

METHOD AND SYSTEM FOR FACILITATING DINING AT A VENUE

FIELD OF THE INVENTION

[0001] The invention generally relates to a method and system for facilitating dining at a venue via a device application (app) and the Internet, thereby promoting cashless transactions. Specifically, the invention relates to a method and system for facilitating dining at a venue by managing seat reservation, holding and release of reserved seats, and facilitating self-cleaning at the venue via usage of indoor positioning techniques, the device app and the Internet.

BACKGROUND OF THE INVENTION

[0002] In modern cities, several people dine at food establishments such as, but not limited to, food courts, hawker centers and cafeterias. During peak/busy hours, such as during lunch time near business centers or industry parks and dinner time near residential areas, it is cumbersome for a diner to find a seat or table in such establishments. Also, it is inconvenient for the diner to search for a vacant seat or table while carrying the food tray in their hands. Finally, when the diner does find a vacant seat, it is often the case that napkins/tissues and dishes/bowls used by the previous diner are still left on the table, and there are not many cleaners available at busy hours to clean the tables prior to the next service. Moreover, during times of pandemic or outbreak of infectious diseases, these cleaners are exposed to risks when catering to and cleaning the leftovers from other diners.

[0003] All the above issues coupled with lack of support personnel, causes such food establishments to suffer delays in their provision of customer service. For instance, such delays are encountered when finding available tables for customers, taking customers' orders, fulfilling those orders and finally receiving payment for those orders.

[0004] Currently, there are stores using a paging token mechanism to notify a customer when food is ready. However, when the customer is distracted or engaged in social interactions or in playing games, they tend to miss their token, rendering such techniques inefficient.

[0005] Thus, there exists a need for a method and system that offers a more seamless and efficient dining experience for customers by managing reservation of seats, food orders and payments, and finally to also ensure cleanliness in the dining area.

BRIEF DESCRIPTION OF THE FIGURES

[0006] The accompanying figures where like reference numerals refer to identical or functionally similar elements throughout the separate views and which together with the detailed description below are incorporated in and form part of the specification, serve to further illustrate various embodiments and to explain various principles and advantages all in accordance with the invention.

[0007] FIG. 1 illustrates a conceptual simplified schematic of a system for facilitating dining at a venue in accordance with an embodiment of the invention.

[0008] FIG. 2 conceptually illustrates a dining process in accordance with an embodiment of the invention.

[0009] FIG. 3 illustrates an exemplary food court map representation of a screen for choosing a seat, viewing the positions of the stores and the tray-return geofence in accordance with an embodiment of the invention.

[0010] FIG. 4 illustrates an example of a table with seats and labels in a food court in accordance with an embodiment of the invention.

[0011] FIG. 5 illustrates a seat reservation/holding/release process in accordance with an embodiment of the invention.

[0012] FIG. 6 illustrates various modules of a system for facilitating dining at a venue in accordance with an exemplary embodiment of the invention.

[0013] FIG. 7 illustrates a flowchart of a method for facilitating dining at a venue in accordance with an exemplary embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0014] Before describing in detail embodiments that are in accordance with the invention, it should be observed that the embodiments reside primarily in combinations of method steps and system components for facilitating dining at a venue by managing seat reservation, holding and release of reserved seats, and facilitating self-cleaning at the venue via usage of indoor positioning techniques, a device application and the Internet.

[0015] Accordingly, the system components and method steps have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the invention so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.

[0016] The terms “a” or “an”, as used herein, are defined as one or more than one. The term plurality, as used herein, is defined as two or more than two. The term another, as used herein, is defined as at least a second or more. The terms including and/or having, as used herein, are defined as comprising (i.e., open language). The term coupled, as used herein, is defined as connected, although not necessarily directly, and not necessarily mechanically. The terms program, software application, and the like as used herein, are defined as a sequence of instructions designed for execution on a computer system. A program, computer program, or software application may include a subroutine, a function, a procedure, an object method, an object implementation, an executable application, an applet, a servlet, a source code, an object code, a shared library/dynamic load library and/or other sequence of instructions designed for execution on a computer system.

[0017] Various embodiments of the invention disclose a method and system for facilitating dining at a venue. The method enables reserving one or more seats at the venue for a user by enabling the user to select the one or more seats for reserving via an application (app) on a computing device. In addition to reserving seats, the method enables the user to place an online order corresponding to the venue and complete payment related to the order via the app on the computing device. Further, a location of the user is tracked at the venue, to derive position

information of the user at an instant of time. The location of the user is tracked using techniques such as, but not limited to, auto indoor positioning techniques (such as, but not limited to, Bluetooth Low Energy (BLE) beacons, ultrasonic pulses, Wi-Fi), assisted Global Positioning System (GPS), and manual methods such as scanning Quick Response (QR) codes. Upon detecting the user either leaving the venue, leaving the reserved seat or entering a tray-return geo-fence at the venue based on the position information of the user, a decision whether to release or hold the one or more reserved seats is taken. In order to decide whether to release or hold the one or more reserved seats, a condition is evaluated in conjunction with a timer. The condition can be, but need not be limited to, the user temporarily leaving the one or more reserved seats or venue owing to a circumstance such as, but not limited to, to attend an emergency call, to wash hands, and to collect food. The timer is pre-configurable or may be adaptively adjusted using an algorithm based on parameters such as, but not limited to, a minimum dining time estimated from an amount of ordered food at the venue, statistics of population on different days and hours. Finally, the method facilitates self-cleaning at the venue by sending notifications/reminders to the user to clean a dining area associated with the one or more reserved seats and to return a tray associated with the user after dining. The notifications/reminders are triggered based on determining that the user does not enter the tray-return geo-fence based on the position information of the user, via tracking the tray and based on reports received from other users/diners or cleaners.

[0018] FIG. 1 illustrates a conceptual simplified schematic of a system for facilitating dining at a venue in accordance with an embodiment.

[0019] As illustrated in FIG. 1, the system comprises a user 100 having a computing device 102. Computing device 102 can be, but need not be limited to, a mobile device, a smartphone, a laptop, and a tablet. User 100 may be present at any location such as, but not limited to, office, home, a shopping mall, on a street, or may be taking a bus or riding a train.

[0020] In accordance with a scenario, user 100 wants to have a meal nearby and launches an application (app) on computing device 102. In this scenario, computing device 102 may be a mobile device and the application is a mobile app.

[0021] The system utilizes the positioning information of user 100 from the mobile device's operating system and the positioning information database of food courts stored in the system, to locate user 100 within the covering regions of two food courts 104.

[0022] Food courts 104 contain at least one food store 110, some tables with seats 114, and tray-return point/points (or tray-return geofence) 108. Each store is equipped with a computing device 112 running a specific software.

[0023] Computing device 112 can be, but need not be limited to, a mobile device, a smartphone, a laptop, a tablet, and a point-of-sale (POS) terminal. Computing device 112 is connected to the Internet to transmit and receive messages. Both the user's computing device 102 and the store's computing device 112 communicate with a system server 116.

[0024] The system determines that user 100 is within the covering region of food court 104 if the system detects user 100 seated in food court 104 and consuming food within a reasonably short time frame. Upon such determination, the system permits user 100 to reserve and hold a seat from the app on computing device 102. By offering such a provision, the system avoids holding unoccupied seats for a long time owing to these seats being rare resources in food courts, especially during busy hours. Furthermore, the system enables configuring/setting a 'reasonable short time' for holding a reserved seat or adaptively adjusting the time based on statistics such as, but not limited to, a dining population on different days and hours.

[0025] In accordance with an embodiment, the covering region illustrated in FIG. 1 can be a circular area 106 with the food court in the center, having an adaptive radius. In other embodiments, the covering region can be of any shape such as, but not limited to, a polygon with the food court inside.

[0026] User 100 can reserve a seat only when he/she is within the covering region. When the reservation is confirmed, the app prompts a time to user 100 for entering the food court and occupying the reserved seat. If user 100 does not appear in the food court at the specified time, the reservation is canceled, and the reserved seat is released and is made available to others.

[0027] FIG. 2 conceptually illustrates a typical dining process in accordance with an embodiment of the invention.

[0028] As illustrated in FIG. 2, a diner launches a mobile app 200, identifies an available food court 202, chooses a seat and sends a seat reservation request to a server 204. The server confirms the seat reservation 206 and fetches available stores at a food court along with their current available menus 208 and presents them to the diner. The diner orders food from menus 210.

[0029] The system then creates a payment request according to an order 212. Once the diner completes an online payment 214, the order is forwarded to corresponding stores 216 to prepare food 220 corresponding to the order.

[0030] When food items corresponding to the order are ready 222, the store places the food on a tray and sends a “food-ready” message with the order number to a system server 224. A notification with the order number and store name is then sent to the diner’s mobile device 226 to inform the diner to collect the food 228.

[0031] In some embodiments, stores provide delivery-to-seat service. In this case, the notification is sent to inform the diner that the food is ready for delivery. The notification is a message such as, but not limited to, a push notification, an SMS and an MMS.

[0032] In case the ordered food items are from multiple stores, the system server splits the ordered items by store, and forwards the sub-orders to the corresponding stores. The sub-orders are transparent to the store and are handled as usual orders by each store. In this case, the diner receives multiple notifications.

[0033] After the diner finishes the meal 230, the diner cleans the seat zone 232 and returns the tray/trays in the designated tray-return point 234. When the tray is returned or the diner leaves the food court, the seat is released by the system for next reservation 236. The process then terminates at step 238.

[0034] Furthermore, in order to educate a user/diner to develop self-cleaning habits, some methods are employed by the system. In accordance with an embodiment, the user can rate and comment on a cleaning grade of the seat region 218. A corresponding grade is awarded to the previous diner. The system or the relevant food courts may then reward users of high grade and send messages to remind users of low grade to not to forget to clean after dining. Further, the system may impose some charges/fines to users with frequent low cleaning grade for past additional cleaning work done by cleaners when these users attempt to reserve seats and order food via the mobile app.

[0035] In some embodiments, to accurately associate a tray with a diner, the tray is identified by a tray id. To facilitate reading the tray id from a tray, the id may be, but need not be limited to, a plain text tag attached to the tray which is readable by a human or an Optical Character Recognition (OCR) software, or the id text may be encoded in a QR code/bar code tag attached on the tray which can be scanned by a camera or an optical module with a decoder, or both the text and the QR code/bar code are displayed on the tray, or there is no display on the tray, instead the id is stored in a chip embedded in the tray such as, for example, a BLE beacon advertising the id or a Near-Field Communication (NFC) tag storing the id.

[0036] When the food is prepared and placed on a tray by the food store, the tray id is read and input to the software running on the store's computing device. A food-ready message with the tray id and the order number is then sent to the system server. In this way, the tray is associated with the corresponding diner.

[0037] In accordance with an embodiment, when paying the order, the diner provides a monetary deposit online via the mobile app for a tray at the venue.

[0038] In accordance with an embodiment, even if the diner does not return the tray to the designated point and places it somewhere else after a meal, such as, for example, when the diner leaves the tray on the reserved seat or places it in a nearby seat zone, when another user such as, but not limited to, another diner or a cleaner, finds the unreturned tray, he/she may open the mobile app, and scan the tag with the tray. The app reads the unreturned-tray id. With the unreturned tray-id, the app creates an unreturned-tray message, which is sent to the system server

by the other user. Upon receiving the unreturned-tray message from the app, the system server finds the respective diner and sends a reminder message to the diner. Optionally, the system can charge the diner a cleaning fee for the unreturned tray when the diner orders food at his/her next dining, or in the embodiment where monetary deposit is provided for a tray, the deposit is forfeited as cleaning fee.

[0039] In accordance with various embodiments, to facilitate accurate detection of the diner entering or leaving the food court, auto indoor positioning techniques are employed. For example, BLE beacons may be placed around the entrance/exit of the food court to form a geofence. For instance, when a diner reserves a seat outside the food court, but the diner's mobile device is not detected entering the food court within the specified time, the reservation is canceled. In another instance, when the diner's mobile device is detected leaving the food court without any pending order, the mobile app sends a reservation-release message to the system server, and the diner's reserved seat is released for a next reservation.

[0040] A user has no pending order when the user's ordered food was prepared, and a food-ready message was sent to the user. In case of multiple orders/sub-orders being associated with the reservation, all the food-ready messages were already sent to diner.

[0041] In accordance with another embodiment, BLE beacons are placed around the stores to track whether the diner/user arrives to collect the food. In this embodiment, the definition of a user having no pending order is that all the user's food-ready messages were sent, and the user appeared in all the stores in which the user had ordered from. If the user does not appear at a store within a pre-configurable time after the food-ready message is sent, the system may resend the message to remind the user.

[0042] In accordance with an embodiment, to enable earlier seat release, BLE beacons may also be placed around the tray-return area to form a tray-return geofence. When a diner is detected entering the tray-return geofence without any pending order, the system assumes the diner is returning the tray, and the mobile app sends a reservation-release message to the system server. In the embodiment where monetary deposit is provided for a tray, the deposit is refunded to the diner's account at the same time the tray is returned. If the diner is detected leaving the food

court without entering the tray-return geofence first, a message is sent to the diner to remind him/her to clean the seat and return the tray before leaving.

[0043] To enable an even more earlier seat release, more BLE beacons may be placed inside the food court to accurately track the diner's movement. After the diner appears in all the stores from which the diner ordered food to collect the items that are ready, returns to the reserved seat to have the food, and then when he/she leaves the seat, the mobile app sends a reservation-release message to the system server and the seat is released.

[0044] In some cases, occasionally some users may go through the tray-return geofence when collecting food, and during dining, some users may leave the seat or the food court owing to a circumstance such as, but not limited to, to attend an emergency call, to wash hands, and to collect food. In order to deal with such situations, the mobile app may employ one or a combination of the following resolutions.

[0045] In a first case, if the user has no pending order, a timer starts ticking. Thus, the reserved seat is not released even if the user leaves the seat/food court or enters the tray-return geofence, if the timer has not expired. The timer may be pre-configurable by the system based on parameters set by the food court or may be adaptively adjusted by algorithms based on criteria such as, but not limited to, a minimum dining time estimated from the amount of ordered food.

[0046] In a second case, a button may also be provided in the mobile app. When a user taps on the button, the seat will be held for the user for some time even if the user leaves the seat/food court or enters the tray-return geofence. The timer may be pre-configurable by the system, or by the user or may be adaptively adjusted with certain constraints (that is, not greater than x minutes). In an instance, the timer is canceled if the user returns to the seat/food court before the timer expires.

[0047] It is also possible that there are no available seats at the user's intended food court when the user opens the mobile app. The app may display one or all of the following along the food court: available seats, the number of queuing diners waiting for seats to be available, an estimated waiting time of the user joining the waiting queue. With this information, the user may

decide to proceed to either join the waiting queue and order food or choose another food court. If the user joins the waiting queue, and when the user becomes the first diner in the queue and when a seat becomes available, the seat is automatically assigned to the user. A notification with the seat number is then sent to the user's mobile device.

[0048] In accordance with an embodiment, a technique to estimate the waiting time is as follows.

[0049] Let *avg* be the average dining time of one user in the food court, which is a statistic based on the data collected from the food court. Let *n* be the number of queueing diners before the user, *t* is the elapsed time of the *n*-th diners currently holding a seat. If *t* is bigger than *avg*, then *t* is the elapsed time of the (*n*+1)-th diners, and so on until *t* is smaller than *avg*. The estimated waiting time is given by:

$$\text{Waiting_time} = \text{avg} - t$$

[0050] The process illustrated in FIG. 2 is a typical dining sequence but not the only sequence to be considered. It is possible that the user may be quite far away from his/her intended food court. For instance, consider that the user leaves the office and, on the way home he/she opens the mobile app to select a food court near home for dining. Since the user is not within the food court covering region at this point, the app may let the user order food without reserving a seat. At this time, the order is not forwarded to the food store. When the user enters the covering region, if there are seats available, the seat nearest to the food store that the user ordered is assigned to the user, and the order is forwarded to the store for preparation. At the same time, a confirmation notification message is sent to the user's mobile device. The user may tap on the message to view the assigned seat and may change it. If no seat is available when the user enters the covering region, a "no-seat" message is sent to the user's mobile device. When the user taps on the message, it shall display queueing information and asks the user whether he wants to join the queue or opt for a take-away order or cancel the order. If the user chooses to join the waiting queue or opts for take-away, the order is confirmed and forwarded to the food store.

[0051] It is possible that a diner may want to have more food after his/her first order. The mobile app then allows the user to add multiple orders to the same seat reservation.

[0052] If a diner sits on a seat without reservation, the seat is still available to everybody online for reservation and another diner may reserve the seat. To avoid seat conflicts, a dine-in user must reserve a seat through the system. For people facing issues with handling technology, such as, for example, an elderly person without smart phones, in some embodiments, the person can directly take the support of the staff at the store to order food and to reserve a seat. In these embodiments, the store's software also provides a seat reservation functionality. In other embodiments, the food court may retain some seats not administered by the system in a special zone for these users.

[0053] To facilitate food preparation, when an order is forwarded to the food store, the store's software may report the new incoming order number and items immediately by voice. The store's software may also accept voice commands.

[0054] FIG. 3 illustrates a typical food court schematic map in accordance with an embodiment of the invention. As illustrated in FIG. 3, a food court 300 displays each occupied seat 302, each available seat 304, the name and position of every food store 306, and the position of a tray-return point 308. When a user chooses a seat, the map may be presented automatically with a route from the reserved seat (or the user's current position if it can be accurately identified by the BLE positioning) to the food store when the user taps on the food-ready notification message. The map may also be presented when the user wants to view the position of a food store or the tray-return point by tapping on the food court map button on the mobile app.

[0055] FIG. 4 shows an example of allocation of seats at a food court in accordance with an embodiment of the invention.

[0056] In the example, a table 400 with four chairs 402 are divided into four seats. In order to recognize each seat, a tag 404 with a seat number is placed on every seat region. However, it will be apparent to those skilled in the art that the one seat per chair allocation scheme is not limiting and the invention may be based on any seat allocation scheme.

[0057] For example, for the convenience of parents dining with children, there may be a children-dining zone, where two or more chairs with the corresponding region may be

collectively grouped as one logical seat with one seat number assigned to identify the group seat region. In another example, a table with all chairs may also be grouped as one logical seat identified by one seat number with one tag placed on it for group dining without sharing.

[0058] Some users may also come with colleagues, friends or family members. In this case, in the embodiment of one seat per chair allocation scheme, the user needs to reserve multiple seats. The system may allow a user to reserve multiple adjacent seats for group dining. It may impose one or more of the following schemes to check whether the user abuses multiple seats reservation.

[0059] In one case, the system totally trusts the community moral and the user without checking the number of diners associated with the reservation.

[0060] In another case, the system estimates whether the amount of ordered food matches the number of diners reasonably.

[0061] In yet another case, the system requires the user to forward the reservation to other diners within the app. The system then checks the appearance of every diner's mobile device in the food court.

[0062] Further, the system stores the user's attributes such as, but not limited to, a dining time, venue, seat, and food, for a period, and obeys the laws and the industry's best practices to protect the data and not to abuse the data. Using the system and the data, a system operator may collaborate with the authorities to improve public hygiene and health, by educating the diner to clean the table and return the tray to the designated point after dining. The system then immediately notifies affected customers to take necessary actions when there is an emergency, such as, for example, when the food is polluted, or a dinner is contaminated. It may also ensure that people obey the safe social distancing rules during an epidemic, by blocking some adjacent seats from reservation in the system.

[0063] In some embodiments, an automatic detection of a user's appearance in a food court is preferred. To save cost, in some embodiments, manual techniques may be employed to confirm a user's presence. For example, QR codes/bar codes which encode position information may be

attached on the seat regions and the tray-return points. The diner confirms his/her appearance by opening the mobile app and scanning the code when he/she sits on the seat, and confirms his/her leaving by scanning the code attached at the tray-return point using the mobile app. Thus, in the case where a user can be detected leaving the food court via scanning, the user can reserve a seat outside the food court or within the food court. This ensures that nobody else is assigned the seat when it is available on the app, until the event of the user leaving the food court is reported to the system by scanning.

[0064] Further, to eliminate the scanning upon leaving process, some variation is made in the seat reservation process as illustrated in FIG. 5. In this case, the user cannot reserve a seat outside the food court and as depicted in FIG. 5, when the timer expires and the seat becomes available in the system, the diner may still be occupying the seat for dining.

[0065] Referring to FIG. 5, a user may order food using the app either outside the food court or inside the food court. However, since the user cannot reserve a seat outside the food court, the seat reservation process starts when the user comes to the seat 500. When the user finds that nobody is sitting on the seat 502, the user scans the tag attached on the seat region 506. If other people are seated on it, the user finds another seat 504.

[0066] After scanning, a seat reservation request with the seat information decoded from the tag is sent to the server. The server checks the database 508. If the seat is not held by another user 510, the server confirms the reservation 514. If the user scans a seat tag, but the system checks the database and finds that the seat is currently held by another user, the reservation fails 512 and the user may find another seat.

[0067] The user can hold the reserved seat until a timer expires. The timer is configurable by the system 520. If the user does not order food from the app before seat reservation 516, the timer starts ticking immediately after the seat reservation is confirmed 522. The user may move around the food stores to choose food items before the timer expires.

[0068] If the user orders food from the app 516, the timer starts ticking when the last food-ready message is sent to the user 518. The user may go to collect the food before the timer expires.

[0069] If the user reserves a seat first and orders food later 534, the ticking timer will be cancelled immediately when the food order is made 536, and the timer starts ticking again when the last food-ready message is sent to the user 518.

[0070] During dining, if the user needs to leave the seat owing to a circumstance such as, but not limited to, to attend an emergency call, to wash hands, and to collect food, the user may scan the seat tag again 506 to hold the seat during leaving. When the system finds that the user requests to reserve the seat held by himself, the previous reservation is cleared first and the current reservation is successful and proceeds as normal 514.

[0071] In an implementation, a button may be provided in the app. When the restart count in the timer is less than an allowable value, the button may be pressed by the user to restart the timer. Else, the button is disabled/grayed out and cannot be pressed by the user. If the user needs to be away from the seat for a longer time than that set in the timer, before the timer expires, the user may restart the timer manually on the app 530 and the timer restart count is incremented 532. The number of times manual restarting may be allowable is restricted and configurable by the system 528.

[0072] After the timer expires 524, the seat is released and is made available in the system 526. The process then ends at step 538. However, the user may continue occupying the seat to have food. Only when the current user leaves the seat, it is then made available to other users for scanning and reservation. In this way, the system does not need to check if a current user is leaving the seat.

[0073] FIG. 6 illustrates various modules of a system 600 for facilitating dining at a venue in accordance with an exemplary embodiment of the invention.

[0074] The venue can be, but need not be limited to, an establishment. a restaurant, a food court, a store and an arena.

[0075] System 600 can be, but need not be limited to, a program installed on a computing device. The computing device can be, but need not be limited to, a mobile device, a smart phone, a

laptop, a personal computer, a tablet, a POS terminal, and a server. In an embodiment, system 600 is an app (front-end) running on the computing device.

[0076] As illustrated in FIG. 6, system 600 comprises a memory 602 and a processor 604 communicatively coupled to memory 602. Memory 602 and processor 604 further communicate with various modules of system 600 via a communication module 606.

[0077] Communication module 606 may be configured to transmit data between modules, engines, databases, memories, and other components of system 600 for use in performing the functions discussed herein. Communication module 606 may include one or more communication types and utilizes various communication methods for communication within system 600.

[0078] System 600 includes a seat reservation module 608 for reserving one or more seats at the venue for a user. Seat reservation module 608 enables the user to select the one or more seats for reserving via the app on the computing device. In accordance with an embodiment, in addition to reserving seats, system 600 includes an order and payment module 610 to enable the user to place an online order corresponding to the venue and complete payment related to the order via the app on the computing device.

[0079] System 600 further includes a position tracking module 612 to track a location of the user at the venue, to derive position information of the user at an instant of time. In an embodiment, position tracking module 612 tracks the location of the user using techniques such as, but not limited to, auto indoor positioning techniques (such as, but not limited to, BLE beacons, ultrasonic pulses, Wi-Fi), assisted GPS, and manual methods such as scanning QR codes.

[0080] Upon detecting the user either leaving the venue, leaving the reserved seat or entering a tray-return geo-fence at the venue based on the position information of the user, a seat hold/release decision module 614 decides whether to release or hold the one or more reserved seats. In order to decide whether to release or hold the one or more reserved seats, seat hold/release decision module 614 evaluates a condition in conjunction with a timer. The

condition can be, but need not be limited to, the user leaving the one or more reserved seats or venue owing to a circumstance such as, but not limited to, to attend an emergency call, to wash hands, and to collect food.

[0081] In an embodiment, seat hold/release decision module 614 releases the one or more reserved seats if the timer for collecting food expires, and the user does not start the hold-the-seat timer. The timer is pre-configurable or may be adaptively adjusted using an algorithm based on parameters such as, but not limited to, a minimum dining time estimated from an amount of ordered food at the venue, statistics of population on different days and hours.

[0082] In accordance with another embodiment, seat hold/release decision module 614 holds the one or more reserved seats during a food collection period.

[0083] System 600 further includes a reservation waiting time calculation module 616 for estimating a reservation waiting time for the user at the venue based on factors such as, but not limited to, an average dining time of the user in the venue, which is a statistic based on data collected from the venue, a number of queueing users (n) before the user, and an elapsed time (t) of the (n)th dining users and so on, until 't' is smaller than average (avg).

[0084] Furthermore, system 600 includes a self-cleaning educating module 618 to facilitate self-cleaning at the venue by sending notifications/reminders to the user via a notification module 620 to clean a dining area associated with the one or more reserved seats and to return a tray associated with the user after dining. The notifications/reminders are triggered based on one or more of determining that the user does not enter the tray-return geo-fence based on the position information of the user and via tracking the tray using a tray tracking module 622.

[0085] Notification module 620 is further triggered to send the notifications/reminders to the user based on receiving a report from another user or cleaner if the other user or the cleaner notices the tray being left on the table by the user, and the other user reads the tray's id using the app on his device.

[0086] Tray tracking module 622 associates a tray id with the user for tracking whether the user returns the tray after dining. The tray id can be, but need not be limited to, a plain text tag, a QR

code/bar code tag attached to the tray that may be scanned by a camera or an optical module with a decoder, a BLE beacon advertising the id, and an NFC tag storing the id.

[0087] In accordance with an embodiment, system 600 further includes a monetary deposit/refund module 624 for enabling the user to provide a monetary deposit online via the app for collecting the tray at the venue and refunding the monetary deposit via the app once the user returns the tray.

[0088] System 600 also includes a fee charging module 626 for imposing cleaning charges on the user for an unreturned tray.

[0089] Further, system 600 includes a grading module 628 for enabling another user to rate/comment on the cleaning quality of the user and a grade is awarded to the user based on the rate/comment. The grade can be either a high grade or a low grade.

[0090] System 600 then rewards the user via a rewarding module 630 in case of high grade and in case of low grade, a message is sent via notification module 620 to remind the user not to forget cleaning after dining along with imposing charges by fee charging module 626 for cleaning work done by cleaners when the user attempts to reserve seats in future via the app.

[0091] It will be apparent to those skilled in the art that a module is a logical entity which possibly resides in one or more physical entities. For instance, seat reservation module 608 may be split into a client part and a server part, with the client residing in the front-end (such as but not limited to, a user's mobile device), and the server residing in the back-end (such as, but not limited to, a cloud server).

[0092] FIG. 7 illustrates a flowchart of a method 700 for facilitating dining at a venue in accordance with an exemplary embodiment of the invention.

[0093] As illustrated in FIG. 7, at step 702, seat reservation module 608 reserves one or more seats at the venue for a user. Seat reservation module 608 enables the user to select the one or more seats for reserving via the app on the computing device. In accordance with an embodiment, in addition to reserving seats, order and payment module 610 enables the user to

place an online order corresponding to the venue and complete payment related to the order via the app on the computing device.

[0094] At step 704, position tracking module 612 tracks a location of the user at the venue, to derive position information of the user at an instant of time. In an embodiment, position tracking module 612 tracks the location of the user using techniques such as, but not limited to, auto indoor positioning techniques (such as, but not limited to, BLE beacons, ultrasonic pulses, Wi-Fi), assisted GPS, and manual methods such as scanning QR codes.

[0095] At step 706, upon detecting the user either leaving the venue, leaving the reserved seat or entering a tray-return geo-fence at the venue based on the position information of the user, seat hold/release decision module 614 decides whether to release or hold the one or more reserved seats. In order to decide whether to release or hold the one or more reserved seats, seat hold/release decision module 614 evaluates a condition in conjunction with a timer. The condition can be, but need not be limited to, the user leaving the one or more reserved seats or venue owing to a circumstance such as, but not limited to, to attend an emergency call, to wash hands, and to collect food.

[0096] In an embodiment, seat hold/release decision module 614 releases the one or more reserved seats if the timer for collecting food expires, and the user does not start the hold-the-seat timer. The timer is pre-configurable or may be adaptively adjusted using an algorithm based on parameters such as, but not limited to, a minimum dining time estimated from an amount of ordered food at the venue, statistics of population on different days and hours.

[0097] In accordance with another embodiment, seat hold/release decision module 614 holds the one or more reserved seats during a food collection period.

[0098] Finally, at step 708, self-cleaning educating module 618 facilitates self-cleaning at the venue by sending notifications/reminders to the user via notification module 620 to clean a dining area associated with the one or more reserved seats and to return a tray associated with the user after dining. The notifications/reminders are triggered based on one or more of determining

that the user does not enter the tray-return geo-fence based on the position information of the user and via tracking the tray using tray tracking module 622.

[0099] Notification module 620 is further triggered to send the notifications/reminders to the user based on receiving a report from another user or cleaner if the other user or the cleaner notices the tray being left on the table by the user, and the other user reads the tray's id using the app on his device.

[00100] Tray tracking module 622 associates a tray id with the user for tracking whether the user returns the tray after dining. The tray id can be, but need not be limited to, a plain text tag, a QR code/bar code tag attached to the tray that may be scanned by a camera or an optical module with a decoder, a BLE beacon advertising the id, and an NFC tag storing the id.

[00101] In accordance with an embodiment, monetary deposit/refund module 624 enables the user to provide a monetary deposit online via the app for collecting the tray at the venue and refunds the monetary deposit via the app once the user returns the tray. Fee charging module 626 imposes cleaning charges on the user for an unreturned tray.

[00102] Furthermore, grading module 628 enables another user to rate/comment on the cleaning quality of the user and a grade is awarded to the user based on the rate/comment. The grade can be either a high grade or a low grade. Rewarding module 630 rewards the user in case of high grade and in case of low grade, a message is sent via notification module 620 to remind the user not to forget cleaning after dining along with imposing charges by fee charging module 626 for cleaning work done by cleaners when the user attempts to reserve seats in future via the app.

[00103] The present invention is advantageous in that it provides a method and system based on a mobile app and the Internet to provide a simple and effective solution to address the problems existing in current reservation systems.

[00104] The invention enables a diner to view vacant seats in his/her preferred food courts, and/or nearby food courts, on the mobile app prior to leaving. Further, the invention enables

diners to reserve and hold a seat (one person)/seats (multiple persons) until a meal is finished. Thus, the invention promotes a more efficient seat reservation culture.

[00105] Furthermore, the invention provides diners the option of ordering food online before reaching the food court which reduces the waiting time for food while it is being prepared.

[00106] The solution provided by the invention further promotes secure, hassle-free online cashless payments, thus eliminating the labor of counting cash and depositing cash in a bank. When most diners order and pay online, a specific cashier is no longer needed, thus reducing the worker headcount at stores. Also, once the food is ready, a notification is sent to a customer's device, which will be present on the device till the customer or diner acknowledges it.

[00107] The present invention further promotes a self-cleaning culture by educating a diner to clean the table and return the tray to the designated point after dining. This reduces the labor of cleaners, thereby reducing cleaning cost, and increasing the table turnover rate to serve more customers during busy hours.

[00108] Finally, the invention immediately notifies affected customers to take necessary actions when there is an emergency such as, for example, the food being contaminated or polluted, and also ensures that people obey safe social distancing rules during infection outbreak periods, by blocking adjacent seats from reservation in the system.

[00109] Those skilled in the art will realize that the above recognized advantages and other advantages described herein are merely exemplary and are not meant to be a complete rendering of all of the advantages of the various embodiments of the present invention.

[00110] The system, as described in the invention or any of its components may be embodied in the form of a computing device. The computing device can be, for example, but not limited to, a general-purpose computer, a programmed microprocessor, a micro-controller, a peripheral integrated circuit element, and other devices or arrangements of devices, which are capable of implementing the steps that constitute the method of the invention. The computing device includes a processor, a memory, a nonvolatile data storage, a display, and a user interface.

[00111] In the foregoing specification, specific embodiments of the present invention have been described. However, one of ordinary skill in the art appreciates that various modifications and changes can be made without departing from the scope of the present invention. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of the present invention.

CLAIMS

What is claimed is:

1. A method for facilitating dining at a venue, the method comprising:
 - reserving, for a user, one or more seats at the venue, wherein the reserving comprises enabling the user to select the one or more seats via an application on a computing device;
 - tracking, at the venue, a location of the user to derive position information of the user at an instant of time;
 - upon detecting the user either leaving the venue, leaving the reserved seat or entering a tray-return geo-fence at the venue based on the position information of the user, deciding whether to release or hold the one or more seats, wherein the deciding comprises evaluating a condition and using a timer to decide whether to release or hold the one or more seats; and
 - facilitating self-cleaning at the venue by sending notifications/reminders to the user to clean a dining area associated with the one or more seats and to return a tray associated with the user after dining, wherein the notifications/reminders are triggered based on at least one of determining that the user does not enter the tray-return geo-fence based on the position information of the user and via tracking the tray.
2. The method of claim 1, wherein a venue is one of a restaurant, a food court, a store and an arena.
3. The method of claim 1, wherein the reserving comprises enabling the user to place an online order corresponding to the venue and complete payment related to the order via the application on the computing device.
4. The method of claim 1, wherein the computing device is at least one of a mobile device and a Point-of-Sale (POS) terminal.
5. The method of claim 1, wherein the location of the user at the venue is tracked using at least one of auto indoor positioning techniques (such as, but not limited to, Bluetooth low energy (BLE) beacons, ultrasonic pulses, Wi-Fi), assisted GPS, and manual methods such as scanning QR codes.

6. The method of claim 1, wherein a condition is the user leaving the one or more seats or venue owing to a circumstance such as, but not limited to, the user leaving the one or more seats or venue to attend an emergency call, the user leaving the one or more seats or venue to wash hands, and the user leaving the one or more seats or venue to collect food.
7. The method of claim 1, wherein the deciding comprises releasing the one or more seats if the timer for collecting food expires, and the user does not start the hold-the-seat timer;
8. The method of claim 7, wherein the timer is pre-configurable or may be adaptively adjusted using an algorithm based on at least one of a minimum dining time estimated from an amount of ordered food at the venue, statistics of population on different days and hours.
9. The method of claim 1, wherein the deciding comprises holding the one or more seats during a food collection period.
10. The method of claim 1 further comprises estimating a reservation waiting time for the user at the venue based on at least one of an average dining time of the user in the venue, which is a statistic based on data collected from the venue, a number of queueing users (n) before the user, and an elapsed time (t) of the (n)th dining users and so on, until 't' is smaller than average (avg).
11. The method of claim 1, wherein sending the notifications/reminders further comprises receiving a report from another user or cleaner based on at least one of the other user or the cleaner noticing the tray being left on the table by the user, and the other user reading the tray's id using the application.
12. The method of claim 1, wherein tracking the tray comprises associating a tray id with the user for tracking whether the user returns the tray after dining, wherein the tray id is at least one of a plain text tag, a QR code/bar code tag attached to the tray that may be scanned by a camera or an optical module with a decoder, a BLE beacon advertising the id, and a Near-Field Communication (NFC) tag storing the id.

13. The method of claim 1 further comprises imposing cleaning charges on the user for an unreturned tray.
14. The method of claim 1 further comprises enabling another user to rate/comment on the cleaning quality of the user and awarding a grade to the user based on the rate/comment, wherein the grade is one of a high grade and a low grade.
15. The method of claim 14 further comprises rewarding the user in case of high grade and in case of low grade, sending a message to remind the user not to forget cleaning after dining and imposing charges for cleaning work done by cleaners when the user attempts to reserve seats in future via the application.
16. A system for facilitating dining at a venue, the system comprising:
- a memory;
 - a processor communicatively coupled to the memory, wherein the processor is configured to:
 - reserve, for a user, one or more seats at the venue, wherein the processor is configured to enable the user to select the one or more seats via an application on a computing device;
 - track, at the venue, a location of the user to derive position information of the user at an instant of time;
 - upon detecting the user either leaving the venue, leaving the reserved seat or entering a tray-return geo-fence at the venue based on the position information of the user, decide whether to release or hold the one or more seats, wherein the processor is configured to evaluate a condition and use a timer to decide whether to release or hold the one or more seats; and
 - facilitate self-cleaning at the venue by sending notifications/reminders to the user to clean a dining area associated with the one or more seats and to return a tray associated with the user after dining, wherein the notifications/reminders are triggered based on at least one of determining that the user does not enter the tray-return geo-fence based on the position information of the user and via tracking the tray.

17. The system of claim 16, wherein the processor is configured to enable the user to place an online order corresponding to the venue and complete payment related to the order via the application on the computing device.
18. The system of claim 16, wherein the processor is configured to impose cleaning charges on the user for an unreturned tray.
19. The system of claim 16, wherein the processor is configured to enable another user to rate/comment on the cleaning quality of the user and award a grade to the user based on the rate/comment, wherein the grade is one of a high grade and a low grade.
20. The system of claim 19, wherein the processor is further configured to reward the user in case of high grade and in case of low grade, send a message to remind the user not to forget cleaning after dining and impose charges for cleaning work done by cleaners when the user attempts to reserve seats in future via the application.

METHOD AND SYSTEM FOR FACILITATING DINING AT A VENUE**ABSTRACT**

The invention relates to a method and system for facilitating dining at a venue. The method includes reserving one or more seats at the venue for a user by enabling the user to select the one or more seats via an app on a computing device. Further, a location of the user is tracked at the venue, to derive position information of the user. Upon detecting the user either leaving the venue, the reserved seat or entering a tray-return geo-fence based on the position information, a decision whether to release or hold the one or more reserved seats is taken based on evaluating a condition in conjunction with a timer. Self-cleaning is facilitated at the venue by sending notifications/reminders to the user to clean a dining area and return a tray after dining, based on determining that the user does not enter the tray-return geo-fence and via tracking the tray.

Figure of the drawing which should accompany the abstract when published: please use **FIG. 6** (of Page 6) from the drawings sheet.