electronics, Inc. of Concord, N.C. (http://www.racingelectronics.com). Other suitable systems are available from Sampson Racing Communications of Oak View, Calif. (http://www.sampsonracing.com).

[0047] The Racer I/O subsystem 300 also incorporates the Racer Visual Interface 330 which allows the Racer Manager 200 to communicate its requests and status messages visually to the racer via graphics, text, icons, indicators, or other visual display mechanisms. An example of a suitable Racer Visual Interface 330 is the SportView in-helmet Heads-up Display, available from Motion Research of Seattle Wash. (http://www.motionresearch.com/).

[0048] Finally, the Racer Control module 310 gives the Race Director control over the functional state of any racer (through the Racer Manager 200) and can be used to temporarily or permanently disable or limit a racer for the purpose of enforcing the Race Director’s instructions to the racer; or to address safety concerns. An example of a suitable Racer Control 310 module is the Inis Remote Speed Control System available from Inis Motorsport of Cork, Ireland (http://www.motorsporttiming.com/).

The Race Manager Subsystem

[0049] Continuing to refer to FIG. 1, as shown therein, the heart of the system 10 is the Race Manager subsystem 200, a software-programmable general-purpose computer which communicates with the Race Control subsystem 100 and with the Racer I/O subsystem 300. The Race Manager 200 incorporates all of the communications and user-interface features commonly found on a personal computing system, such as video displays, keyboard and pointing device inputs, network connectivity, and so forth.

[0050] Since the racers are moving in relation to the Race Manager 200 and cannot be easily physically connected to it, the Race Manager 200 and Racer I/O subsystems 300 are connected by a wireless Communications Network 400 which may consist of one or more network topologies, each capable of transmitting and receiving electronic data between multiple network endpoints.

[0051] Examples of preferred types of Communications Networks 400 include the 802.11 wireless local area networks, and short-hop data networks such as “Zigbee” 802.14, or Wireless USB networks and the like. It may be appreciated that the Communications Network 400 may consist of topologies combining several sub-networks in order to reuse existing data communications capabilities present in the racing venue as well as those already carried by the racers and their equipment.

[0052] The Race Manager 200 implements the primary functions of the system 10 and can be used by the Race Director and other race officials to manage the recording of the racing field during a caution period prior to the restart of a race. To this end, the Race Manager 200 contains an operator interface that can be used by the Race Director to capture and save a snapshot of the running order of the field at any point in time. This information can then be used as a starting point to reorder the field for the restart of the race following the caution period. Since the Race Director may choose to assign racers a different order in the field for a restart, typically due to assessment of penalties, the Race Manager 200 provides an editing interface to the Race Director for use in creating the preferred field restart order. After editing the running order, the Race Director is given the option by the Race Manager 200 to indicate that the automatic reordering of the race field should commence.

[0053] In order to automatically reorder the race field, the Race Manager 200 compares the current order of the racers on the circuit to the preferred order requested by the Race Director and computes a sequence of ordering changes that can be made to the field in order to arrive at the preferred running order.

[0054] The Race Manager 200 then begins to transmit running order change requests to the racers, either visually by way of the Racer Visual Interface 330 or aurally by transmitting audio to the Racer Audio Interface 340 using the Audio Transmitter 120, or both. Change requests would be specific to the racing format and racer identification scheme used by a particular racing series, but would typically be instructions to pass another racer, allow another racer to pass, or to locate and follow a fellow racer. Table 1 below lists additional examples of audio instructions that could be transmitted to the racers. Table 2 below lists examples of visual indicators that might be employed to instruct racers during the race and field reset process.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Example Audio Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Move forward and follow the 20 car”</td>
<td></td>
</tr>
<tr>
<td>“Wait for the 20 car, then follow it”</td>
<td></td>
</tr>
<tr>
<td>“Pass 7 cars, then follow the 24 car”</td>
<td></td>
</tr>
<tr>
<td>“Pullover and wait for 8 cars to pass, then follow the 88 car”</td>
<td></td>
</tr>
<tr>
<td>“Drop to the rear of the field”</td>
<td></td>
</tr>
<tr>
<td>“Pass the pace car and catch up to the rear of the field”</td>
<td></td>
</tr>
<tr>
<td>“Pull into the pits”</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Example Visual Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A numeric indicator showing a racer who they should be following in the running order.</td>
<td></td>
</tr>
<tr>
<td>A wait indicator, meaning that the racer needs to wait for and then follow another racer.</td>
<td></td>
</tr>
<tr>
<td>A move forward indicator, meaning that the racer needs to move forward to find their correct position in the running order.</td>
<td></td>
</tr>
<tr>
<td>A numeric indicator with minus sign that indicates a racers delta from their correct running order, which would be indicated by 0.</td>
<td></td>
</tr>
</tbody>
</table>

[0055] Aural commands might be pre-recorded audio snippets recorded by race officials or the racing teams and stored
by the Race Manager 200. Or, aural commands might be generated by performing a text-to-speech conversion using arbitrary text generated by the Race Manager 200 as the input.

After the Race Manager 200 begins sending field order change requests to the racers, the Race Manager 200 continuously monitors new field order information as it is received from the Scoring System 110 and re-computes the sequence of changes needed to effect the reordering of the field. As new change requests are computed, the Race Manager 200 transmits them to the racers until the running order reported by the Scoring System 100 matches the preferring running order requested by the Race Director. At that point, the Race Manager 200 indicates that the field has been successfully reset for the restarting of the race.

If a racer should fail to respond to the running order change requests, the Race Manager 200, also makes available an operator interface that can be used by the Race Director to temporarily or permanently disable or limit a particular racer. This is typically in response to a racer willfully or inadvertently ignoring instruction from the Race Manager 200, Race Director, or other race officials but might also be used if a racer loses control of a racing vehicle due to racing vehicle damage or injury to a racer. In this case, the Race Manager 200 communicates with the Racer Control 310 to disable or limit the racer. The Race Manager 200 may also implement an automatic warning system to notify the racer that they are about to be disabled or limited by way of the Audio Transmitter 120 and Racer Audio Interface 340 and/or Racer Visual Interface 330.

System Operation

Referring now to FIG. 2, which is a top-level flow chart showing an example of system operation, and where like steps in the process flow are numbered.

System execution begins at the start of a racing event. As the racing event progresses, the Scoring System 110 periodically determines the race position of each racer and makes this information available to the Race Manager 200 in real-time, which it collects in step 12.

In step 14 the Race Manager 200 checks to see if a field reset has been requested. This can happen at any time, whenever the race is paused for a caution period or other delay and the Race Director would like the system to automatically set the racing field for a restart. If a field reset has been requested, execution continues at step 15 which is a call to a subroutine beginning with step 20 in FIG. 3. If a field reset request is not in effect, execution continues at step 12.

Referring now to FIG. 3, which is a flow chart showing an example of a subroutine which manages the automatic resetting of the racing field, and where like steps in the process flow are numbered. Execution begins with step 20 which is called from step 15 in FIG. 2.

Continuing with step 21 the Race Manager 200 collects the latest revision of the preferred field restart order, as specified by the Race Director. At any time, the Race Director may use the control interfaces of the Race Manager 200 to capture a snapshot of the current positions of every racer in the field, and edit that snapshot into a preferred race restart order. Since the preferred restart order may change several times during any particular resetting of the field, the Race Manager 200 must continually check for updates as the Race Director makes them.

For example, when a race caution is declared, the racers typically will slow down and fall into a single file or some other orderly arrangement and will proceed at slow speed around the circuit. As this happens, their relative positions are being logged by the Scoring System 110 and are collected by the Race Manager 200, as described in step 12.

At the same time, the Race Director is determining the desired restart order for the racers, according to the rules of the racing series. As an example, some racing series will specify that restart order of the racers be the same as on the last lap completed by each racer, disregarding passes made during the lap when the caution was called. In this case, the director might take the running order from the last fully completed lap, as reported by the Scoring System 110, as the starting point for creating the new running order for restarting the race. In addition, the Race Director may choose to penalize certain racers for various rules infractions or on-track incidents and will change their restart order to reflect the penalties. A common example would be to send racers who caused the caution to the rear of the field before the restart. Also, in some racing series, some racers who are one or more laps behind the leader may receive one or more of their laps back as a “free pass” during each caution period, and this also needs to be accounted for when resetting the field for the restart.

Since calculating penalties and determining the final restart order may take some time, the Race Director may choose to send an initial field order to the Race Manager 200 for it to work on while the Race Director works out the final field order. As more information becomes available, the Race Director may incrementally update the preferred restart order and communicate it to the Race Manager 200 several times as the latest changes in field ordering become available. Overlapping the resetting of the field with the final determination of restart order in this way allows for the bulk of the work necessary to reset the racing field to be accomplished while the Race Director works out the final details regarding field position for penalties, free passes, and the like.

As an example, the Race Director might immediately direct the Race Manager 200 to begin resetting the field to the running order of the last completed lap before the caution as soon as a caution period begins. This would allow the process of resetting the field to begin and partially complete while the Race Director works out additional penalty assessments and other activities that might affect the eventual running order.

In step 22 the Race Manager 200 compares the current state of the racing field to the running order requested by the Race Director. In step 23, the Race Manager 200 then updates status indicators in for the field reset process, which keep the Race Director apprised of the field reset progress. For example, this might involve simply displaying a complete/not-complete indicator, or it might involve computing and displaying a comprehensive graphic animation showing the differences between the requested field order and the current field order as racers make their way into their new positions. In any case, the Race Director is able to continuously monitor the field reset process and watch for problems that need to be addressed by direct intervention of race officials.

Continuing with step 24, each time that the Race Manager 200 receives a new running order from the Race Director, or receives new information regarding the position of racers on the racing surface from the Scoring System 110, it immediately recomputes the difference between the desired running order and the actual running order. If differences are
found, the Race Manager 200 computes a set of running order change requests to be made of the racers in order to rearrange the field into the requested running order.

[0069] The computation of optimal change requests is preferably specific to the racing series and will take into account factors such as minimizing the number of racers involved, minimizing the distance traveled by the racers to effect the changes, and maximizing the safety of the requested changes. For example, a motorsports racing series where the best visibility for racers is forward of their vehicles might give preference to moving racers further back in the field forward as opposed to asking racers farther ahead in the field to fall back. Similarly, if a single racer is out of position in the field, it would be likely that instructions would be given only to that racer to either move forward (pass) or backwards (wait to be passed) in the running order in order to effect the change. This process can be thought of as a sorting algorithm where optimization depends on the particulars of the racing series, the racers, and their equipment, among other things.

[0070] It should also be noted that the Race Manager 200 will also attempt to compute an optimal time sequence for the required changes in the field order, again, taking into account the particular foibles of a racing series. As an example, if several racers need to change positions, it might be preferable to have the changes made one at a time in some series, perhaps due to safety concerns. But, in another series, it might be acceptable to have several changes taking place during the same time period or perhaps in different parts of the field if there is enough physical separation amongst the racers who are changing position.

[0071] In any case, once the Race Manager 200 arrives at an optimal set of race field change requests, in step 25 it begins to communicate the change requests to individual racers via the Racer Visual Interface 330 and/or the Racer Audio Interface 340 (after possibly converting textual instructions into speech audio). The instructions will generally be some set of commands common to the particulars of the racing series, sent out to various racers indicating that they should effect a change in their running order, either moving ahead of other racers, or waiting for other racers to move past them or by taking other similar types of actions.

[0072] FIG. 2 is a list of example audio and visual instructions that might be provided to an individual racer in order to direct them to their correct position in the running order. At this time, the Race Manager 200 might also provide additional explanatory information to the racers regarding changes being made to the running order. For example, a racer being penalized and sent to the back of the field might receive an additional explanation of the Race Director’s actions, while a racer being removed from the race might be told the reason for such actions.

[0073] Another common scenario occurs when two racers are competing closely when a caution comes out and are in disagreement as to who should be ahead in the running order at the restart. If the Race Manager 200 has access to sufficiently detailed timing information from the Scoring System 110, it might be able to automatically reduce on-circuit tension by informing each of the racers involved as to their actual running order and timing interval relative to each other when the caution came out, or at whichever point the racing series determines its running order, thereby justifying the running order and improving the chances of its acceptance by all of the competitors.

[0074] In step 26 the system 10 addresses the case where racers choose to disregard the field reordering instructions sent by the Race Manager 200, or are unable to receive or act on the instructions, for some reason. In this case, the Race Director and other race officials will attempt to bring a racer into compliance by other, more direct means. But, if all else fails, the Race Director has the option of disabling or limiting the performance of a racer by using the Race Manager 200 control interface to indicate that a racer should be disabled or at least slowed. The Race Manager 200 accomplishes this by communicating the commands to disable or limit the racer to the Racer Control module 310 enabling the race officials to remotely slow or stop the errant racer, either to remove the racer from the race, or to enforce compliance with instructions from the race officials.

[0075] In step 27 the system 10 checks to see if the field reset process is complete. This may be a “field reset complete” command which is manually entered by the Race Director into the Race Manager 200 or race status might be automatically communicated in the data stream received from the Scoring System 110. If the field reset process has not completed, execution continues with step 21.

[0076] If it is determined in step 27 that the field reset process has completed, execution continues with step 28 where execution returns to step 15 in FIG. 2 which then, in turn, loops execution back to step 12 where another cycle of analysis and correction begins. As the system continuously updates for present conditions, it smoothly transitions between normal non-caution racing periods, and periods during which the field is being reset prior to a race restart. This cycle continues for the duration of the race.

[0077] Based on the foregoing description, it will be readily understood by those persons skilled in the art that the present invention is susceptible of broad utility and application. Many embodiments and adaptations of the present invention other than those specifically described herein, as well as many variations, modifications, and equivalent arrangements, will be apparent from or reasonably suggested by the present invention and the foregoing descriptions thereof, without departing from the substance or scope of the present invention.

[0078] Accordingly, while the present invention has been described herein in detail in relation to one or more preferred embodiments, it is to be understood that this disclosure is only illustrative and exemplary of the present invention and is made merely for the purpose of providing a full and enabling disclosure of the invention. The foregoing disclosure is not intended to be construed to limit the present invention or otherwise exclude any such other embodiments, adaptations, variations, modifications or equivalent arrangements, the present invention being provisionally limited only by the claims appended hereto and the equivalents thereof.

What is claimed is:

1. A method of resetting the order of participants in a racing field, comprising:

(a) during a closed-circuit racing event, repeatedly and automatically collecting, at a race manager subsystem, data representative of real-time information regarding the running order of participants in a racing field, participating in the racing event, from at least one automated timing and scoring system located at the racing event; and
(b) in response to a reset instruction, controlling the order of the race participants, such controlling step including:
(i) receiving data, entered by a race official, representative of a preferred running order for the race participants;
(ii) comparing, at the race manager subsystem, a current running order to the preferred running order;
(iii) based on the comparison, computing, at the race manager subsystem, a sequence of racing field reorder requests; and
(iv) automatically transmitting the resulting racing field reorder requests directly from the race manager subsystem to respective user interfaces, perceptible by the race participants, using wireless communications.

2. The method of claim 1, wherein the automatically computed reorder requests are displayed as visual indicators.

3. The method of claim 1, wherein the automatically computed reorder requests are transmitted as automatically created audio on a voice communications network.

4. The method of claim 3, wherein the automatically created audio reorder requests are created by automatically converting reorder requests into an audio format by means of matching textual command phrases and sub-phrases to pre-recorded audio clips which are combined and then transmitted on the racers audio channel.

5. The method of claim 3, wherein the audio reorder requests are automatically created by converting textual representations of reorder requests into audio recordings of simulated human speech by an automated text-to-speech processor.

6. The method of claim 3, wherein the voice communications network is a pre-existing installation and is shared with human speakers.

7. The method of claim 1, further comprising a step of allowing for the automatic, continuous real-time recomputation of optimal running order reordering requests as running order changes on the track are sensed, or as updates are made to the preferred final running order.

8. The method of claim 1, further comprising a step of automatically notifying race participants and race officials whenever the actual running order matches the requested running order, as well as when the actual running order ceases to match the requested running order.

9. The method of claim 1, further comprising a step of allowing for the configuration of the optimization of running order reorganization steps, as well as the timing of their transmission to racers, based on the specific requirements of particular racing formats.

10. The method of claim 1, wherein the running order reorganization requests are automatically computed so as to minimize disruption of the racing event.

11. The method of claim 10, wherein the running order reorganization requests are automatically computed so as to minimize the physical change in position of the racing participants.

12. The method of claim 10, wherein the running order reorganization requests are automatically computed so as to minimize the time necessary to implement them by the racing participants.

13. The method of claim 10, wherein the running order reorganization requests are automatically computed so as to minimize safety risk to racing participants and race officials.

14. The method of claim 1, further comprising a step of allowing for manual modification of automatically computed running order requests before they are sent to the race participants.

15. The method of claim 1, further comprising a step of disabling or limiting the performance of a racer in order to bring the racer into compliance with the requirements of the system or its operators.

16. The method of claim 15, wherein the disabling or limiting action is carried out by transmitting commands to a remote actuator attached to the racing participant or their equipment.

17. A racing management system adapted to reset the order of participants in a racing field, comprising:
(a) a scoring system interface configured to repeatedly and automatically receive, during a closed-circuit racing event, data representative of real-time information regarding the running order of participants in a racing field, participating in the racing event, from at least one automated timing and scoring system located at the racing event;
(b) a user interface adapted to receive a reset instruction from a race official and configured to receive data, entered by a race official, representative of a preferred running order for the race participants;
(c) a respective racing I/O subsystem for each race participant, each racing I/O subsystem including a user interface perceptible by the respective race participant; and
(d) a race manager subsystem configured to:
(i) compare a current running order to the preferred running order,
(ii) based on the comparison, compute a sequence of racing field reorder requests, and
(iii) automatically transmit the resulting racing field reorder requests directly to the racing I/O subsystems for presentation to the race participants via the respective user interfaces.

18. A racing management system adapted to reset the order of participants in a racing field, comprising:
(a) a scoring system interface configured to repeatedly and automatically receive, during a closed-circuit racing event, data representative of real-time information regarding the running order of participants in a racing field, participating in the racing event, from at least one automated timing and scoring system located at the racing event;
(b) a user interface adapted to:
(i) detect the initiation of a field reset sequence,
(ii) receive data, entered by a race official, representative of a preferred running order for the race participants, and
(iii) detect the completion of the field reset sequence;
(c) a respective racing I/O subsystem for each race participant, each racing I/O subsystem including a user interface perceptible by the respective race participant; and
(d) a race manager subsystem configured to:
(i) compare a current running order to the preferred running order,
(ii) based on the comparison, compute a sequence of racing field reorder requests, and
(iii) automatically transmit the resulting racing field reorder requests directly to the racing I/O subsystems for presentation to the race participants via the respective user interfaces.

19. The system of claim 18, wherein the user interface is adapted to detect the completion of a field reset sequence by either receiving a manually entered field reset complete
instruction from a race official or automatically detecting the completion of a field reset sequence based on information received from the scoring system interface.

20. The system of claim 18, wherein the user interface is adapted to receive instructions, entered by a race official, to limit or disable a racing participant, wherein each racing I/O subsystem includes a racer limiting or disabling control, and wherein the race manager subsystem is configured to transmit requests for racer limiting or disabling control to the racing I/O subsystem.

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