AN ACCESS TRACKING METHOD

TECHNICAL FIELD

This invention relates generally to an access tracking method.

Background

In various industries and settings, tracking of movement of items within, to and from a containment area has always been either non-existent or have been done manually. For example, the logistics industry and healthcare/medication industry have always performed their physical stock take manually. Due to the manual operation, there exists a high possibility that the performed tasks highly error prone and labor intensive as well. For example, in a super market or grocery shop, there can be instances where employees forget to perform the frequent inventory checks and stocks of specific products runs out. Also, in establishments such as bars there can be instances where theft of liquor bottles, wastage of liquor when serving, over pouring of liquor when serving can take place. At home, there can be instances where some individuals would like to keep track of their eating habits or there can be scenarios where it is inconvenient for senior citizens to go to grocery shop and purchase the necessary food items. There are many other scenarios where tracking of items, articles and their content is a critical part of activities. Therefore, there exists an access tracking method for addressing the foregoing problems.

Summary

In accordance with a first aspect of the invention, there is disclosed an access tracking method comprising determining at least one measured value of at least one physical parameter of at least one article disposed at a quantification module, detecting access to the at least one article, and determining deviation from the at least one measured value in response to access of the at least one article being detected.

In accordance with a second aspect of the invention, there is disclosed an access tracking system comprising a quantification module for determining at least one measured value of at least one physical parameter of at least one article disposed thereat and for detecting access to the at least one article, and a controller for determining deviation from the at least one measured value in response to access of the at least one article being detected.

Brief Description of the Drawings

FIG. 1 shows a system diagram with data flow of an access tracking system according to an aspect of the invention; and

FIG. 2 shows a process flow diagram of an access tracking method according to an aspect of the invention and implementable by the access tracking system of FIG. 1.

Detailed Description

An exemplary embodiment of the present invention, an access tracking system 20 utilising an access tracking method 100, is described hereinafter with reference to FIG. 1 and FIG. 2. The access tracking system 20 preferably comprises a controller 22 and a quantification module 24. It is preferred that the quantification module 24 is in signal and data communication with the controller 22. Communication between the controller 22 and the quantification module 24 can occur through wired or wireless means. In some implementations, the controller 22 is also in signal and data communication with control computer systems 26 over a network 28 in some implementations of the access tracking method 100. The control computer systems 26 may reside on a cloud platform.

In a step 110 of the access tracking method 100, the quantification module 24 determines at least one measured value 30 of at least one physical parameter 32 of at least one article 34 thereat. Next, the quantification module 24 will detect for access of the at least one article 34 in a step 112, with the controller 22 determining deviation from the at least one measured value 30 in a step 114 in response to access of the at least one article 34 being detected.

The quantification module 24 can be implemented in various forms without deviating from the spirit and intent of the access tracking system 20 and the access tracking method 100. In its simplest form, the quantification module 24 is implementable as a standalone system with a defined space 35 for receiving the at least one article 34. The defined space 35 may be substantially enclosed, partially exposed or be configured as one or multiple platforms whereat the at least one article 34 is disposable, for example a tray, a receptacle or a cabinet. Further, the defined space 35 can also be defined as an area within a distance from a reference point, a range between two heights or an envelope pre-defined by spatial coordinates. Alternatively, the quantification module 24 may be implemented as part of another system or structure, for example, as part of shelvings within a fridge, as part of display shelvings in supermarkets or as part of racks in a storage facility or warehouse. Further alternatively, the quantification module 24 can be implemented as attachments to the at least one articles 34 or to containers for containing the at least one articles 34.

In the step 112, access to the at least one article 34 can occur under at least three access situations. In a first access situation, access to the at least one article 34 occurs when the at least one article 34 comprises a plurality of articles with at least one of the plurality of articles being detected as being displaced away from the quantification module 24 in a step 120. Examples of the first situation include the detection of removal of an item from a fridge. A further example of the first situation includes the detection of an item, or items, from a shopping basket or trolley with the quantification module 24 constituting an element of the shopping basket or trolley. This further example of the first situation enables purchases to be captured and identified at the cashier or point of sales (POS) when the item or items to be purchased is accessed via removal thereof from the quantification module 24 when formed with the shopping basket or trolley. In a second access situation, access to the at least one article 34 occurs when the at least one article 34 comprises a plurality of articles with changes to the quantity of the plurality of articles being detected by the quantification module 24 in a step 121. Examples of the second situation include removal of food items from or replenishment of food items to a supermarket display shelve.

In a third access situation, access to the at least one article 34, specifically for temporary use thereof, comprises a step 122 of detecting removal of the at least one article 34 from the quantification module 24 and a step 124 of detecting redisposing of the at least one article 34 back to the quantification module 24. Examples of the third situation include the removal and return of a liquor bottle from a bar counter during preparation of a beverage, removal and return of a condiment bottle from a condiment tray, and removal and return of a pill bottle or topical cream package from a medication trolley. In a fourth access situation, access to the at least one article 34 comprises detecting removal of at least a portion of content 36 of the at least one article 34 in a step 126. Examples of the fourth situation include dispensing of soap from a soap bottle, dispensing of pills or medicated syrup from a medication container or the dispensing coffee beans from a coffee beans dispenser.

It is preferred that the at least one physical parameter 32 comprises at least one of quantity, weight, shape, volume and dimension of at least one of the at least one article 34 and content thereof. The at least one physical parameter 32 can be associated with one of the at least one article 34, for example, the weight, shape, volumetric size, containment volume and dimensions of one of the at least one article 34. However, the at least one physical parameter 32 is not limited to that of only one of the at least one article 34. Additionally, the at least one physical parameter 32 can also be associated with more than one of the at least one article 34, for example, the quantity or number of articles and the collective weight, dimension or shape. Further, the at least one physical parameter 32 can be associated with the content of one of, each or more than one of the at least one article 34. For example, the at least one physical parameter 32 can be associated with the content of articles such as a container, a box, a bottle or the like containment articles.

Preferably, the access tracking method 100 further comprises a step 130 of determining duration of access 38 to the at least one article 34. For example, the duration of access 38 can refer to duration an article 34 has been removed from a fridge, duration a whisky bottle has been removed from the bar counter for pouring, or duration that a shelving in a supermarket has not been replenished.

Additionally, the step 110 of the access tracking method 100 further comprises a step 132 of retrieving at least one reference value 40 corresponding to the at least one physical parameter 32 associated with the at least one article 34 for calibrating the at least one measured value 30 determined from the at least one article 34. Preferably, the at least one reference value 40 is identified from a reference value dataset 42 based on article type 44 of the at least one article 34. The article type 44 is determined from at least one of visual characteristic of the at least one article 34, tag identifier 46 obtained from a tag 48 coupled to at least one of the at least one article 34 and the quantification module 24, and a machine readable code, for example barcodes, QR codes or RFID identifier codes, readable from at least one of the at least one article 34 and the quantification module 24.

The reference value dataset 42 can be stored on-site by the access tracking system 20, off-site on a cloud, for example on the control computer systems 26 accessible over the network 28, or a combination of both storage strategies. The tag 48 can be, for example, a barcode tag, QR code tag or an RFID tag attached to the at least one article 34 or attached to the defined space 35, for example to a tray for containing the at least one article 34.

When attached to the at least one article 34, laser scanners employing a mirror assembly can be employed for scanning the tag 48. The laser scanners employing the mirror assembly can be configured as substantially a frame defining access to the defined space 35 therethrough and to substantially increase the chance of scanning the tag 48 wherever it is placed on the at least one article 34 and whatever the orientation of the at least one article 34 when being accessed or displaced from the defined space 35. The frame can be defined at an opening of a fridge, an access point/space to shelving in a supermarket or warehouse, an opening of a container or at a platform where articles are disposable or an opening of a shopping basket or trolley. To complement or in replacement of the laser scanners employing the mirror assembly, one or more image capture device for capturing one or more image of the tag 48 is placed on the at least one article 34 for determining the tag identifier 46 therefrom. The one or more image capture device can be used for defining multi-directional field of capture of access to the defined space 35 to substantially increase the chance of scanning the tag 48 wherever it is placed on the at least one article 34 and whatever the orientation of the at least one article 34 when being accessed or displaced from the defined space 35.

Additionally or alternatively, the tag 48 can be the one or both of the shape and the dimensions of the at least one article 34. The at least one reference value 40 can be defined prior to or during use of the access tracking system 20. Further, the reference value dataset 42 or part thereof can be obtained from manufacturers, distributors, suppliers or third party vendors of the at least one article 34. For example, the at least one reference value 40 can be the unit net weight and content volume of a bottle with the bottle of soda water, with the bottle being the at least one article 34.

Preferably, the access tracking method 100 determines quantity of the at least one article 34 from weight of the at least one article 34 determined by the quantification module 24 and unit weight of the at least one article 34 obtained from the at least one reference value 40.

The quantification module 24 comprise a variety of quantification and measurement instruments and instruments including one or more of each of weight sensors, scanners for reading bar codes, QR codes or the like machine readable codes, interrogators for communicating with or extracting information from RFID tags or the like transponders, image capture devices, range finders, pressure sensors, tilt and gyroscopic sensors, accelerometers, temperature sensors and proximity switches and limit switches.

The access tracking method 100 also further comprises a step 134 of assigning at least one of a score and a rating to the determined from the at least one measured value 30. The step 134 can be used when there is a need to assess or determine the quality of access to the at least one article 34. For example, a bartender may be assessed on the quality of pour based on how accurate he can pour a shot of beverage, for example rum. In this example, the speed of access to the at least one article 34, the rum bottle, and the accuracy of the amount being dispensed determined based on one or more of weight deviation and tilt duration during pouring, can be determined using an implementation of the quantification module 34 attached to the bottle of rum. An accuracy and speed rating or score can then be assigned. In another example, the score and rating can be assigned to a food display counter or barista overseeing the food display counter on how long a particular food type, the article type 44, remains low or empty before replenishment is effected.

When implemented in a bar or pub setting, the access tracking system 20 can be implemented with a camera array. As aforementioned, the access tracking system 20 is integratable at a designated location, the defined space 35, where liquor bottles are placed. When a new bottle is added to the designated location, the camera array of the access tracking system 20 identifies the new bottle, the at least one article 34, and captures an image of the service staff or a tag worn thereby (for example a name tag, RFID tag, a

transponder, or the like device for identifying the service staff) who placed the new bottle at the designated location. After identifying the service staff and the new bottle, the quantification module 24 determines the at least one measured value 30 of the at least one physical parameter 32 of the new bottle, for example the weight of the new bottle, and records the at least one measured value 30 against the identified service staff. Whenever a drink is served from the new bottle and returned to the designated location, the access to the new bottle will be detected by the quantification module 24. The controller 22 will then determine the new weight of the bottle to determine deviation from the weight of the new bottle prior to access thereto. This will in turn enable the amount of content, for example liquor, that has been served from the new bottle as drinks. The collected data is used to build a usage profile for the new bottle, the type of content of the new bottle and the service staff. The use of the camera array also enables capture and identification of a customer to whom the drink / liquor has been served. The camera array can include a portable camera worn on the service staff for capturing image of and potentially identifying the customer to determine of the customer has been served with the correct drinks order and to build up a consumption profile against the customer.

In addition or alternative to the step 134 of assigning at least one of a score and a rating to the determined from the at least one measured value 30, the access tracking method 100 can comprise a step 136 of at least one of updating and generating an access profile 50 associated with the at least one article 34. The access profile 50 is for indicating the expected activity and behavior of access to the at least one article 34. Additionally, the access tracking method 100 can further comprise a step 138 of generating at least one trigger value 52 based on the access profile 50, and a step 140 of triggering an alert event when the at least one measured value 30 of the at least one physical parameter 32 approaches the at least one trigger value 52. The at least one trigger value 52 can comprise limits to a range of values.

The alert event can be an alert to replenish stocks or articles in a supermarket or warehouse, an alert to determine wrong placement of articles, an alert to indicate discrepancy during stock-taking, an alert that a particular article has been left unaccessed for a predetermined duration, an alert that wrong medication has been dispensed or the like alert event. The alert triggered can be in the form of a visual alert, an audible alert, a message sent to one or more mobile devices, an alert sent to a control station, an alert to a third party service vendor or the like alerts for soliciting attention to the cause of the alert event.

It is preferred that the quantification module 34 employs multiple of the least one physical parameter 32 for cross-verification. For example, an image can be captured of the at least one article 34 to determine at least one of quantity, colour and shape of the at least one article 34 for verifying the article type 44 and the weight of each of the at least one article 34.

The quantification module 34 can comprise a weight sensor and a camera or the like image capture device. The weight sensor can quantify the weight and quantity of the dispensed medication while the camera can captures an image of the medication, the at least one article 34, dispensed by or from a medication cart having the access tracking system 34 intergrated therewith prior to consumption of the medication. The determined weight of the medication can be determined while the captured image can be processed with AI (Artificial Intelligence) module to determine the physical data such as shape, size, pattern, colour and quantity, which are compared with the at least one reference value 40 based on the article type 44 of each type of medication being dispensed to ensure that the dispensed medication is within the tolerance. If there is a discrepancy, an alert notification is sent to a care giver of a patient to whom the medication is dispensed for consumption.

The access tracking method 100 may be implemented through use of a machine-readable medium having stored therein a plurality of programming instructions, which when executed, the instructions cause the machine to determine at least one measured value of at least one physical parameter of at least one article disposed at a quantification module, detect access to the at least one article, and determine deviation from the at least one measured value in response to access of the at least one article being detected

Aspects of particular embodiments of the present disclosure address at least one aspect, problem, limitation, and/or disadvantage associated with existing access tracking methods and systems. While features, aspects, and/or advantages associated with certain embodiments have been described in the disclosure, other embodiments may also exhibit such features, aspects, and/or advantages, and not all embodiments need necessarily exhibit such features, aspects, and/or advantages to fall within the scope of the disclosure. It will be appreciated by a person of ordinary skill in the art that several of the above-disclosed structures, components, or alternatives thereof, can be desirably combined into alternative structures, components, and/or applications. In addition, various modifications, alterations, and/or improvements may be made to various embodiments that are disclosed by a person of ordinary skill in the art within the scope of the present disclosure, which is limited only by the following claims.

Claims

1. An access tracking method comprising:

determining at least one measured value of at least one physical parameter of at least one article disposed at a quantification module;

detecting access to the at least one article; and

determining deviation from the at least one measured value in response to access of the at least one article being detected.

2. The access tracking method as in claim 1, the at least one article comprising a plurality of articles and detecting access to the at least one article comprising:

detecting displacement of at least one of the plurality of articles away from the quantification module.

3. The access tracking method as in claim 1, detecting access to the at least one article comprising:

detecting removal of the at least one article from the quantification module; and

detecting redisposing of the at least one article at the quantification module.

4. The access tracking method as in claim 1, detecting access to the at least one article comprising:

detecting removal of at least a portion of content of the at least one article therefrom.

5. The access tracking method as in claim 1, the at least one physical parameter comprising at least one of quantity, weight, shape, volume and dimension of at least one of the at least one article and content thereof.

6. The access tracking method as in claim 1, further comprising:

determining duration of access to the at least one article.

7. The access tracking method as in claim 1, further comprising:

retrieving at least one reference value corresponding to the at least one physical parameter associated with the at least one article for calibrating the at least one measured value determined from the at least one article.

8. The access tracking method as in claim 7, the at least one reference value being identified from a reference value dataset based on article type of the at least one article, the article type being determined from at least one of visual characteristic of the at least one article, tag identifier obtained from a tag coupled to at least one of the at least one article and the quantification module, and a machine readable code readable from at least one of the at least one article and the quantification module.

9. The access tracking method as in claim 7, further comprising:

determining quantity of the at least one article from weight of the at least one article determined by the quantification module and unit weight of the at least one article obtained from the at least one reference value.

10. The access tracking method as in claim 1, further comprising:

assigning at least one of a score and a rating to the determined deviation.

11. The access tracking method as in claim 1, further comprising:

at least one of updating and generating an access profile associated with the at least one article, the access profile being indicative of the expected activity and behavior of access to the at least one article.

12. The access tracking method as in claim 11, further comprising:

generating at least one trigger value based one the access profile; and

triggering an alert event when the at least one measured value of the at least one physical parameter approaches the at least one trigger value.

13. The access tracking method as in claim 12, the at least one trigger value comprising limits to a range of values.

14. The access tracking method as in claim 1, further comprising:

capturing an image of the at least one article to thereby determine at least one of quantity, colour and shape of the at least one article.

15. An access tracking system comprising:

a quantification module for determining at least one measured value of at least one physical parameter of at least one article disposed thereat and for detecting access to the at least one article; and

a controller for determining deviation from the at least one measured value in response to access of the at least one article being detected.

16. The access tracking system as in claim 15, the at least one article comprising a plurality of articles and the quantification module further for detecting displacement of at least one of the plurality of articles away from the quantification module.

17. The access tracking system as in claim 15, the quantification module further for detecting removal of the at least one article from the quantification module and detecting redisposing of the at least one article at the quantification module.

18. The access tracking system as in claim 15, the quantification module further for detecting removal of at least a portion of content of the at least one article therefrom.

19. The access tracking system as in claim 15, the at least one physical parameter comprising at least one of quantity, weight, shape, volume and dimension of at least one of the at least one article and content thereof.

20. The access tracking system as in claim 15, the controller further for determining duration of access to the at least one article.

21. The access tracking system as in claim 1, the controller further for retrieving at least one reference value corresponding to the at least one physical parameter associated with the at least one article for calibrating the at least one measured value determined from the at least one article.

22. The access tracking system as in claim 21, the at least one reference value being identified from a reference value dataset based on article type of the at least one article, the article type being determined from at least one of visual characteristic of the at least one article, tag identifier obtained from a tag coupled to at least one of the at least one article and the quantification module, and a machine readable code readable from at least one of the at least one article and the quantification module.

23. The access tracking system as in claim 21, the quantification module further for determining quantity of the at least one article from weight of the at least one article determined by the quantification module and unit weight of the at least one article obtained from the at least one reference value.

24. The access tracking system as in claim 15, the controller further for assigning at least one of a score and a rating to the determined deviation.

25. The access tracking system as in claim 15, the controller further for at least one of updating and generating an access profile associated with the at least one article, the access profile being indicative of the expected activity and behavior of access to the at least one article.

26. The access tracking system as in claim 15, the controller further for generating at least one trigger value based one the access profile and triggering an alert event when the at least one measured value of the at least one physical parameter approaches the at least one trigger value.

27. The access tracking system as in claim 26, the at least one trigger value comprising limits to a range of values.

28. The access tracking system as in claim 15, further comprising:

at least one image capture device for capturing an image of the at least one article to thereby determine at least one of quantity, colour and shape of the at least one article.