Methods, devices, and systems are presented for detecting where shoppers in a store stop, turn, and look from accelerometers in their own smartphones or other mobile devices. These movement events can be correlated with merchandise on their receipts as well as the movement events and merchandise on the receipts of other users so that a map of the store’s wares can be generated. The map can be used to inform manufacturers where their merchandise is stocked in the store or to advertise to shoppers as they browse the store.
FIG. 3

RECEIPT

High Brand Cookies 4.95
Chocolate 0.75
Peanut Butter 4.35

LOCATED ON STORE SHELF AT LOCATION OF STOP-AND-TURN EVENT
RECEIVE TIME SERIES VELOCITY DATA OR TIME SERIES ORIENTATION DATA OF A MOBILE DEVICE OF A USER

DETERMINE A MOVEMENT EVENT FROM THE TIME SERIES VELOCITY DATA OR TIME SERIES ORIENTATION DATA

OBTAIN A LOCATION AT A STORE OF THE MOBILE DEVICE DURING THE MOVEMENT EVENT

CORRELATE THE LOCATION WITH MERCHANDISE AT THE STORE

PERFORM FURTHER PROCESSING USING THE CORRELATED LOCATION AND MERCHANDISE

SEND A COUPON OR ADVERTISEMENT PERTAINING TO THE MERCHANDISE TO THE MOBILE DEVICE

BUILD A MERCHANDISE MAP OF THE STORE BASED ON MULTIPLE CORRELATED MOVEMENT EVENTS AND MERCHANDISE LOCATIONS

FIG. 7
RECEIVE TIME SERIES VELOCITY DATA OR TIME SERIES ORIENTATION DATA OF MOBILE DEVICES OF USERS

DETERMINE MOVEMENT EVENTS BASED ON THE TIME SERIES VELOCITY DATA OR TIME SERIES ORIENTATION DATA

OBTAIN MOVEMENT EVENT LOCATIONS USING THE MOVEMENT EVENTS

RECEIVE THE MOVEMENT EVENT LOCATIONS OF MOBILE DEVICES OF USERS

RECEIVE A LIST OF ITEMS PURCHASED FROM A STORE BY EACH OF THE USERS

CORRELATE MOVEMENT EVENT LOCATIONS OF SOME OF THE USERS WITH A COMMON ITEM OF MERCHANDISE ON THE USERS' PURCHASE LISTS

PERFORM FURTHER PROCESSING USING THE CORRELATED MOVEMENT EVENT LOCATIONS AND MERCHANDISE

SEND AN ADVERTISEMENT OR COUPON TO AT LEAST ONE OF THE MOBILE DEVICES BASED ON A MOVEMENT EVENT

FIG. 8
900 PROVIDE AN ADVERTISEMENT FOR MERCHANDISE TO A USER

902 RECEIVED VELOCITY OR ORIENTATION DATA OF A MOBILE DEVICE OF THE USER

904 DETERMINE A MOVEMENT EVENT FROM THE VELOCITY OR ORIENTATION DATA

906 OBTAIN A LOCATION OF THE MOBILE DEVICE AT THE MOVEMENT EVENT

908 CORRELATE THE LOCATION WITH THE ADVERTISED MERCHANDISE

910 PERFORM FURTHER PROCESSING USING THE CORRELATION

912 SEND A FURTHER ADVERTISEMENT OR COUPON FOR THE MERCHANDISE TO THE MOBILE DEVICE BASED ON THE CORRELATION

FIG. 9
CUSTOMER MAPPING USING MOBILE DEVICE WITH AN ACCELEROMETER

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/264,543, filed Nov. 25, 2009 (Attorney Docket No. 016222-056900US), and U.S. Provisional Application No. 61/264,983, filed Nov. 30, 2009 (Attorney Docket No. 016222-057000US). The applications above are hereby incorporated by reference in their entirety for all purposes.

BACKGROUND

[0002] 1. Field of the Art

[0003] Generally, systems and methods are disclosed for determining customers' various interests in items in stores by analyzing the physical movements of the customers. More specifically, methods and systems are disclosed for correlating customers' movements as measured by accelerometers in their mobile phones with items on store shelves.

[0004] 2. Discussion of the Related Art

[0005] Cellular phones, portable music players, handheld global positioning system (GPS) devices, personal digital assistants, and other mobile devices have become popular among the general public. Some of the functions of these devices include mapping a user's current location and offering directions to where he or she wishes to go, connecting the user to the Internet, and/or store calendar reminders and shopping lists. Entertainment, such as songs, videos, and video games, are playable on some mobile devices so that a user does not get bored while waiting for others. So handy are many of the mobile devices that people often carry them around wherever they go.

[0006] Some mobile devices include integrated accelerometers. The accelerometers can be part of an inertial measurement unit (IMU) within the housing of a mobile device. An IMU that is fed with periodic calibrations from a global positioning system (GPS) measurements has been found to be an effective way to measure position. Accelerometers can be used as an internal input device for the mobile device itself. For example, a drawing application on the mobile device can be shaken to clear its screen, much like a mechanical Etch A Sketch® toy. With accelerometers, a mobile device can be used as an input device for other devices. For example, a mobile device can act as a tennis racket grip for a video game depicting virtual tennis. Accelerometers in smart phones, such as the Apple iPhone and Google Android devices, have been creatively applied to measure user's intentional movements of the smart phones for games.

[0007] Although video games and traditional IMU functions are natural uses for accelerometers in mobile devices, the inventors of the present application recognize that the accelerometers carried around by people in their smart phones may be advantageous in other, nontraditional areas. Particularly, mining accelerometer data, which might be continuously generated by a smart phone anyway, for a shopper's movements while browsing a store and the shopper is not necessarily focusing on the mobile device may be helpful.

BRIEF SUMMARY

[0008] The present disclosure generally relates to methods, devices, and systems for using accelerometers in mobile devices to map where shoppers interests are inside a retail store. The locations of interest, which can be found by measuring 'stop and turns' or other physical patterns with accelerometers, can be correlated with products on the store shelves or on the shoppers' receipts. The locations of products on store shelves can then be mapped with accuracy. The maps of products on store shelves can be sold to product manufacturers, consumers, and even the stores themselves.

[0009] If multiple shoppers have stopped at the same place in a store aisle and they all have the same item on their receipts, then it may be assumed that the item is stocked in the aisle location at which they all stopped. The more shoppers for which this is the case, the more likely that the item is indeed at the particular aisle location. Over the course of a week, with thousands of shoppers going into the store, such as a supermarket, department store, or other high volume retail store, fairly good probabilities can be assigned to locations of merchandise in the stores.

[0010] The locations of items on store shelves can be determined by an entity without the labor of having to go into the stores themselves. Many items can be mapped with more accuracy over time as more shoppers shop the stores. With the resulting maps in some embodiments, coupons can be texted to the users' mobile phones as they pass by items. Complementary items can be advertised as well.

[0011] An embodiment in accordance with the present disclosure relates to a method of correlating merchandise location at a store. The method includes receiving time series velocity data or time series orientation data of a mobile device of a user, determining a movement event, such as a stop and turn event, from the time series velocity data or time series orientation data, obtaining a location at a store of the mobile device during the movement event, and correlating the location with merchandise at the store. The method further includes performing further processing using the correlated location and merchandise, such as sending a coupon or advertisement pertaining to the merchandise to the mobile device in a short message service (SMS) format or multimedia messaging service (MMS) format.

[0012] The method can include sending a message to the store based on the movement event, thereby alerting the store to a user's possible interest in the merchandise.

[0013] An embodiment in accordance with the present disclosure relates to a method of correlating movement events of shoppers with items purchased by them. The method includes receiving movement event locations of mobile devices of users, receiving a list of items purchased from a store by each of the users, and correlating movement event locations of some of the users with a common item of merchandise on the users' purchase lists. The method further includes performing further processing using the correlated movement event locations and merchandise.

[0014] An embodiment in accordance with the present disclosure relates to a method of correlating movement events of shoppers with advertisements. The method includes providing an advertisement for merchandise to a user, receiving velocity and orientation data of a mobile device of the user, determining a movement event from the velocity and orientation data, obtaining a location of the mobile device at the movement event, and correlating the location with the advertised merchandise. The method further includes performing further processing using the correlation.
Other embodiments relate to machine-readable tangible storage media and computer systems which employ or store instructions for the methods described above.

A further understanding of the nature and the advantages of the embodiments disclosed and suggested herein may be realized by reference to the remaining portions of the specification and the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a “stop and turn” event of a shopper on a store aisle in accordance with an embodiment.

FIG. 2A is a chart of time series velocity data in accordance with an embodiment.

FIG. 2B is a chart of time series orientation data in accordance with an embodiment.

FIG. 3 illustrates a receipt in accordance with an embodiment.

FIG. 4 illustrates a store map in accordance with an embodiment.

FIG. 5 illustrates a store map in accordance with an embodiment.

FIG. 6 illustrates MMS coupons in accordance with an embodiment.

FIG. 7 is a flowchart illustrating a process in accordance with an embodiment.

FIG. 8 is a flowchart illustrating a process in accordance with an embodiment.

FIG. 9 is a flowchart illustrating a process in accordance with an embodiment.

FIG. 10 shows a block diagram of a portable consumer device in accordance with an embodiment.

FIG. 11 shows a block diagram of an exemplary computer apparatus that can be used in some embodiments.

The figures will now be used to illustrate different embodiments in accordance with the invention. The figures are specific examples of embodiments and should not be interpreted as limiting embodiments, but rather exemplary forms and procedures.

DETAILED DESCRIPTION

Generally, the present disclosure relates to methods, devices, and systems for using accelerometers in people’s smart phones to detect where they stop in a store, correlating those locations with merchandise or advertisements on their receipts, and then producing maps of the locations of merchandise or advertisements in the store. The maps can be used to advertise further, rearrange products for better placement, send coupons to users who are passing by the same locations, and/or otherwise use the location data.

Privacy, or at least the feeling of being tracked, can be a concern to some people. Analyzing another’s movements by using the measurement devices and processing power within the trackee’s own personal electronics can be a further concern. Tracking user movements in a store using the users’ own smart phones may be socially unacceptable in some contexts but socially acceptable in others. Consent of the users may be paramount in what is considered acceptable. Consent of the user can be established in many ways. Users may voluntarily opt in to their movements being tracked in a store for discounts, monetary awards, or the potential of winning a sweepstakes. Because consent of minors may be potentially unnerving to parents, tracking could be limited to certain groups of people, such as adults who have opted in to a store-selected tracking program.

Technical advantages of embodiments are manifold. The labor of walking around and mapping stores is virtually free. Shoppers are already there looking at items. They carry their own electronic devices that measure, store, and transmit their locations. Shoppers do not need to be provided with extra equipment, save a software application that can read, send, and store the accelerometer data on their device. Another advantage is that the attention of real-world users is mapped. It is as if people’s answers to a survey are submitted through their actions and not merely through their verbal (i.e., oral or written) responses. Shoppers can forget that they are being tracked so that their movements are more natural and psychologically close to movements of unaware shoppers. Maps and other data can be sold to manufacturers or wholesalers that are a great geographical distance from the mapped store. For example, a manufacturer in Arkansas does not need to go visit a store that sells its products in California to determine where its items are placed. It can analyze the data from afar and negotiate with the store for better positioning of its products (e.g., on end caps as opposed to on a low shelf in middle of an aisle; near complementary items as opposed to far away). The stores themselves can look at the same data and optimize their placement of high-profit items and advertisements. Consumers may look at maps of store merchandise to determine the most popular merchandise in a store. Much like “most popular products” lists on retail-sale web sites, there can be a “most popular parts of a store” for particular brick and mortar stores.

“Time series data” includes a set of data points for which each data point corresponds to a time. Time series data may be stored in chronological or any other order. The time periods between respective data points may be equally spaced, such as that collected by periodic sampling, or unequally spaced, such as that collected by event driven sampling. An object’s trajectory data through space, having only position (e.g., x, y, and z location) coordinates, is considered time series data because each coordinate was derived from position data corresponding to a time at which an object was at the corresponding position.

“Time series velocity data” includes time series data that includes velocity or speed of an object. For example, data points having the of the speed of a user walking through a store aisle is time series velocity data.

“Time series orientation data” includes time series data that includes angular orientation of an object. For example, data points having the pitch, roll, and yaw of a mobile phone in the pocket of consumer’s jacket is time series orientation data.

A “movement event” an event in which a position, velocity, and/or orientation of an object has changed significantly from an otherwise normal course or where there is an abrupt change in movement. For example, a movement event can include suddenly moving toward the shelves in an aisle from a normal position of in the center of an aisle. As another example, a movement event can include an event in which the physical speed of a has halved, quartered, etc. from a normal walking speed. A user may be slowing to contemplate an item on a shelf. A movement event can include an event in which the yaw of a phone has skewed over 90 degrees, 45 degrees, 30 degrees, or less. A user may rotate to look at an item on a shelf. A movement event can include events in which a user is detected to bend over, stoop, or crouch. For
example, a user bending over could be detected by sensing that his phone’s velocity goes to zero and its orientation changes pitch by 60 degrees. A user crouching could be detected by sensing that his phone’s velocity goes to zero and its position is lowered by 1, 2, 3, or more feet.

[0037] A “stop and turn” is a movement event in which a user has slowed down or stopped and has changed his or her orientation. This can indicate that the user has stopped to look at something on a store shelf or otherwise reveal that the user has focused on something in the store. While the user’s stop and turn may have nothing to do with what is on a store shelf because the user may be just tying his or her shoe, answering her cell phone, speaking with a store employee, or other “false alarms,’ a stop and turn event correlated to the same location as stop and turn events of other users can indicate a higher likelihood that the user is indeed looking at something in the store. A “slow and turn” event is a stop and turn event.

[0038] FIG. 1 illustrates a “stop and turn” event of a shopper on a store aisle in accordance with an embodiment. In situation 100, shopper 108 carries mobile device 116 in his hand 110. As he walks, user 108 steps here and there, planting footsteps 112, and supporting mobile device 116 through space described by trajectory 114.

[0039] Trajectory 114 can be described with respect to Euclidean, orthogonal axes, x, y, and z such as those shown as x axis 102, y axis 104, and z axis 106. Other coordinate systems are, of course, applicable as well. In addition to trajectory 114, the orientation of the mobile device can be described by reference to pitch axis 118, roll axis 120, and yaw axis 122. Each of the components of trajectory 114 or orientation can be saved as data series with respect to time. For example, x-position data in inches can be saved with respect to time in seconds.

[0040] Time series data, such as that describing trajectory 114, is analyzed to detect stop and turn event 124. Exemplary stop and turn event 124 includes an x-velocity going to zero (and negative for a short bit) and a y-velocity that takes the phone to the side of an aisle. Stop and turn event 124 may also be indicated by a change in the yaw of mobile device 116 as shopper 108 turned to walk toward the side of the aisle.

[0041] A location at the store of the mobile device during stop and turn event 124 is analyzed in order to correlate it with merchandise in the store aisle. In this embodiment, the position of stop and turn event 124 is found to most closely match that of position 128 on the store shelves. Merchandise 126 is known to sit at position 128, so stop and turn event 124 is correlated with merchandise 126. Because shopper 108 did not bend over, stoop, or crouch, that may indicate that shopper 108 was indeed attracted to merchandise 126 as opposed to merchandise on lower or higher shelves.

[0042] Alternatively or in conjunction with shopper 108’s apparent interest in merchandise 126 is his apparent interest in advertisement 130. Advertisement 130, a ‘SALE!’ sign, may have attracted shopper 108 to come look at merchandise 126. Stop and turn event 124 can be correlated with the placement of advertisement 130. If many people are attracted to the sign, even if the store shelves are bare of merchandise 126, then it may indicate that shoppers’ attentions are attracted to the advertisement and that the advertisement is effective in that way. Conversely, if no shoppers’ attentions are attracted to the advertisement, that may indicate that the advertisement fails to grab viewers’ attentions.

[0043] FIG. 2A is a chart of time series velocity data in accordance with an embodiment. Speed 232 is plotted against time 234. Accelerometer data from three accelerometers aligned orthogonally with one another is integrated and combined to plot curve 236 of the time series data. Curve 236 stretches from when an owner of the mobile device in which the accelerometers are located walks down and aisle and sees a product he likes to when he resumes walking again.

[0044] During time period 240, the owner of the mobile device walks down a store aisle at a regular, slow pace. Curve 236 is at a fairly constant, steady speed. During time period 242, the owner slows to look at an item on a store shelf. The speed drops from a normal slow pace to a plodding, slower pace as the owner’s attention is consumed and he saunters over to the shelf. During time period 244, the owner of the mobile device is stopped in front of a store shelf. The speed of the mobile phone is zero as its owner contemplates merchandise on the shelf that caught his eye. During time period 246, the owner scoots a few feet to the left or right and scans for similar products, competing products, prices, etc. The curve indicates that the owner is fidgeting around. During time period 248, the owner resumes walking down the aisle at a normal pace. The curve matches back up to its previous, normal slow pace.

[0045] As time periods 242, 244, and 246 on the figure indicate, the user has slowed and stopped as opposed to the normal pace of time periods 240 and 248. In this embodiment, the time series data indicates a stop event.

[0046] FIG. 2B is a chart of time series orientation data in accordance with an embodiment. Yaw orientation 262 of the device is plotted against time 234. Accelerometer data and/or gyroscopic data is combined to plot curve 266 of the time series data. Curve 266 stretches for the same duration as curve 236 (FIG. 2A).

[0047] During time period 250, the owner of the mobile device is facing down the aisle as indicated by an almost zero yaw angle. During time period 252, the owner turns toward an item on a shelf that has attracted his attention. Curve 266 increases to about 60-90 degrees as the owner’s body turns. During time period 254, the owner looks back at the shelves he just passed to scan for similar products, competing products, price tags, etc. The curve increases past 90 degrees to about 135 degrees as the owner’s body turns even more. During time period 256, the owner looks ahead and starts scooting forward a little during his forward scan of the shelves and price tags. The curve falls back to zero to about 180 degrees. During time period 258, the owner turns back toward the center of the aisle and starts walking. Curve 266 shows a negative yaw that goes back to zero as the user gets back to walking down the center of the store aisle.

[0048] As time periods 252, 254, and 256 on the figure indicate, the user has turned from his normal orientation of facing down the aisle. In this embodiment, the data in these time periods indicate a turn event.

[0049] Analyzing both the velocity data of FIG. 2A and the orientation data of FIG. 2B, stop and turn event 238 is determined. The position of the mobile device during stop and turn event 238 can be obtained from the mobile device’s GPS antenna (with help from a differential GPS antenna if available) and then recorded. The position can be correlated with merchandise whose positions are already known on the store shelves, or the positions can be correlated with items purchased.

[0050] FIG. 3 illustrates a receipt in accordance with an embodiment. Store receipt 270, shown here in paper form for illustrative purposes only, can list many purchased items,
including item 272. This item may or may not be correlated with a stop and turn event or other movement event of a user at the store. If many shoppers have stopped and turned in a particular location of the store, and they all have item 272 on their purchase lists, then it can be inferred that item 272 is located at the location of the stop and turn events.

Fig. 4 illustrates a store map in accordance with an embodiment. In map 400, a shopper's path through the store, derived from time series data of the shopper's smart phone 416, is shown as path 420. Path 420 is overlaid on predetermined map of store aisles 402.

Stop and turn events 404, 406, 408, and 410 are detected by analyzing the time series data of smart phone 416's accelerometers. The stop and turn events are shown almost immediately clustered around where the shopper enters the store. The shopper has gone to one of the first aisles and begun browsing at the beginning for that item that he needs. After checking a couple items, indicated by stop and turn events 404 and 406, and crossing the aisle to check out another item, indicated by movement event 408, the shopper turns to find what he appears to be looking for, indicated by stop and turn event 410. After stop and turn event 410, the shopper makes way for the checkout line and door.

Stop and turn events 404, 406, 408, and 410 are correlated with the closest positions on the store shelves, 424, 426, 428, and 430, respectively. If merchandise positions are already known, then the shopper's stop and turn event positions are correlated with merchandise at positions 424, 426, 428, and 430.

Fig. 5 illustrates a store map in accordance with an embodiment. In map 500, another shopper's path, derived from time series data of the shopper's smart phone 516, is shown as path 520. Path 520 is overlaid on map of store aisles 402.

Stop and turn events 504, 506, 508, 510, 512, 514, 516, and 518 are detected by analyzing the time series data of smart phone 516's accelerometers. They are shown scattered throughout the store. The shopper has meandered her way through many of the aisles, stopping to look at several items of interest in the middle of aisles, on end caps, and at the impulse buy racks just before the checkout stands.

Stop and turn events 504, 506, 508, 510, 512, 514, 516, and 518 are correlated with the closest positions on the store shelves, 524, 526, 528, 530, 532, 534, 536, and 538, respectively. If merchandise positions are already known, then the shopper's stop and turn event positions are correlated with merchandise at positions 524, 526, 528, 530, 532, 534, 536, and 538.

Between the shoppers of Figs. 4 and 5, one of the positions in the store has garnered both of their interests. The shopper of Fig. 4 stopped and turned at event 410, and the shopper of Fig. 5 stopped and turned at event 508. Both stop and turn events correspond to position 430. If both shoppers picked up the same item, as evidenced by their receipts, then it may be inferred that the item is at position 430 in the store.

The position of the item can be saved along with a probability that the item is at the position. The more shoppers who have movement events near position 430 and end up with the same item on their receipts, the higher the probability that the item is at position 430. With hundreds or thousands of shoppers ambling the aisles of a store, many item positions can be mapped with accuracy.

Certain positions of stores can be allocated ratings in line with empirical data collected by the aforementioned methods. Some parts of the store may have many people crouching, bending, or otherwise stopping and turning to view items on nearby shelves. Certain times of the day, or certain days of the week, may have more shoppers performing stop and turn events than others. Furthermore, there might be more movement events in certain areas of the store on some days, and movement events in other areas of the store on other days.

Scavenger hunts and other games may be planned with maps of items generated from consumers. For example, a scavenger hunt competitor may use the maps to more quickly find items for which he is seeking. A store can use item maps to plan or score scavenger hunts for its employees.

Fig. 6 illustrates MMS coupons in accordance with an embodiment. Store map 600 shows shelves, doorways, and other features 402. After positions of items are mapped by analyzing the movement events and receipts of other shoppers, the positions may be used for further marketing. In the exemplary embodiment, position 430 has been associated with a chocolate bar because previous shoppers had stopped and turned near position 430 and had the same chocolate bar on their receipts.

As a shopper passes by position 430, his smart phone 616 is sent an MMS message with advertisement coupon 674. The coupon is sent as the person is wandering past the position so that the logo on the MMS message is recognized by the user on the shelf. The shopper gets a valuable coupon that can be stored for use later or deleted.

Complementary items can be advertised as well. As the shopper strolls by position 604, his smart phone is sent an MMS message with advertisement coupon 676 for peanut butter. The coupon has a bar code that is scannable from a checkout register scanner. The shopper can store the coupon for use or delete it immediately.

The chocolate and peanut butter, in this instance being considered complementary items, can be dual-marketed to those who browse the same aisles of a store. In an alternate embodiment, coupon 676 for peanut butter can be sent to a shopper as he stops and turns by position 430, the location of chocolate bars. The sending of the advertisement coupon at this location may seed a thought in the consumer that peanut butter may taste good with a chocolate bar that he just took from a store shelf. Whether the coupon worked can be determined by whether there is a stop and turn event detected later at position 604.

Fig. 7 is a flowchart illustrating a process in accordance with an embodiment. Operations in the flowchart can be performed by a computer processor or non-computer mechanisms. The process can be coded in software, firmware, or hardware. Process 700 includes operations that are optional. In operation 702, time series velocity data and/or time series orientation data of a mobile device of a user is received. In operation 704, a movement event, such as a stop and turn event, is determined from the time series velocity data and/or time series orientation data. In operation 706, a location at a store of the mobile device during the movement event is obtained. In operation 708, the obtained location is correlated with merchandise at the store. In operation 710, further processing is performed using the correlated location and merchandise. In operation 712, a coupon or advertisement pertaining to the merchandise is sent to the mobile device. In operation 714, a merchandise map of the store is built based on multiple correlated movement events and merchandise locations.
FIG. 8 is a flowchart illustrating a process in accordance with an embodiment. Process 800 includes operations that are optional. In operation 802, time series velocity data and/or time series orientation data of mobile devices of users is received. In operation 804, movement events are determined based on the time series velocity data and/or time series orientation data. In operation 806, movement event location are obtained using the movement events. In operation 808, the movement event locations of the mobile devices of users are received. In operation 810, a list of items purchased from a store by each of the users is received. In operation 812, movement event locations of some of the users are correlated with a common item of merchandise on the users’ purchase lists. In operation 814, further processing is performed using the correlated movement event locations and merchandise. In operation 816, an advertisement or coupon is sent to at least one of the mobile devices based on a movement event.

FIG. 9 is a flowchart illustrating a process in accordance with an embodiment. Process 900 includes operations that are optional. In operation 902, an advertisement for merchandise is provided to a user. In operation 904, velocity and/or orientation data of a mobile device of the user are received. In operation 906, a movement event is determined from the velocity and/or orientation data. In operation 908, a location of the mobile device at the movement event is obtained. For example, it can be obtained through a GPS module in the mobile device. In operation 910, the location is correlated with the advertised merchandise. In operation 912, further processing is performed using the correlation. In operation 914, a further advertisement or coupon for the merchandise is sent to the mobile device based on the correlation.

FIG. 10 shows a block diagram of a portable consumer device or mobile device and subsystems that may be present in computer apparatuses in systems according to embodiments.

An exemplary portable consumer device 1040 in the form of a phone may comprise a computer readable medium and a body. The computer readable medium 1044 may be present within the body of the phone, or may be detachable from it. The body may be in the form a plastic substrate, housing, or other structure. The computer readable medium 1044 may be a memory that stores data and may be in any suitable form including a magnetic stripe, a memory chip, encryption algorithms, private or public keys, etc. The memory also preferably stores information such as financial information, transit information (e.g., as in a subway or train pass), access information (e.g., as in access badges), etc. Financial information may include information such as bank account information, bank identification number (BIN), credit or debit card number information, account balance information, expiration date, consumer information such as name, date of birth, etc.

Information in the memory may also be in the form of data tracks that are traditionally associated with credit cards. Such tracks include Track 1 and Track 2. Track 1 ("International Air Transport Association") stores more information than Track 2 and contains the cardholder’s name as well as account number and other discretionary data. This track is sometimes used by the airlines when securing reservations with a credit card. Track 2 ("American Banking Association") is currently most commonly used. This is the track that is read by ATMs and credit card checkers. The ABA (American Banking Association) designed the specifications of this track and all world banks must generally abide by it. It contains the cardholder’s account, encrypted PIN, plus other discretionary data.

The portable consumer device 1040 may further include a contactless element 1056, which is typically implemented in the form of a semiconductor chip (or other data storage element) with an associated wireless transfer (e.g., data transmission) element, such as an antenna. Contactless element 1056 is associated with (e.g., embedded within) portable consumer device 1040, and data or control instructions transmitted via a cellular network may be applied to contactless element 1056 by means of a contactless element interface (not shown). The contactless element interface functions to permit the exchange of data and/or control instructions between the mobile device circuitry (and hence the cellular network) and an optional contactless element 1056.

Contactless element 1056 is capable of transferring and receiving data using near field communications ("NFC") capability (or near field communications medium) typically in accordance with a standardized protocol or data transfer mechanism (e.g., ISO 14443/NFC). Near field communications capability is a short range communications capability, such as RFID, Bluetooth®, infra-red, or other data transfer capability that can be used to exchange data between the portable consumer device 1040 and an interrogation device. Thus, the portable consumer device 1040 is capable of communicating and transferring data and/or control instructions via both cellular network and near field communications capability.

The portable consumer device 1040 may also include a processor 1046 (e.g., a microprocessor) for processing the functions of the portable consumer device 1040 and a display 1050 to allow a consumer to see phone numbers and other information and messages. The portable consumer device 1040 may further include input elements 1052 to allow a consumer to input information into the device, a speaker 1054 to allow the consumer to hear voice communication, music, etc., and a microphone 1048 to allow the consumer to transmit her voice through the portable consumer device 1040. The portable consumer device 1040 may also include an antenna 1042 for wireless data transfer (e.g., data transmission).

Portable consumer device 1040 may be used by a buyer to initiate push payments. In some implementations, portable consumer device 1040 can include an interface to allow the buyer to create a payment request message. The portable consumer device 1040 can then send the payment request message to a payment processing network using contactless element 1056 or over a wireless or wired communications channel.

Portable consumer device 1040 can include accelerometer(s) 1058. Multiple accelerometers can be oriented orthogonally or non-orthogonally to each other.

FIG. 11 shows a block diagram of an exemplary computer apparatus that can be used in some embodiments.

The subsystems shown in the figure are interconnected via a system bus 1110.

Additional subsystems such as a printer 1108, keyboard 1118, fixed disk 1120 (or other memory comprising computer readable media), monitor 1114, which is coupled to display adapter 1112, and others are shown. Peripherals and input/output (I/O) devices, which couple to I/O controller 1102, can be connected to the computer system by any num-
ber of means known in the art, such as through serial port 1116. For example, serial port 1116 or external interface 1122 can be used to connect the computer apparatus to a wide area network such as the Internet, a mouse input device, or a scanner. The interconnection via system bus 1110 allows the central processor 1106 to communicate with each subsystem and to control the execution of instructions from system memory 1104 or the fixed disk 1120, as well as the exchange of information between subsystems. The system memory 1104 and/or the fixed disk 1120 may embody a computer readable medium.

[0079] It should be understood that the present invention as described above can be implemented in the form of control logic using computer software in a modular or integrated manner. Based on the disclosure and teachings provided herein, a person of ordinary skill in the art can know and appreciate other ways and/or methods to implement the present invention using hardware and a combination of hardware and software.

[0080] Any of the software components or functions described in this application, may be implemented as software code to be executed by a processor using any suitable computer language such as, for example, Java, C++ or Perl using, for example, conventional or object-oriented techniques. The software code may be stored as a series of instructions, or commands on a computer readable medium, such as a random access memory (RAM), a read only memory (ROM), a magnetic medium such as a hard-drive or a floppy disk, or an optical medium such as a CDROM. Any such computer readable medium may reside on or within a single computational apparatus, and may be present on or within different computational apparatuses within a system or network.

[0081] The above description is illustrative and is not restrictive. Many variations of the invention will become apparent to those skilled in the art upon review of the disclosure. The scope of the invention should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the pending claims along with their full scope or equivalents.

[0082] One or more features from any embodiment may be combined with one or more features of any other embodiment without departing from the scope of the invention.

[0083] A recitation of “a”, “an” or “the” is intended to mean “one or more” unless specifically indicated to the contrary. A recitation of “she” is meant to be gender neutral, and may be read as “he” or “she”, unless specifically indicated to the contrary.

[0084] All patents, patent applications, publications, and descriptions mentioned above are herein incorporated by reference in their entirety for all purposes. None is admitted to be prior art.

What is claimed is:

1. A method comprising:
   receiving time series velocity data or time series orientation data of a mobile device of a user;
   determining a movement event from the time series velocity data or time series orientation data;
   obtaining a location at a store of the mobile device during the movement event;
   correlating the location with merchandise at the store;
   performing further processing using the correlated location and merchandise;
   sending a coupon or advertisement pertaining to the merchandise to the mobile device;
   wherein the movement event includes a stop and turn event.

2. The method of claim 1 wherein the movement event includes a stop and turn event.

3. The method of claim 1 further comprising:
   sending a coupon or advertisement pertaining to the merchandise to the mobile device.

4. The method of claim 3 wherein the sending of the coupon or advertisement occurs while the user is still at the location.

5. The method of claim 3 wherein the sending of the coupon or advertisement uses a short message service (SMS) format or a multimedia messaging service (MMS) format.

6. The method of claim 1 further comprising:
   sending a message to the store based on the movement event, thereby alerting the store to a user’s possible interest in the merchandise.

7. The method of claim 1 further comprising:
   receiving a list of merchandise purchased by the user; and
   confirming an item of merchandise on the list is associated with the location.

8. The method of claim 1 wherein the time series velocity or time series orientation data is from the user bending over, stooping, or crouching.

9. The method of claim 1 wherein the receiving includes receiving both time series velocity data and time series orientation data of a mobile device of a user.

10. The method of claim 1 further comprising:
    building a merchandise map of the store based on multiple correlated movement event and merchandise locations.

11. The method of claim 1 further comprising:
    moving the merchandise to a different location at the store based on a number of correlated location correlations.

12. The method of claim 1 wherein the location is inside a store.

13. The method of claim 1 wherein the operations are performed in the order shown.

14. The method of claim 1 wherein each operation is performed by the processor operatively coupled to a memory.

15. A machine-readable storage medium embodying information indicative of instructions for causing one or more machines to perform the operations of claim 1.

16. A computer system executing instructions in a computer program, the computer program instructions comprising program code for performing the operations of claim 1.

17. A method comprising:
   receiving movement event locations of mobile devices of users;
   receiving a list of items purchased from a store by each of the users;
   correlating movement event locations of some of the users with a common item of merchandise on the users’ purchase lists; and
   performing further processing using the correlated movement event locations and merchandise.

18. The method of claim 17 further comprising:
   receiving time series velocity data or time series orientation data of the mobile devices;
   determining movement events based on the time series velocity data or time series orientation data; and
   obtaining the movement event locations using the movement events.
19. A method comprising:
providing an advertisement for merchandise to a user;
receiving velocity and orientation data of a mobile device of the user;
determining a movement event from the velocity and orientation data;
obtaining a location of the mobile device at the movement event;

   correlating the location with the advertised merchandise;
   and
   performing further processing using the correlation.

20. The method of claim 19 further comprising:
sending a further advertisement or coupon for the merchandise to the mobile device based on the correlation.

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