COMMUNICATIONS-ENABLED SHOPPING CART

FIELD OF THE INVENTION

The present invention relates generally to a communications-enabled shopping cart, and more particularly to a shopping cart having a display and being adapted to receive information from a remote source and to display the information on the display.

BACKGROUND TO THE INVENTION

Shopping carts are usually supplied by an establishment, such as a supermarket or an airport, for use by customers inside the establishment for the purposes of transporting goods or merchandise. Information, in particular advertising, is commonly provided on the shopping carts, typically on one or more panels or surfaces of the shopping carts. While cost effective, such information delivery is untargeted, unsuitable for regularly-updated information and is not usable to retrieve desired information.

An alternative to the above information delivery for shopping carts is described in US Patent No. 7,443,295 to Brice et al ('Brice'). Brice provides a display at a nose end of its shopping cart for displaying at least one advertisement for a product based on the location of the shopping cart within the store. The display is foldable or retractable to allow a plurality of shopping carts to be nested for storage.

SUMMARY OF THE INVENTION

The present invention is defined in the appended independent claims. Some optional features of the present invention are defined in the appended dependent claims.

In one specific expression, the present invention relates to a communications-enabled shopping cart comprising:

a handle attached to a frame,

a display having a base and being attached to the shopping cart by an attachment arm, the attachment arm being configured to locate the base of the display higher than the handle, and

a computing module configured to receive information from a remote source and to display the information on the display.

Preferably the shopping cart further comprises a base tray, the display being closer to the handle than the base tray.

Preferably the shopping cart further comprises a basket attached to the frame, wherein the basket extends a first distance from the frame, the base tray extends a second distance from the frame, and the display is arranged at a third distance from the frame, the third distance being between the first and second distances.

Preferably the frame comprises two legs between which the basket is attached and between which a spine panel is arranged, the computing module being arranged on the spine panel. In this form, the base tray and the computing module are preferably on opposite sides of the spine panel.

Preferably the attachment arm comprises a neck portion attached to the base of the display, and a base plate attached to one of the legs of the frame.

Preferably the display includes a top portion and wherein when the communications-enabled shopping cart is in use on a surface, the top portion of the display is at a height of around 1150mm to 1300mm from the surface, and at a distance of around 420mm to 520mm from the handle. The base of the display is preferably at a height of around 900mm to 1100mm from the surface and at a distance of around 200mm to 400mm from the handle.

Preferably the computing module includes a location determining module that is in communication with an RFID reader and a GPS receiver, and that is configured to determine the location of the shopping cart. The computing module preferably also includes a peer communication module configured to allow one cart to communicate with one or more other carts. Preferably the peer communication module is configured to allow said one cart to communicate with the remote source via the one or more other carts.

Preferably the communications-enabled shopping cart is an airport trolley, and wherein the information to be displayed is selected from the group consisting of: flight information, boarding details, and facilities within the airport. The communications-enabled shopping cart preferably includes a scanner configured to scan an airport boarding pass.

Preferably the computing module includes a content synchronization module configured to receive and store packaged content from the remote source.

Preferably the computing module includes a selection module configured to store one or more selection rules to determine which content from the received packaged content in the content synchronization module to be displayed on the display.

In another specific expression, the present invention relates to a display assembly for a communications-enabled shopping cart having a handle, the display assembly comprising:

a display having a base, and

an attachment arm configured to locate the base of the display higher than the handle of the communications-enabled shopping cart.

Preferably the attachment arm comprises a neck portion attached to the base of the display, and a base plate for attachment to one of the legs of the frame, and preferably the neck portion extends substantially perpendicularly from the base plate.

In yet another specific expression, the present invention relates to a communications-enabled shopping cart having a frame and comprising:

a display attached to the frame, and

a computing module configured to receive information from a remote source and to display the information on the display, the computing module including a peer communication module configured to allow the communications-enabled shopping cart to communicate with one or more other communications-enabled shopping carts.

Preferably the peer communication module is configured to: receive information from a user of the communications-enabled shopping cart or a second communications-enabled shopping cart, determine if the communications-enabled shopping cart is within range of a wireless access point, if within range of the wireless access point, send the information from the communications-enabled shopping cart directly to the wireless access point, and if not within range of the wireless access point, send the information from the communications-enabled shopping cart to a third communications-enabled shopping cart that is within range of the communications-enabled shopping cart.

In yet another specific expression, the present invention relates to a method using a communications-enabled shopping cart having a display, the method comprising:

receiving at a first communications-enabled shopping cart information from a user of the first communications-enabled shopping cart or a second communications-enabled shopping cart,

determining if the first communications-enabled shopping cart is within range of a wireless access point,

if within range of the wireless access point, sending the information from the first communications-enabled shopping cart directly to the wireless access point, and

if not within range of the wireless access point, sending the information from the first communications-enabled shopping cart to a third communications-enabled shopping cart that is within range of the first communications-enabled shopping cart.

In still another specific expression, the present invention relates to a system comprising:

one or more communications-enabled shopping carts described above, and

a central server in communication with one or more terminal servers, the central server being configured to synchronize its contents with the one or more terminal servers, each terminal server being configured to synchronize its contents with the one or more communications-enabled shopping carts.

Preferably the central server is further configured to send real-time announcements to the one or more communications-enabled shopping carts via the one or more terminal servers.

As will be apparent from the following description, the provision of the display at an evelated height from the handle of the shopping cart makes it possible to nest the shopping carts as usual without requiring any folding or retracting of the display. This simplification of the construction of the shopping cart not only reduces manufacturing time and cost but also increases the lifetime of the display assembly as it obviates the wear-and-tear associated with movable parts. The operation of the preferred form shopping cart also provides significant advantages over conventional shopping carts. For example, where peer-to-peer communication is provided, inter-cart communication is realised. An unexpected advantage of providing this form of communication is that a shopping cart that is not within range of a wireless access point may communicate with other shopping carts within range for relaying information to the wireless acccess point. These and other related advantages will be readily apparent to skilled persons from the description below.

BRIEF DESCRIPTION OF THE FIGURES

A preferred embodiment of the communications-enabled shopping cart will now be described with reference to the accompanying figures in which:

Figure 1A is a front perspective view of the shopping cart,

Figure 1B is a side view diagram of the shopping cart,

Figure 1C is a side view diagram showing the nestability of the shopping cart,

Figure 2 is an architecture diagram of the computing module,

Figures 3A-3F are example screenshots of the display,

Figure 4 is a block diagram of a system for communicating with the shopping carts, and

Figure 5 is an architecture diagram of the central server.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figures 1A and 1B, the preferred form communications-enabled shopping cart is shown as an airport trolley 100. The term 'shopping cart' as used herein denotes a cart (i.e. a relatively small wheeled-vehicle pushed by hand) suitable to store and transport objects and goods for purchase within an establishment. Skilled persons will appreciate that an airport trolley is a form of shopping cart given that its purpose is generally not limited to carrying baggage and given that it can be used to carry purchased goods from stores within an airport.

The airport trolley 100 illustrated in Figure 1A includes a handle 102 and a basket 104 attached to a frame 106. A display 108 having a top portion 108a and a base 108b is attached to the trolley 100 by an attachment arm 109 that is configured to locate the base 108b of the display higher than the handle 102. For ease of reference, the combination of the display 108 and the attachment arm 109 will herein be referred to as a display assembly. As can be seen in Figure 1B, the attachment arm 109 of the display assembly is configured to provide the base 108b external to the basket 104 and at a height h_1 above the handle 102.

The trolley 100 also includes a computing module that is mounted in a compartment 110 on the trolley 100 and is configured to receive information from a remote source and to display the information on the display 108.

The Display Assembly

As noted above, the display assembly comprises the display 108 and the attachment arm 109.

The display 108 in the preferred form is a touch-screen display 108, which provides easy browsing through various pages of content. The display 108 is located closer to the handle 102 than a base tray 112 of the trolley 100. This allows a user to reach and manipulate the touch

screen 108 while using the trolley 100. In the preferred embodiment, speakers are provided in or adjacent the display to provide audio-based content to the user. The display 108 or the trolley 100 in general may also be provided with a scent dispenser. This allows a further enhancement to the sensorial experience of the trolley or to complete an advertised message. The scent dispensed may be of food or even a perfume to incite consumer interest.

The display 108 is in the preferred form a modular display that allows it to be selectively removed and attached to the attachment arm 109. In addition to allowing the display 108 to be easily replaced, this arrangement provides the following advantages: (a) ease of future upgrading, changes or maintenance of display screens, (b) allow the design to be adaptable to fit other airport trolleys of slightly different dimension or design, and (c) ease of packing and shipment of component parts. As depicted in Figure 1B, the display 108 is located between the handle 102 and the end of the base tray 112. Specifically, the basket 104 extends a first distance D_1 from the frame 106, the base tray 112 extends a second distance D_2 from the frame 106, and the display 108 is arranged at a third distance D_3 from the frame 106, the third distance D_3 being between the first distance D_1 and the second distance D_2 . This arrangement provides the display 108 adjacent the handle 102 for ergonomic viewing without causing visual obstruction or disruption to the use of the existing storage space provided by the trolley 100.

The attachment arm 109 in the preferred embodiment has at one end a neck portion 109a to receive the display base 108b, and at the other end a base plate 109b for attachment to the frame 106, and in particular to one leg 106a of the frame 106. While only a single arm is shown, two or more arms may be provided instead. For example, two attachment arms may be provided, one for connection to each of two legs 106a, 106b of the frame 106. Also, the neck portion 109a need not receive the display base 108b but may, where necessary or desired, receive a side or top of the display instead.

The base plate 109b is preferably configured to be adjustable using an adjusting means for retrofitting the display assembly to existing airport trolleys. The adjusting means in the preferred form are adjustable screw brackets, but skilled persons will appreciate that equivalents such as other forms of adjustable brackets, clamps, clips and the like may be used instead to cater for flexibility. In the preferred form, the neck portion 109a extends substantially perpendicularly from the base plate 109b (i.e. such that the attachment arm 109 has a substantially 'L' shape from a plan view). This removes the need for the neck portion 109a to attach to the nose or front surface of the basket 104 and is advantageous since such an attachment further hinders nesting of the trolleys or alternatively requires complex folding or retracting mechanisms for nesting. Also in the preferred form, the neck portion 109a of the attachment arm 109 is higher than the handle 102.

The attachment arm 109 also provides adjustability in terms of angle, depth and height of the display 108. In the preferred form, adjustable hinges are used to provide the adjustability. Where desired, variants such as telescoping slides may be used for depth and height adjustments. The tilt angle θ of the display 108 is preferably adjustable by 10° to 20° (e.g. to adjust the display to be between 30° to 40° from a vertical plane to allow optimum viewing by users having different heights. The attachment arm 109 is further configured to allow the following display placement (and adjustability within the ranges noted):

1. Height (h_2) of the display top 108a from the floor ranges between 1150mm to 1300mm,
2. Height (h_3) of the display base 108b from the floor ranges between 900mm and 1100mm,
3. Distance (fourth distance D_4) from the display top 108a to the handle 102 is between 420mm to 520mm.
4. Distance (fifth distance D_5) from the display base 108b to the handle 102 is between 200mm to 400mm.
5. Height (h_1) of the display base 108b from the handle 102 ranges between 0 and 100mm.

As shown in Figure 1C, the provision of the display base 108b higher than the handle 102 allows a plurality of trolleys 100A and 100B to be nested as normal without requiring the display 108 to be foldable or retractable (i.e. the display base 108b may be fixedly positioned on the trolley 100).

Specifically, in the preferred embodiment, the base 108b of the display 108 and the neck portion 109a are at a height greater than the height of the trolley handle 102, thus removing the possibility of the handle 102 of other similar trolleys from being obstructed by the display base 108b or attachment arm 109, which in turn allows the handle 102 of a second trolley 100B to pass underneath or clear the display 108 of a first trolley 100A to nest the trolleys 100A, 100B. In the form shown, the handle 102 of the second trolley 100B passes under the display base 108b and the neck portion 109a of the first trolley 100 to such an extent that a back surface of the basket of the second trolley 100B abuts the front surface of the basket of the first trolley 100A. To allow for such nesting, the display base 108b and the neck portion 109a of the preferred embodiment are not attached to the trolley 100 by any means in the area on or around the basket 104 (shown in broken lines in Figure 1C) that is configured to abut or overlap with the handle 102 and basket 104 of another trolley 100 when the trolleys are nested.

It will be appreciated that the term 'base' as used herein with reference to the display refers to the bottom portion of the display as a whole and not just the bottom portion of a viewable area

of the display. In a typical construction of a display, whereby a screen is placed within a housing, the 'base' refers to the bottom portion of the housing and not the bottom portion of the screen (i.e. the viewable area).

The Computing Module

The computing module as shown in Figure 1A is located in a compartment 110 between the legs 106a, 106b of the frame. Specifically, the frame 106 comprises two legs 106a, 106b between which the basket 104 is attached and between which a spine panel 114 is arranged. The computing module compartment 110 is shown arranged on the spine panel 114 such that the computing module compartment 110 and the base tray 112 are on opposite sides of the spine panel 114 (i.e. the computing module is on a rear surface of the spine panel 114). The compartment 110 is also used to house a battery pack and required communication components. This placement of the compartment 110 and thus the computing module, battery pack and other components centralizes weight distribution about the trolley 100 and also allows easy access for maintenance of the components within the compartment 110. A cover on the outer surface of the compartment 110 also allows the continued use of the rear of the trolley 100 for advertising (e.g. via a slip-in frame).

As will be apparent from the description below, the computing module of the preferred form trolley 100 is particularly configured to: (a) operate a display for displaying digital contents, (b) enable users to interact with the contents, (c) provide location detection capability, and (d) allow contents to be transmitted to the display seamlessly.

The computing module in the preferred embodiment is a computer apparatus which implements one or more modules in software, as a series of instructions which, when executed by a processor or other computing device, performs the determinations or controls described below. As illustrated in Figure 2, the computing module includes a location determining module 200, a peer communication module 202, a user input module 204, a content synchronization module 206, a selection module 208 and a GUI module 210.

The location determining module 200 is configured to ascertain information relating to the location of the trolley. The information is ascertained using Radio Frequency Identification (RFID) technology and specifically by reading RFID tags or beacons strategically placed at various locations within the airport. These beacons define virtual boundaries, creating and demarking different zones within the airport. Specifically, passive and/or active RFID tags are placed in the facility to define zones or mark a key spot where triggered content events are programmed to occur or commence playing. The zones and key spots are also used to determine the location of

the trolley, thereby tracking the activity and location of the trolley in the airport. That is to say, as the trolley 100 navigates through the airport, its location is tracked and traced by the location determining module 200 interfacing with the RFID beacons. For tracking outside of an enclosed premises (e.g. a parking bay of an airport), location determination by way of GPS (Global Positioning System) technology may be used instead. In the preferred form, therefore, the location determining module 200 includes an RFID reader and a GPS receiver.

The peer communication module 202 is configured to allow the trolley to communicate with one or more other trolleys. Specifically, by providing a unique identification to each trolley together with a handset device or an in-built microphone/speaker assembly, a passenger using the trolley is able to communicate with family and friends locally via external communication lines (e.g. voice over IP) or to interact with other passengers using similar trolleys (i.e. inter-trolley communication). Where a video camera is provided on the trolley, the peer communication module 202 allows video conferencing between trolleys. In addition to enabling calls to each other, the peer communication module 202 may also provide a trolley-to-trolley location map to help friends and family find each other easily. The peer communication module 202 is also configured to allow the trolley to communicate with the remote source via one or more other trolleys. This allows a trolley that is not within range of a wireless access point to reach an access point via one or more trolleys that are close enough to provide a link to the access point.

The user input module 204 is configured to allow interactivity through the use of one or more user input devices. The user input module 204 is specifically configured to receive or capture inputs from a user or passenger, and in particular inputs from the touch screen display. In the preferred form, the user input module 204 is also in communication with a boarding pass scanner or a magnetic strip reader that is provided on the trolley to scan and retrieve user information from one or more of a user's boarding pass and the user's credit card. The user input module 204 also interfaces with the video camera that is provided on the trolley to capture passive demographics on users, to monitor security or to verify if a passenger that has signed into the trolley with its boarding pass is still at the trolley at the time of boarding.

The content synchronization module 206 is configured to receive information or content from the remote source. In the preferred embodiment, the remote source is a terminal server or central server and the content synchronization module 206 includes a receiver configured to receive from the remote source one or more selected from the group consisting of: packaged advertising content, user-requested content and real-time announcements.

The selection module 208 is configured to store selection rules or algorithms that determine which content from the content synchronization module 206 to be displayed on the display of the trolley. Possible selection rules include those:

1. Based on the location of the trolley - the contents displayed will be relevant to the shops or items being sold in the vicinity of the trolley, and
2. Based on the profile of the users of the trolley.

In the preferred form, the selection module 208 receives the selection rules or algorithms from the remote source and is configured to interface with the location determining module 200 to allow selection rules or algorithms to take into account the location of the trolley as determined by the location determining module 200.

The graphical user interface (GUI) module 210 is configured to display the content selected by the selection module 208 from the content synchronization module 206 on the display. Content is typically full-motion video and/or static images but may also include audio or scent information. Where audio or scent information is provided, the GUI module 210 may be configured to present the information to the user via speakers and a scent dispenser respectively. The GUI module 210 is further configured to display user interfaces for passengers or users to navigate for the purposes of retrieving specific information. These will now be described below with reference to Figures 3A to 3F.

Figure 3A shows a home screen that is presented to a user and to which a user can return using a home button 300. The home screen in the preferred form includes the following options: (i) find my boarding gate – 306 (ii) 24-hours entertainment – 308 (iii) free activities to enjoy – 310. The following additional options may be presented using arrow buttons 302 and 304: (i) facilities around me (ii) show me good buys, discounts and gift ideas (iii) allow me to scan my boarding pass to get personalized services (iv) allow me to view my flight details and notify me on flight changes (v) remind me to go to my boarding gate (vi) show me the way to my boarding gate.

Figure 3B shows the screen that is presented upon selection of the option 'find my boarding gate'. The screen shown includes a virtual keypad 312 that is usable to enter into the search box 314 the gate number to be located. Upon pressing the 'enter' button, the user is presented with the screen shown in Figure 3C, showing the user's present location 316 and the gate location 317 on a terminal map so as to allow a user to navigate the airport to the boarding gate.

Figure 3D shows the screen that is presented upon selection of the option '24-hours entertainment'. Example options that are presented include: TV entertainment lounge 318,

movie theatre 320, free internet 322, spa and lounge 324, transit hotel 326, meditation room 328, rest area 330 and shower 332. The 'TV entertainment lounge' option may provide users with on-demand television programs, news, movies, games and the like. A selection of the option 'movie theatre' results in a presentation of the screen in Figure 3E, which provides details relating to movies playing at the airport and any movie alert 334, such as details of a movie that is about to start. A selection of the remaining options above presents the user with a terminal map showing the location of the relevant facility. It will be appreciated that these options allow passengers to access on-demand entertainment or navigate the airport efficiently while waiting to board their flights, thus improving the passenger's airport experience.

Figure 3F shows an example advertising screen that is presentable on the display. As will be detailed later in this specification, the advertisements presented may be location-based, that is to say relevant advertisements can be triggered and be displayed based on the location of the trolley. In the example of Figure 3F, as a passenger with the trolley approaches a Louis Vuitton (LV) boutique, an LV advertisement showing the latest LV product is displayed. Figure 3F also shows an example real-time announcement 336 relating to a change of gate location that is presented to the user.

Additional modules that may also be provided by the computing module include: an internet access module configured to allow passengers to access the internet, check emails or chat to friends online, a credit card module coupled to the user input module and configured to allow instant credit card purchases on limited promotions which can be picked up at the store or at a designated location, and an e-coupon module configured to allow discount coupons relating to delivered advertisements to be sent to a user's mobile telephone.

The system of the invention will now be described with reference to Figure 4. In the system, trolleys 100A-D of the invention interface with a central server 400 via one or more terminal servers. In the preferred embodiment, an airport's Terminal 1, Terminal 2 and Terminal 3 include terminal servers 402, 404 and 406 respectively. The central server 400 in the preferred form includes a web portal in wired or wireless communication with the terminal servers 402, 404, 406 which are in turn in wireless communication with trolleys 100A-100D via wireless access points 412, 414, 416 in the terminals. Although only one wireless access point is shown for each terminal server, skilled persons will appreciate that, in practice, a plurality of access points may be provided. The figure also shows inter-cart or inter-trolley communication, between trolley 100D and trolleys 100B and 100C. Such communication may be used by users of trolleys to communicate with one another and/or to relay signals from trolley 100D, which may not be within range of an access point, to the access point via the other trolleys 100B and 100C.

The Central Server

The central server 400 is configured to aggregate, re-format, customize and prioritize content provided by various parties and users of the system. Example users include the airport authority 408 and the airport tenants 410. In particular, the central server 400 is configured to manage contents on the terminal servers 402, 404, 406 and the trolleys 100A-D.

The central server 400 broadly includes the following functionalities: (a) content delivery, (b) content prioritization, and (c) content standardization. Content delivery not only allows a bulk synchronization of the contents between the central server 400 and the trolleys 100A-D but also pulling of on-demand content in real-time such as last minute announcements. Content prioritization is used to arrange the display order of the contents either manually or through its selection rules or algorithm, while content standardization ensures that all contents that are managed by the central server 400 follow the same technical specifications as required by the trolleys 100A-D.

The modules within the preferred form central server 400 are illustrated in Figure 5 and include a gateway module 512, user account module 514, content storage module 516, scheduler module 518, content delivery module 520 and data analytics module 522.

The gateway module 512 is configured to restrict access to the central server 400. It does this by requiring a user (e.g. the airport authority 408 and the airport tenants 410) to provide a username and a corresponding password. Once entered, the username and password are sent to the user account module 514 for verification. The user account module 514 is accordingly configured to verify the user's submitted details and to inform the gateway module 512 of the result of the verification.

If the user's details have been verified, gateway module 512 grants access to the user to view, edit, delete and upload content to the content storage module 516. The content storage module 516 is accordingly configured to store all content in a database together with the relevant attributes of the content. In the preferred form, the content storage module 516 includes a standardization module configured to ensure contents in the central server 500 follow the same technical specifications as required by the trolleys (e.g. correct data format etc).

The scheduler module 518 is configured to: (i) pull out contents from the content storage module 516 either at fixed intervals (e.g. daily, weekly etc based on a date attribute of the content, i.e. first in, first out) or manually by a system administrator and (ii) send the content to the content delivery module 520. In the preferred form, the schedule module 518 includes a

prioritization module that is used to arrange the display order of the contents either manually or through its selection algorithm. Prioritization can be set based on the type of advertisers or content providers that leverage on the system of the invention to provide contents, or the profile and/or interest of the users of the trolleys. Where trolleys are provided with a video camera (i.e. to determine a user's personal attributes) or a magnetic strip reader, the scheduler module 518 may use attributes relating to the user's gender, country of origin etc to pull out relevant content.

The content delivery module 520 is configured to package the content scheduled by the scheduler module 518 for the specific terminals according to a destination attribute (e.g. the Internet Protocol address or IP address of the destination) and deliver the content to the relevant terminal server. This may be done in a bulk synchronization manner (i.e. synchronizing the contents of all terminal servers with those of the content delivery module in bulk). Real-time announcements that have been inputted into the central server 400 may also be delivered at this time. In this manner, the system allows not only bulk synchronization of contents but also pulling of on-demand or real-time content such as last minute announcements. Once the terminal servers have received the content package, the package is unpacked and delivered to the trolleys in the terminals. As will be appreciated from the foregoing description, information or content may be delivered to passengers on the basis of: (i) user information (e.g. information obtained from reading the passenger's boarding pass) and (ii) location information (e.g. the location of the trolley within the airport). The latter is carried out in a non-invasive way, such as by tracking the trolley position using RFID beacons placed strategically within the airport premises or by receiving and processing GPS signals, as outlined earlier.

The data analytics module 522 is configured to assimilate raw data collected by the system, and provide intelligent data filtering to enable the delivery of a management report to meet a user's requirements. The data analytics module 522 may specifically be configured to record and correlate data including passengers' path within stores, advertisements viewed on the trolleys and passengers' interactions with the display. The data analytics module 522 may additionally be configured to analyze a consumer's shopping pattern and determine what forms of communications or marketing campaigns are effective.

The Terminal Servers

As outlined earlier, a terminal server is deployed at each terminal of the airport, each serving as a hub for all of the trolleys in the respective terminal. Each terminal server is configured to unpack content received from the central server and to synchronize them with the content synchronization module of the trolleys. The terminal servers are also configured as a repository for activities log of trolleys in a particular terminal. A trolley management module is also

provided at each terminal server to manage the trolleys within the terminal. The trolley management module is specifically configured to provide a quick overview of the status information of all the trolleys deployed in a particular site. Such status information include: physical presence of the trolleys (e.g. in what zones are the trolleys located), battery level of the trolleys, and whether the display is turned on / functioning properly.

With the above system in place, effective advertisement planning and execution of brand promotions and marketing campaigns may be implemented, offering efficiency and process optimization for the airport authority, its tenants and their advertising agencies. In the preferred embodiment, the system provides a one-stop web portal for brand and product promotions execution in the airport. By virtue of being a web portal, content providers are able to upload their content onto the system anywhere and at any time.

In addition to the above, by providing the display of the trolley at an evelated height from the handle of the trolley, the display requires no folding or retracting means for storage during nesting of the trolleys. This can be contrasted with Brice's conventional provision of a display at the nose end of the trolley as described in the background section. Such a provision requires the display to be foldable or retractable for storage during nesting and which in turn requires a complicated mechanical design of the display assembly and leaves the assembly susceptible to breakdown as a result of wear and tear.

The operation of the preferred form trolley also provides significant advantages over conventional trolleys. For example, the preferred form trolley supports peer-to-peer communication as well as communications via wireless access points . This means that if a trolley (trolley A) does not detect any wireless access points but detects another trolley (trolley B), trolley A can communicate with trolley B and transfer or recieve data through trolley B to or from the central server. This advantage is particularly desirable in an airport setting, given the large areas of the airport. Speficially, by providing inter-trolley communication for relaying information from trolley to trolley, an airport need not provide a large number of access points throughout the airport premises. Put simply, the above advantage allows the invention to be realised in establishments that are much larger or more expansive than a supermarket without having to provide a suitably large number of access points. System cost and complexity are accordingly reduced.

The present invention also allows data to be transferred on a real-time basis between the central server, terminal servers and trolleys. This allows time-sensitive information to be sent to the trolleys and is particularly advantageous for airport applications given the need to receive urgent announcements. Such an operation is not envisaged in the conventional trolley of Brice.

Also, in contrast with conventional trolleys that rely solely on RFID-based location determination, the preferred form trolley of the present invention uses GPS technology to supplement a deployment of the system outdoors.

The benefits arising from the present invention from the perspectives of a passenger, the airport authority and advertisers will also be apparent to skilled persons. For example, from the perspective of a passenger, desired information such as flight information, boarding gate details, boarding gate map location and reminders can be obtained or received on-the-go and with minimum delay. This improves the passenger's experience in the airport at least because it provides a means by which the passenger can confidently orient its way around an unknown airport and safely to its boarding gate. The passenger's experience in the airport is also enhanced by providing entertaining and informative content and shopping information.

From the perspective of the airport authority, the present invention provides a non-intrusive medium for communicating with passengers, e.g. highlighting new facilities and services, providing orientation map and boarding gate location information. Current operations in terms of trolley management are also enhanced by giving real-time location information of the trolleys or the passengers. This in turn allows a determination of crowd flow, the most/least popular spots within the airport vicinity and other statistical relevant information. Also, the location of missing or unused trolleys may be determined. This obviates the conventional need to store an excess of trolleys to address the issue of missing/unused trolleys.

From the perspective of advertisers, the present invention provides 'push' capabilities based on location and/or zone, which allows advertising and promotional content to be targeted and selectively displayed on the display of the trolley, depending on where the trolley is. This may be based on broad determinations (e.g. within which particular zone) and/or specific determinations (e.g. within which particular shop). Such multiple-level considerations are not implemented in conventional systems.

The foregoing describes a preferred embodiment, which, as will be understood by those skilled in the art, may be subject to variations or modifications in design, construction or operation without departing from the scope of the claims. For instance, while the preferred embodiment has been described with reference to an airport trolley, the claimed invention may be implemented in a supermarket instead. In a supermarket embodiment, a base tray may be dispensed with. Also, while the preferred form relates to a display assembly that is retrofitted to a trolley, this is not limiting since an integral formation of the display assembly with a trolley is envisaged. Similarly, while the preferred form trolley includes a basket, this is not limiting.

Airport trolleys having a base tray without a basket can also be provided with the display assembly of the present invention.

With regard to the modules described above, in addition to a software implementation, a hardware-based implementation may be provided instead. For instance, individual or separate processors may be specifically programmed to carry out the disclosed functions of the modules. A combination of hardware and software implementation may also be used. For instance, the modules may be a hardware arrangement configured to read from a computer readable medium, or obtain from a network, executable code for implementing the disclosed functions. Also with regard to the modules, it will be appreciated that not all of the modules need to be provided to implement the invention – for example, where peer-to-peer communication is not needed (e.g. in a supermarket), the peer communication module may be dispensed with. The above variations, for instance, are intended to be covered by the scope of the claims.

CLAIMS

1. A communications-enabled shopping cart comprising:

a handle attached to a frame,

a display having a base and being attached to the shopping cart by an attachment arm, the attachment arm being configured to locate the base of the display higher than the handle, and

a computing module configured to receive information from a remote source and to display the information on the display.

2. The communications-enabled shopping cart of claim 1, further comprising a base tray, the display being closer to the handle than the base tray.

3. The communications-enabled shopping cart of claim 2, further comprising a basket attached to the frame, wherein the basket extends a first distance from the frame, the base tray extends a second distance from the frame, and the display is arranged at a third distance from the frame, the third distance being between the first and second distances.

4. The communications-enabled shopping cart of claim 3, wherein the frame comprises two legs between which the basket is attached and between which a spine panel is arranged, the computing module being arranged on the spine panel.

5. The communications-enabled shopping cart of claim 4, wherein the base tray and the computing module are on opposite sides of the spine panel.

6. The communications-enabled shopping cart of claims 4 or 5, wherein the attachment arm comprises:

a neck portion attached to the base of the display, and

a base plate attached to one of the legs of the frame.

7. The communications-enabled shopping cart of any one of the preceding claims, wherein the display includes a top portion and wherein when the communications-enabled shopping cart is in use on a surface, the top portion of the display is at a height of around 1150mm to 1300mm from the surface.

8. The communications-enabled shopping cart of claim 7, wherein the top portion of the display is at a distance of around 420mm to 520mm from the handle.

9. The communications-enabled shopping cart of claim 7 or 8, wherein the base of the display is at a height of around 900mm to 1100mm from the surface.

10. The communications-enabled shopping cart of any one of claims 7 to 9, wherein the base of the display is at a distance of around 200mm to 400mm from the handle.

11. The communications-enabled shopping cart of any one of the preceding claims, wherein the computing module includes a location determining module that is in communication with an RFID reader and a GPS receiver, and that is configured to determine the location of the shopping cart.

12. The communications-enabled shopping cart of any one of the preceding claims, wherein the computing module includes a peer communication module configured to allow one cart to communicate with one or more other carts.

13. The communications-enabled shopping cart of claim 12, wherein the peer communication module is configured to allow said one cart to communicate with the remote source via the one or more other carts.

14. The communications-enabled shopping cart of any one of the preceding claims, wherein the communications-enabled shopping cart is an airport trolley, and wherein the information to be displayed is selected from the group consisting of: flight information, boarding details, facilities within the airport, advertisement contents and entertainment contents.

15. The communications-enabled shopping cart of claim 14, wherein the communications-enabled shopping cart includes a scanner configured to scan an airport boarding pass.

16. The communications-enabled shopping cart of any one of the preceding claims, wherein the computing module includes a content synchronization module configured to receive and store packaged content from the remote source.

17. The communications-enabled shopping cart of claim 16, wherein the computing module includes a selection module configured to store one or more selection rules to determine which content from the received packaged content in the content synchronization module to be displayed on the display.

18. A display assembly for a communications-enabled shopping cart having a handle, the display assembly comprising:

a display having a base, and

an attachment arm configured to locate the base of the display higher than the handle of the communications-enabled shopping cart.

19. The display assembly of claim 18, wherein the attachment arm comprises:

a neck portion attached to the base of the display, and

a base plate for attachment to one of the legs of the frame.

20. The display assembly of claim 19, wherein the neck portion extends substantially perpendicularly from the base plate.

21. A communications-enabled shopping cart having a frame and comprising:

a display attached to the frame, and

a computing module configured to receive information from a remote source and to display the information on the display, the computing module including a peer communication module configured to allow the communications-enabled shopping cart to communicate with one or more other communications-enabled shopping carts.

22. The communications-enabled shopping cart of claim 21 wherein the peer communication module is configured to:

receive information from a user of the communications-enabled shopping cart or a second communications-enabled shopping cart,

determine if the communications-enabled shopping cart is within range of a wireless access point,

if within range of the wireless access point, send the information from the communications-enabled shopping cart directly to the wireless access point, and

if not within range of the wireless access point, send the information from the communications-enabled shopping cart to a third communications-enabled shopping cart that is within range of the communications-enabled shopping cart.

23. A computer-implemented method using a communications-enabled shopping cart having a display, the method comprising:

receiving at a first communications-enabled shopping cart information from a user of the first communications-enabled shopping cart or a second communications-enabled shopping cart,

determining if the first communications-enabled shopping cart is within range of a wireless access point,

if within range of the wireless access point, sending the information from the first communications-enabled shopping cart directly to the wireless access point, and

if not within range of the wireless access point, sending the information from the first communications-enabled shopping cart to a third communications-enabled shopping cart that is within range of the first communications-enabled shopping cart.

24. A system comprising:

one or more communications-enabled shopping carts of any one of claims 1 to 17 or 21 to 22, and

a central server in communication with one or more terminal servers, the central server being configured to synchronize its contents with the one or more terminal servers, each terminal server being configured to synchronize its contents with the one or more communications-enabled shopping carts.

25. The system of claim 24, wherein the central server is further configured to send real-time information to the one or more communications-enabled shopping carts via the one or more terminal servers.