

SYSTEM AND METHOD FOR PREDICTING PURCHASING

BEHAVIOUR OF A TARGET USER

TECHICAL FIELD

[0001] The present invention relates broadly, but not exclusively, to a system and a method for predicting purchasing behaviour of a target user.

BACKGROUND

[0002] In recent times, the globalisation of ecommerce has offered many opportunities to consumers, marketers and retailers, which can be shown in the value of ecommerce, with an annual expenditure of £91 billion in the United Kingdom alone in 2013. However, consumers have been bombarded with advertising online, using techniques such as banner advertising that surrounds editorial content, or pop-ups which take over the page when a consumer hovers over a word. Such advertisements are usually related to a particular key word in the text and the consumer's previous browsing behaviour, thus making them contextually irrelevant or unrelated to the content the consumer is browsing at that point in time.

[0003] Online advertising is now frequently seen as truly invasive, irrelevant and annoying to a spectrum of emotions. It often fails to efficiently drive commerce or build emotional bonds between consumers and retailers. As a result, 'ad-blindness' has prevailed amongst consumers who have grown apathetic to the irrelevant ads they encounter online, i.e., they no longer engage with them and often simply ignore them. Therefore, the current situation have publishers seeing revenues drop; consumers becoming increasingly irritated; advertisers watching engagement with advertisements fall; and brands struggling to build emotional engagement.

[0004] A need therefore exists to provide an ecommerce platform that predicts purchasing behaviour of consumers by using the data relating to the ambient environment to recommend choices of advertising that are contextually relevant. In addition, there also exists a need to benefit consumers by getting the most useful and relevant products and offers. This may

benefit advertisers (or merchants) when consumers purchase their products and also develop a positive relationship between consumers and merchants.

[0005] Herein disclosed are embodiments of methods and systems for predicting purchasing behaviour of a target user that addresses one or more of the above problems.

[0006] Furthermore, other desirable features and characteristics will become apparent from the subsequent detailed description and the appended claims, taken in conjunction with the accompanying drawings and this background of the disclosure.

SUMMARY

[0007] According to a first aspect of the present invention, there is provided a system for predicting purchasing behaviour of a target user, the system comprising: a server having at least one processor and at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the server at least to: receive user identity data, the user identity data comprising a user identifier identifying a profile characteristic of the target user and/or location data identifying a location of the target user; receive, from at least one sensor device, sensor data based on the location data, the sensor data comprising ambience data associated with the location identified by the location data, the ambience data representing a state of the location of the target user; retrieve historical transaction data by querying a transaction database, the historical transaction data including transactions settled for a plurality of users having the profile characteristic of the target user; and predict the purchasing behaviour of the target user based on the retrieved historical transaction data and the received sensor data.

[0008] In an embodiment, the ambience data may further comprise a plurality of parameters and the server may be further configured to: calculate a weighted score for each of the plurality of parameters after receiving the sensor data; and determine the state of the location of the target user based on the weighted score for each of the plurality of parameters.

[0009] In an embodiment, the server may be further configured to: determine a plurality of transactions to recommend to the target user based on the predicted purchasing behaviour of

the target user; and transmit, via a user device, the plurality of determined transactions to the target user.

[0010] In an embodiment, the server may be further configured to: identify a plurality of transaction amounts by querying the transaction database having stored thereon the transaction amounts corresponding to the plurality of historical transaction data, each of the corresponding transaction amount relating to an amount that the identified users have spent in each of a plurality of transaction categories; and identify a corresponding transaction amount that the target user is likely to spend in each of the plurality of transaction categories based on the identified corresponding transaction amount of the identified users; wherein the determination of the plurality of transactions to recommend is based on the identified transaction amount.

[0011] In an embodiment, the server may be further configured to receive, from the user device, a transaction request, the transaction request including one of the determined transaction selected by the target user.

[0012] In an embodiment, the server may be further configured to, after predicting the purchasing behaviour of the target user: transmit the transaction request to a merchant server based on the selection by the target user; receive, from the merchant server, a transaction completion message to indicate settlement of the transaction; and update, in the transaction database, the historical transaction data corresponding to the profile characteristic of the target user in response to a receipt of the transaction completion message.

[0013] In an embodiment, the server may be further configured to transmit the plurality of determined transactions to the target user via a push notification.

[0014] In an embodiment, the plurality of parameters may comprise at least one of temperature, illumination, weather, humidity level, sound level and/or pressure.

[0015] In an embodiment, the server may be further configured to: receive a facial image of the target user; and determine the profile characteristic of the target user based on the facial image of the target user.

[0016] In an embodiment, the server may be further configured to predict the purchasing behaviour of the target user based on the received facial image.

[0017] According to a second aspect of the present invention, there is provided a computer-implemented method for predicting purchasing behaviour of a target user, the method comprising: receiving user identity data, the user identity data comprising a user identifier identifying a profile characteristic of the target user and location data identifying a location of the target user; receiving, from at least one sensor device, sensor data based on the location data, the sensor data comprising ambience data associated with the location identified by the location data, the ambience data representing a state of the location of the target user; retrieving historical transaction data by querying a transaction database, the historical transaction data including transactions settled for a plurality of users having the profile characteristic of the target user; and predicting the purchasing behaviour of the target user based on the retrieved historical transaction data and the received sensor data.

[0018] In an embodiment, the ambience data may further comprise a plurality of parameters and the method may further comprise: calculating a weighted score for each of the plurality of parameters after receiving the sensor data; and determining the state of the location of the target user based on the weighted score for each of the plurality of parameters.

[0019] In an embodiment, the method may comprise: determining a plurality of transactions to recommend to the target user based on the predicted purchasing behaviour of the target user; and transmitting, via a target user device, the plurality of determined transactions to the target user.

[0020] In an embodiment, the method may comprise receiving, from the target user device, a transaction request, the transaction request including one of the determined transaction selected by the target user.

[0021] In an embodiment, the method may comprise: identifying a plurality of transaction amounts by querying the transaction database having stored thereon the transaction amounts corresponding to the plurality of historical transaction data, each of the corresponding transaction amount relating to an amount that the identified users have spent in each of a plurality of transaction categories; and identifying a corresponding transaction amount that the target user is likely to spend in each of the plurality of transaction categories based on the identified corresponding transaction amount of the identified users; wherein determining the plurality of transactions to recommend is based on the identified transaction amount.

[0022] In an embodiment, the method may comprise: after predicting the purchasing behaviour of the target user, transmitting a transaction request to a merchant server based on the selection by the target user; receiving, from the merchant server, a transaction completion message to indicate settlement of the transaction; and updating, in the transaction database, the historical transaction data corresponding to the profile characteristic of the target user in response to a receipt of the transaction completion message.

[0023] In an embodiment, the step of transmitting the plurality of determined transactions to the target user may comprise transmitting via a push notification.

[0024] In an embodiment, the step of identifying the profile characteristic of the target user may comprise: receiving a facial image of the target user; and determining the profile characteristic of the target user based on the facial image of the target user.

[0025] In an embodiment, the step of predicting the purchasing behaviour of the target user may be based on the received facial image.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

[0027] Figure 1 shows a system 100 for predicting purchasing behaviour of a target user according to an example embodiment.

[0028] Figures 2A to 2B show a flow chart 200 of a method for predicting purchasing behaviour of a target user using the system 100 of Figure 1 according to an example embodiment.

[0029] Figure 3A shows a schematic diagram 300 illustrating the flow of information between various entities for predicting purchasing behaviour of a target user based on the method of Figures 2A to 2B according to an example embodiment.

[0030] Figure 3B shows a schematic diagram 350 illustrating the flow of information for predicting purchasing behaviour of a target user based on the method of Figures 2A to 2B according to an example embodiment.

[0031] Figure 3C shows a schematic diagram 380 illustrating the flow of information between various entities for predicting purchasing behaviour of a target user based on the method of Figures 2A to 2B according to an example embodiment.

[0032] Figure 4 shows a flow chart 400 of a method for determining a transaction to be recommended to the target user according to an example embodiment.

[0033] Figure 5 shows a schematic diagram of a computer system 500 suitable for use in executing the method depicted in Figures 2A to 2B, according to an example embodiment.

[0034] Figure 6 shows a schematic diagram 600 of functional modules present in the payment network server 102 of Figure 1, according to an example embodiment.

DETAILED DESCRIPTION INCLUDING BEST MODE

Terms Description (in Addition to Plain and Dictionary Meaning of Terms)

[0035] Ambience data may refer to environmental information associated with a location and provide an indication (or state) of the location surroundings. Ambience data may include the weather of the location such as but not limited to global positioning satellite (GPS) coordinates of longitude and latitude, temperature, humidity level, precipitation level, amount of illumination (or sunlight) and/or a weather forecast of the location weather. The ambience data may be obtained from one sensor device or a plurality of sensor devices positioned at the location and may also include non-environmental information which may indicate a state of the location. For example, ambience data may include sound level obtained from a sound level meter at the location, traffic conditions from a closed circuit television (CCTV), pressure level from a pressure sensor and/or pedometer level.

[0036] A target user may refer to a consumer who wishes to purchase or has previously purchased products from a merchant. The consumer may also be registered on an application program (e.g. a mobile application that is installed in a smartphone). The application program

may provide functions that are additional to an existing payment program (e.g. MasterPass). Being a registered user on the application program allows the target user to view a list of recommended products from one or various merchants and select at least one product from the list of recommended product(s) he would like to purchase. Further, the target user may have a device (i.e. a user device or a target user device) such as a portable computing device which he is able to install and view the application program. Examples of such a device may be a mobile phone, a laptop or a tablet.

[0037] A profile characteristic of the target user refers to information that is related to the target user, i.e. target user information. Such information may include name, address, age, gender, a photograph, place of birth, contact number, date of birth, historical transaction data, occupation, at least a type of product of interest and a corresponding amount that he is willing to pay for the product of interest. The profile characteristic (or target user information) may be provided by the target user during an initial registration via a mobile application installed in the user device and the information may be stored in a transaction database administered by a payment network server. Additionally or alternatively, the profile characteristic (or target user information) may be updated every time the user completes a transaction.

[0038] Purchasing behaviour of the target user may refer to the target user's attitude, preferences, intentions, and decisions regarding the target user's behaviour in a transaction when purchasing a product or service from the merchant. The purchasing behaviour of the target user may be influenced by the ambience data of the location of the target user (e.g. temperature of the day) and the profile characteristic of the target user (e.g. working adult in an office desk bound job). For example, the target user may decide to order a hot coffee on a work day that is rainy and having an ambient temperature of below 20 degrees Celsius.

[0039] A transaction database may refer to a database that stores historical transaction data associated with the profile characteristic of the target user. Examples of historical transaction data include ambience data, the type of product, an amount of the product, date and time of the transaction, location of a transaction that has been completed for a target user. The transaction database may also store the profile characteristic (or target user information) of the target user. Merchant data associated with the historical transaction may also be stored in the transaction database. Examples of merchant data include Merchant identity, Merchant

Name, Merchant Category Code / Industry Code, Industry Description, Merchant Country, Merchant Address, Merchant Postal Code and or other relevant information associated with the merchant.

Example Implementations

[0040] Embodiments of the present invention will be described, by way of example only, with reference to the drawings. Like reference numerals and characters in the drawings refer to like elements or equivalents.

[0041] Some portions of the description which follows are explicitly or implicitly presented in terms of algorithms and functional or symbolic representations of operations on data within a computer memory. These algorithmic descriptions and functional or symbolic representations are the means used by those skilled in the data processing arts to convey most effectively the substance of their work to others skilled in the art. An algorithm is here, and generally, conceived to be a self-consistent sequence of steps leading to a desired result. The steps are those requiring physical manipulations of physical quantities, such as electrical, magnetic or optical signals capable of being stored, transferred, combined, compared, and otherwise manipulated.

[0042] Unless specifically stated otherwise, and as apparent from the following, it will be appreciated that throughout the present disclosure, discussions utilizing terms such as “scanning”, “calculating”, “analysing”, “determining”, “replacing”, “generating”, “initializing”, “outputting”, “receiving”, “retrieving”, “identifying”, “predicting” or the like, refer to the action and processes of a computer system, or similar electronic device, that manipulates and transforms data represented as physical quantities within the computer system into other data similarly represented as physical quantities within the computer system or other information storage, transmission or display devices.

[0043] The present disclosure also describes a server for performing the operations of the methods. Such a server may be specially constructed for the required purposes, or may comprise a computer or other device selectively activated or reconfigured by a computer program stored in the computer. The algorithms and displays presented herein are not inherently related to any particular computer or other server. Various machines may be used

with programs in accordance with the teachings herein. Alternatively, the construction of more specialized server to perform the required method steps may be appropriate. The structure of a computer will appear from the description below.

[0044] In addition, the present disclosure also describes a computer program, as it would be apparent to the person skilled in the art that the individual steps of the method described herein may be put into effect by computer code. The computer program is not intended to be limited to any particular programming language and implementation thereof. It will be appreciated that a variety of programming languages and coding thereof may be used to implement the teachings of the disclosure contained herein. Moreover, the computer program is not intended to be limited to any particular control flow. There are many other variants of the computer program, which can use different control flows without departing from the spirit or scope of the invention.

[0045] Furthermore, one or more of the steps of the computer program may be performed in parallel rather than sequentially. Such a computer program may be stored on any computer readable medium. The computer readable medium may include storage devices such as magnetic or optical disks, memory chips, or other storage devices suitable for interfacing with a computer. The computer readable medium may also include a hard-wired medium such as exemplified in the Internet system, or wireless medium such as exemplified in the GSM mobile telephone system. The computer program when loaded and executed on such a computer effectively results in a server that implements the steps of the preferred method.

[0046] In embodiments of the present invention, use of the term ‘server’ may mean a single computing device or at least a computer network of interconnected computing devices which operate together to perform a particular function. In other words, the server may be contained within a single hardware unit or be distributed among several or many different hardware units.

[0047] Figure 1 shows a system 100 for predicting purchasing behaviour of a target user according to an example embodiment. The system 100 includes a payment network server 102 that is in communication with a user device 104, a merchant server 106, a plurality of sensors 108a-108c and a transaction database 110. The plurality of sensors 108a-108c may also be in communication with the user device 104.

[0048] The merchant server 106 is generally associated with a merchant who sells products (goods and/or services) to consumers. The merchant server 106 may be one that receives transaction requests from consumers for the purchase of a particular product. The merchant server 106 may have one or more computing devices that are used to establish communication with the payment network server 102 by exchanging messages with and/or passing information to the payment network server 102. The merchant server 106 may be in communication with the merchant via a respective fixed (wired) computing device or a wireless (portable) computing device, such as a handheld or portable or mobile device or a personal computer, a land-line telephone or an interactive voice response (IVR) system and the like. The mobile device may be a mobile phone, a laptop computer or a personal digital computer (PDA).

[0049] The payment network server 102 is a server that hosts software application programs for processing payment of a transaction request message. The payment network server 102 is a typical payment network server 102 that is used to process transaction request messages. The payment network server 102 communicates with a token server (if required), and any other servers (e.g., an issuer server 114, an acquirer server 112) to facilitate payment of transaction requests generated by the user device 104. Payment network servers may use a variety of different protocols and procedures in order to process the transaction requests. Transactions that may be performed via a payment network server 102 include product or service purchases, credit purchases, debit transactions, fund transfers, account withdrawals, etc. Payment network servers may be configured to process transactions via cash-substitutes, which may include payment cards, letters of credit, checks, payment accounts, etc. The payment network server 102 is operated by a service provider such as Mastercard. For example, the payment network server 102 may be the Banknet network operated by Mastercard. The service provider (e.g. Mastercard) may be an entity (e.g. a company or organization) who operates to process transactions, clear and settle funds for payments between two entities (e.g. two banks). The payment network server 102 may include one or more computing devices that are used for processing transactions. According to various embodiments, the payment network server 102 may manage all transactions to which the target user and the merchant are parties. The management functions that the payment network server 102 provides includes, but is not limited to, receiving a transaction request from the

target user via the user device 104, transmitting the transaction request to the merchant server 106 and settling the transaction.

[0050] The payment network server 102 may include a transaction database 110. The transaction database 110 stores data associated with the target user and historical transaction data. Examples of the historical transaction data include Transaction ID, Payment Amount, Type of Product, Name of Product, Buyer ID, Merchant ID, Merchant Name, Merchant Category Code / Industry Code, Buyer Country, Seller Country, Buyer Address and Postal Code, Seller Address and Postal Code and or other relevant information that is provided when a transaction is requested. For example, data (“Merchant Name” or “Merchant ID”) relating to the merchant, time and date for which the products/ services relating to the transaction will be delivered are included in the transaction database 110. In an embodiment, the payment network server 102 and the transaction database 110 may be one single hardware component while the user device 104, the merchant server 106 and the plurality of sensors 108a-108c are separate components. In other words, the transaction database 110 may be part of the payment network server 102 such that the payment network server 102 may retrieve data from the transaction database 110 with little or no disruption or delay. In yet another embodiment, the payment network server 102 may be part of a system which includes the merchant server 106, the user device 104, the transaction database 110 and the plurality of sensors 108a-108c. An exemplary payment network server 102 is shown in Figure 5.

[0051] The user device 104 may be a payment device that is typically associated with a target user (or consumer) who purchases the merchant’s product and initiates a transaction at the user device 104. The transaction may be a contactless transaction and the user device 104 may be a fixed (wired) computing device or a wireless (portable) computing device. In specific implementations, the user device 104 may be a handheld or portable or mobile device carried or used by the target user, or may refer to other types of electronic devices such as a personal computer, a land-line telephone or an interactive voice response (IVR) system and the like. The mobile device may be a device, such as a mobile phone, a laptop computer, a personal digital computer (PDA), a mobile computer, a portable music player (such as an iPod and the like).

[0052] The plurality of sensors 108a-108c may refer to instruments that measure and provide sensor data on environmental parameters at a location and/or parameters that indicate a state

of the location. Examples of such instruments may include but not limited to a thermometer, a global positioning satellite (GPS) device, a hygrometer (or humidity sensor), a sound level meter (or acoustic sensor), a pressure sensor, a gyroscope, an accelerometer, a magnetometer, a pedometer, a digital light sensor, a traffic monitoring closed circuit television and a rain gauge. Further, the parameters may also be obtained from non-instrumental sources such as weather forecast from meteorological stations, traffic condition from the local transport network and/or other relevant information indicating the state of a current location of the target user. In various embodiments below, the plurality of sensors 108a-108c may be part of the user device 104. For example, the user device 104 may be a smartphone which already includes an integrated thermometer (or a temperature sensor), a GPS sensor, an acoustic sensor, a gyroscope, an accelerometer, a pedometer, a digital light sensor, a weather forecast application and/or a traffic condition application.

[0053] The following discloses one implementation of the system 100 suitable for a method for predicting purchasing behaviour of a target user. The target user, who has a user device 104 such as a smartphone, arrives at a particular location. The payment network server 102 receives user identity data, whereby the user identity data includes a user identifier identifying a profile characteristic of the target user and/or location data identifying the location of the target user. More specifically, the payment network server 102 obtains the identity of the target user (e.g. name, address, age and gender) and his current location from the received user identifier. In an illustrative example, the target user, aged 45 and works as a data analyst, may arrive at his office in the morning and uses his office security card to gain access into the office. The target user's office security card may include identity data such as employee number, name, age, gender and position in the company. As the target user uses his office security card at his office, the office's access card reader transmits his identity data to the payment network server 102. At the same time, the payment network server 102 also receives location data from the office access card reader (or a sensor 108a) indicating that the target user is currently at his office.

[0054] Alternatively, the payment network server 102 may receive a facial image of the target user via a sensor 108b and determine the profile characteristic of the target user based on the facial image of the target user. The received facial image of the target may then be used by the payment network server 102 to predict the purchasing behaviour of

the target user. With reference to the above example, the office access reader (or a sensor 108a) may be a biometric system such as a facial recognition system. The target user gains access into his office using facial recognition and the facial recognition system takes a facial image of the target user using a camera. In this instance, one of the sensors 108a-c is a camera. The facial recognition system may include a facial recognition software which identifies that the target user is an employee of the company through the received facial image. Subsequently, the system transmits the facial image to the payment network server 102 whereby the payment network server 102 determines the profile characteristic of the target user such as his name, age and occupation. In an alternative embodiment, the facial recognition system may determine the target user's name, age and position in the company and transmit the information to the payment network server 102. In further embodiments, the office access reader may include other biometric devices such as a fingerprint sensor to identify the target user by scanning his fingerprints, a voice recognition system by receiving and recognizing an audio recording of the target user's voice and/or a retina scanner by scanning his eye retina.

[0055] The payment network server 102 may also receive sensor data from a plurality of sensors 108a-108c based on the location data. It can be appreciated that the payment network server 102 may receive sensor data from at least one of the plurality of sensors 108a-108c. While it is shown in Figure 1 that the payment network server 102 is configured to connect to a plurality of sensors 108a-108c, it can be appreciated that the payment network server 102 may be configured to connect to one sensor 108a. The sensor data may include ambience data associated with the location identified by the location data and the ambience data may represent a state of the location of the target user. The ambience data may further include a plurality of parameters such as but not limited to temperature, illumination, weather, humidity level, sound level and/or pressure. With reference to the above example, after the target user arrives at his office and the payment network server 102 receives the target user's identity data, profile characteristic and location data, the payment network server 102 further receives ambience data from various sensors located at his office. The various sensors may include a temperature sensor in the target user's office indicating that the air-conditioning in his office is at 18 Degrees Celsius, a humidity sensor (or a hygrometer) indicating that the humidity level is 70%, an acoustic sensor indicating that the noise level in his office is 5 Decibels (dB) and a weather forecast from the local meteorological indicating that the weather for the

day is cooling at 15 Degrees Celsius. Alternatively, the plurality of sensors 108a-108c such as the temperature sensor, the humidity sensor and the acoustic sensor may already be integrated with the user device 104 (e.g. the target user's smartphone) such that the payment network server 102 may receive the sensor data directly from the user device 104.

[0056] Thereafter, the payment network server 102 then calculates a weighted score for each of the plurality of parameters after receiving the sensor data. This may be done using a calculation module of the payment network server 102. The payment network server 102 then ranks each of the parameters of the sensor data according to their weighted scores and determines the state of the location of the target user based on the weighted score and rank. In the above example, the payment network server 102 may calculate the temperature in the target user's office has a weighted score of 7.0 out of 10, the weather forecast has a weighted score of 6.0 out of 10, the humidity level has a weighted score of 4.0 out of 10 and the noise level has a weighted score of 3.0 out of 10. The payment network server 102 then ranks the temperature and the day's weather forecast as the most important parameters and determines that the target user's current location is cold.

[0057] The payment network server 102 may then retrieve historical transaction data by querying the transaction database 110. The historical transaction data may include transactions (or past transactions) that were settled for a plurality of users having the profile characteristic of the target user. The historical transaction may include those that have been settled for the target user. The payment network server 102 subsequently predicts the purchasing behaviour of the target user based on the retrieved historical transaction data and the received sensor data. Continuing from the above example, after the payment network server 102 identifies the profile characteristic of the target user (age 45 and a data analyst) and the state of his location (i.e. cold in the office and throughout the day), the payment network server 102 queries the transaction database 110 to retrieve historical transaction data for past completed transactions of similar users who are approximately of age 45 and have a desk-bound job like a data analyst. An example of a historical transaction stored in the transaction database 110 may include a registered user, aged 44 and a desk-bound computer engineer who has previously ordered a hot latte on a cold morning. The payment network server 102 then predicts that the target user may purchase a hot coffee when he enters his office in the cold weekday morning of about 18 Degrees Celsius. This may initiate a message

to the target user such as “Do you want to buy a coffee?” and when he selects “Yes”, a transaction request message may be initiated.

[0058] The payment network server 102 may also determine a plurality of transactions to recommend to the target user based on the predicted purchasing behaviour of the target user. The payment network server 102 may do so by identifying a plurality of transaction amounts by querying the transaction database 110 which stores the transaction amounts corresponding to the plurality of historical transaction data, where each of the corresponding transaction amount may relate to an amount that the identified users have spent in each of a plurality of transaction categories. The payment network server 102 may then identify a corresponding transaction amount that the target user is likely to spend in each of the plurality of transaction categories based on the identified corresponding transaction amount of the identified users before recommending the plurality of transactions to the target user. Further to the above example, the payment network server 102 may not only recommend the target user to purchase a hot coffee when he enters the office, the payment network server 102 may also recommend him to purchase a cup of hot tea which is slightly cheaper based on the target user’s previous transactions of spending not more than \$3 for a cup of hot coffee. The payment network server 102 may also recommend the target user to purchase a hot sandwich of approximately \$3 instead of purchasing a hot beverage. In yet another embodiment, the payment network server 102 may also recommend the target user to purchase a jacket.

[0059] After the payment network server 102 determines the plurality of transactions to recommend to the target user, the payment network server 102 transmits the plurality of determined transactions to the target user via the user device 104. Thereafter, the payment network server 102 receives a transaction request from the user device 104, in which the transaction request may include one of the determined transaction selected by the target user. Referencing from the above example, the payment network server 102 transmits the recommendations of purchasing a hot coffee, a hot tea, a hot sandwich and a jacket to the target user via his smartphone when he enters his office on a cold weekday morning. The recommendations may be transmitted to the target user through a mobile application installed in his smartphone. The target user then chooses to purchase a regular-sized hot coffee costing \$3 through the mobile application which in turn sends the transaction request to the payment network server 102. It can be appreciated that the target user may select more than one of the recommendations provided. He may select to purchase the hot coffee together with the hot

sandwich and the payment network server 102 may thus receive two transaction requests. The plurality of determined transactions may also be transmitted to the user device 104 via a push notification. In other words, the plurality of determined transactions is automatically sent to the user device 104 without prompting or without being requested by the target user. In an embodiment, the push notification may be one in which a message may be displayed as a “pop-up” on the user device 104. The push notification may be accompanied with alert sounds and may also be sent with images and hypertext link in some cases.

[0060] After receiving the transaction request from the user device 104, the payment network server 102 transmits the transaction request to the merchant server 106 based on the selection by the target user. The merchant server 106 may then process the transaction request by forwarding it in order to obtain an amount of the product from an account of the target user (not shown). The transaction request includes details of a target user amount to be used for completing the transaction. The transaction request may be processed by executing the steps for clearing a transaction request. This may include the merchant server 106 notifying an acquirer server 112 which is associated with the merchant of the transaction request. The acquirer server 112 typically is associated with a corresponding acquirer and may include one or more computing devices that are used to perform a payment transaction (or a transaction). The acquirer may be an entity (e.g. a bank company or organization) which issues (e.g. establishes, manages, administers) a transaction credential or an account (e.g. a financial bank account) of the merchant. The acquirer server 112 notifies an issuer server 114 who manages an account of the target user to deduct an amount corresponding to the product to be purchased. The issuer server 114 is generally associated and managed by an issuer which is an entity (e.g. a company or organization) which issues (e.g. establishes, manages, administers) a transaction credential or an account (e.g. a financial bank account) of the target user. The issuer server 112 may have one or more computing devices that are used to establish communication with the payment network server 102 by exchanging messages with and/or passing information to the payment network server 102. The issuer server 114 transmits an authorization request to the target user who in turn signals their approval of the deduction, which causes the issuer server 114 to generate an authorisation of payment to the acquirer server 112. This approval triggers a payment sequence to effect payment from the issuer server 114 to the acquirer server 112.

[0061] After the successful deduction of the amount from the target user's account, the merchant server 106 transmits a transaction completion message to the payment network server 102 to indicate settlement of the transaction. The payment network server 102 then updates the historical transaction data corresponding to the profile characteristic of the target user in the transaction database 110, in response to a receipt of the transaction completion message.

[0062] Further referencing the above example, the target user selects to purchase the \$3 regular-sized hot coffee via the mobile application installed in his smartphone. The mobile application transmits a transaction request for purchasing the regular-sized hot coffee to the payment network server 102. The payment network server 102 then transmits the transaction request to merchant A, which is a café that sells hot coffee. Merchant A receives the transaction request and proceeds to deduct \$3 from the target user's account. Upon the successful deduction of the amount, merchant A transmits the transaction completion message to the payment network server 102 to indicate that the transaction is successful. The transaction completion message may also include information that the amount of \$3 has been successfully deducted and that the regular-sized hot coffee will be delivered to the target user within the next hour. The payment network server 102 then updates the transaction database 110 that the target user, having the profile characteristic of age 45 and a desk-bound job, has paid for a \$3 regular-sized hot coffee in a cold weekday morning when he enters his office at 830am.

[0063] Figures 2A to 2B show a flow chart 200 of a method for predicting purchasing behaviour of a target user using the system 100 of Figure 1 according to an example embodiment.

[0064] At step 202, a target user arrives at a location. At step 204, the payment network server 102 receives user identity data, the user identity data comprising a user identifier identifying a profile characteristic of the target user and location data identifying a location of the target user. The user identity data may be received via a biometric device using at least one of facial recognition, voice recognition or retina scanner. At step 206, the payment network server 102 receives sensor data based on the location data from a plurality of sensors 108a-108c, the sensor data comprising ambience data associated with the location identified by the location data, the ambience data representing a state of the

location of the target user. The ambience data may include a plurality of parameters such as temperature, illumination, weather, humidity level, sound level and/or pressure.

[0065] At step 208, the payment network server 102 calculates a weighted score for each of the plurality of parameters after receiving the sensor data. At step 210, the payment network server 102 determines the state of the location of the target user based on the weighted score for each of the plurality of parameters. At step 212, the payment network server 102 retrieves historical transaction data by querying a transaction database 110, the historical transaction data including transactions settled for a plurality of users having the profile characteristic of the target user. At step 214, the payment network server 102 predicts the purchasing behaviour of the target user based on the retrieved historical transaction data and the received sensor data. At step 216, the payment network server 102 determines a plurality of transactions to recommend to the target user based on the predicted purchasing behaviour of the target user. The plurality of transactions may also be determined by i) identifying a plurality of transaction amounts by querying the transaction database 110 having stored thereon the transaction amounts corresponding to the plurality of historical transaction data, each of the corresponding transaction amount relating to an amount that the identified users have spent in each of a plurality of transaction categories; and ii) identifying a corresponding transaction amount that the target user is likely to spend in each of the plurality of transaction categories based on the identified corresponding transaction amount of the identified users.

[0066] Figure 2B continues from step 216 of Figure 2A. At step 218, the payment network server 102 transmits the plurality of determined transactions to the target user via a user device 104. The plurality of determined transactions may be transmitted to the user device 104 via a push notification. At step 220, the target user selects one or more of the plurality of determined transactions via the user device 104. At step 222, the payment network server 102 receives a transaction request from the user device 104, the transaction request including one or more of the determined transactions selected by the target user. At step 224, the payment network server 102 transmits the transaction request to a merchant server 106 based on the selection by the target user. At step 226, the payment network server 102 receives a transaction completion message to indicate completion of the transaction from the merchant server 106. At step 228, the payment network server 102 updates the historical transaction

data corresponding to the profile characteristic of the target user in response to a receipt of the transaction completion message in the transaction database 110.

[0067] Figure 3A shows a schematic diagram 300 illustrating the flow of information between various entities for predicting purchasing behaviour of a target user based on the method of Figures 2A to 2B according to an example embodiment. In the Figure 3A, a system 302 for predicting purchasing behaviour of a target user is shown. The system 302 includes an ambient server 304, a database 306 and a determination engine 308. In various embodiments, the system 302 may represent the payment network server 102 of Figure 1. The database 306 and the determination engine 308 may be in communication with the ambient server 304. The ambient server 304 may be administered and accessed by an administrative server 330 directly or indirectly. In an embodiment, the administrative server 330 may directly determine the rules of the ambient server 304 and retrieve information handled by the ambient server 304. Alternatively, the administrative server 330 may indirectly administer the ambient server 304 using an application program interface. The determination engine 308 may include an Artificial Intelligence (AI) algorithm that is configured to predict the purchasing behaviour of the target user and retrieve information stored in the database 306. The ambient server 304 is further in communication with a service device 312 which in turn is in communication with an ambient sensor 314 via WiFi. The ambient sensor 314 may be an instrument that measures and provide ambience data on environmental parameters at a location. Examples of the ambient sensor 314 may include but not limited to a thermometer, a global positioning satellite (GPS) device, a hygrometer (or humidity sensor), a sound level meter (or acoustic sensor), a pressure sensor, a gyroscope, an accelerometer, a magnetometer, a pedometer, a digital light sensor, a traffic monitoring closed circuit television and a rain gauge. The service device 312 may be a device where the ambient sensor 314 is installed, e.g. a smartphone having a pedometer installed thereon, such that the ambient sensor 314 may transmit ambience data such as temperature and illumination to the ambient server 304 via the service device 312.

[0068] The ambient server 304 may also be in communication with an external server 316 such as a weather service provider that transmits weather data (e.g. cloudy, rainy or sunny) to the ambient server 304. The external server 316 may also be linked to the local transport network such that the current traffic condition may be transmitted to the ambient server 304. The ambient server 304 may also receive user identity data from the target user via a camera

320. In this case, the user identity data may include a facial image of the target user taken by the camera 320. The facial image may then be transmitted from the camera 320 to a face detection software that is installed on a face detection device 322. The face detection software may be configured to identify the name of the target user from the facial image and the face detection device 322 subsequently transmits the facial image and target user name to the ambient server 304. Alternatively, the ambient server 304 may also receive user identity data from the target user via a card reader 324 when he uses his card 326. The card reader 324 and the face detection device 322 may be part of an access control system whereby access to an area (e.g. office) or access to workstations are restricted to authorized personnel. In this case, the card reader 324 and the face detection device 322 may authenticate the target user based on the received identity data from the card 326 and the facial image from the camera 320. It can be appreciated that the user identity data may be received via both the face detection device 322 and the card reader 324 for additional security purposes.

[0069] In addition, the ambient server 304 may be in communication with a mobile application 328 that may be installed on a user device (not shown), such as the user device 104 of Figure 1. The ambient server 304 may receive user identity data from the mobile application 328 during an initial registration step 346 and a subscription step 348 by the target user. The ambient server 304 may also recommend a plurality of transactions to the target user via a push service 350 to the mobile application 328.

[0070] Figure 3B shows a schematic diagram 350 illustrating the flow of information for predicting purchasing behaviour of a target user based on the method of Figures 2A to 2B according to an example embodiment. A sensor data aggregator 332 receives sensor data from a plurality of sensors 338 located at a location of the target user and user identity data from an access card of the target user. In an embodiment, the sensor data aggregator 332 is configured to aggregate a weighted score based on the parameters that it has received. The plurality of sensors 338 may include but not limited to an accelerometer, a gyroscope, a magnetometer, a humidity sensor, a pressure sensor, a temperature sensor, an acoustic sensor, a pedometer, an illumination sensor and/or a digital light sensor. The sensor data aggregator 332 may represent the payment network server 102 of Figure 1 as both operate with similar functions. The sensor data aggregator 332 transmits an event (or the state of the location of the target user) to a determination engine 308. The sensor data aggregator 332 may also write the sensor data and the user identity data into a database 334. The determination engine 308

may be one that includes an Artificial Intelligence (AI) algorithm which determines a plurality of transactions to be sent to the merchant server 106. The determination engine 308 may also read (or retrieve) historical data from the database 334 and may also predict the purchasing behaviour of the target user based on the received sensor data, received user identity data, aggregated weighted score and retrieved historical data. For example, when the target user arrives at his office, the determination engine 308 receives the current temperature of the target user's office from the sensor data aggregator 332. The determination engine 308 recommends the target user to purchase a cup of hot coffee if the current temperature exceeds a predetermined temperature of 17 Degrees Celsius. Otherwise, the determination engine 308 does not recommend the target user to buy coffee but recommends him to buy a soft drink. In another example, the determination engine 308 receives sensor data indicating that the target user has just left his office at 830pm. The determination engine 308 recommends the target user to call a cab to his favourite club after retrieving his historical data and predicts that the target user may proceed to his favourite club when he leaves his office after 8pm. After predicting the purchasing behaviour of the target user, the determination engine 308 triggers a transaction request to a merchant server 106. After completion of the transaction, the merchant server 106 may send a notification to a registered user device 344 to notify the target user that the transaction is successful.

[0071] Figure 3C shows a schematic diagram 380 illustrating the flow of information between various entities for predicting purchasing behaviour of a target user based on the method of Figures 2A to 2B according to an example embodiment. Figure 3C is identical to Figure 3A except for the inclusion of the merchant server 106 of Figure 1 and Figure 3B and a merchant 346. In this Figure, the ambient server 304 is in communication with the merchant server 106 such that a transaction request is transmitted to the merchant 346 via the merchant server 106 upon a selection of a transaction by the target user. The merchant 346 then processes the transaction request and transmits a transaction completion message to the ambient server 304 to indicate settlement of the transaction upon the successful deduction of a transaction amount corresponding to the transaction request. In alternative embodiments, the merchant server 106 may be in communication with a plurality of merchants (not shown) such that a plurality of transaction requests may be transmitted to the various merchants. For example, the plurality of transaction requests may include purchasing a hot chocolate, a hot coffee, a hot tea and a hot sandwich. The merchant server 106 may then send each of the

transaction requests to the various merchants, i.e. a merchant selling hot chocolate, a merchant selling hot coffee, a merchant selling hot tea and a merchant selling hot sandwich.

[0072] Figure 4 shows a flow chart 400 of a method for determining a transaction to be recommended to the target user according to an example embodiment. At step 402, the payment network server 102 receives a user identity from an access card reader. At step 404, the payment network server 102 retrieves user preferences from the transaction database 110 based on the received user identity. At step 406, the payment network server 102 receives temperature data from a temperature sensor. At step 408, the payment network server 102 predicts the purchasing behaviour based on the received temperature data and the retrieved user preference. At step 410, the payment network server 102 determines and recommends a transaction to purchase a cold drink to the target user. On the other hand, if the payment network server 102 determines that the target user does not require a cold drink, it recommends a hot coffee to the target user as shown at step 412.

[0073] Figure 5 shows a schematic diagram of a computer system 500 suitable for use in executing the method depicted in Figures 2A to 2B, according to an example embodiment. The following description of the computing device 500 is provided by way of example only and is not intended to be limiting.

[0074] As shown in Figure 5, the example computing device 500 includes a processor 504 for executing software routines. Although a single processor is shown for the sake of clarity, the computing device 500 may also include a multi-processor system. The processor 504 is connected to a communication infrastructure 506 for communication with other components of the computing device 500. The communication infrastructure 506 may include, for example, a communications bus, cross-bar, or network.

[0075] The computing device 500 further includes a main memory 508, such as a random access memory (RAM), and a secondary memory 510. The secondary memory 510 may include, for example, a storage drive 512, which may be a hard disk drive, a solid state drive or a hybrid drive and/or a removable storage drive 514, which may include a magnetic tape drive, an optical disk drive, a solid state storage drive (such as a USB flash drive, a flash memory device, a solid state drive or a memory card), or the like. The removable storage drive 514 reads from and/or writes to a removable storage medium 518 in a well-known

manner. The removable storage medium 518 may include magnetic tape, optical disk, non-volatile memory storage medium, or the like, which is read by and written to by removable storage drive 514. As will be appreciated by persons skilled in the relevant art(s), the removable storage medium 518 includes a computer readable storage medium having stored therein computer executable program code instructions and/or data.

[0076] In an alternative implementation, the secondary memory 510 may additionally or alternatively include other similar means for allowing computer programs or other instructions to be loaded into the computing device 500. Such means can include, for example, a removable storage unit 522 and an interface 520. Examples of a removable storage unit 522 and interface 520 include a program cartridge and cartridge interface (such as that found in video game console devices), a removable memory chip (such as an EPROM or PROM) and associated socket, a removable solid state storage drive (such as a USB flash drive, a flash memory device, a solid state drive or a memory card), and other removable storage units 522 and interfaces 520 which allow software and data to be transferred from the removable storage unit 522 to the computer system 500.

[0077] The computing device 500 also includes at least one communication interface 524. The communication interface 524 allows software and data to be transferred between computing device 500 and external devices via a communication path 526. In various embodiments of the inventions, the communication interface 524 permits data to be transferred between the computing device 500 and a data communication network, such as a public data or private data communication network. The communication interface 524 may be used to exchange data between different computing devices 500 which such computing devices 500 form part an interconnected computer network. Examples of a communication interface 524 can include a modem, a network interface (such as an Ethernet card), a communication port (such as a serial, parallel, printer, GPIB, IEEE 1394, RJ45, USB), an antenna with associated circuitry and the like. The communication interface 524 may be wired or may be wireless. Software and data transferred via the communication interface 524 are in the form of signals which can be electronic, electromagnetic, optical or other signals capable of being received by communication interface 524. These signals are provided to the communication interface via the communication path 526.

[0078] As shown in Figure 5, the computing device 500 further includes a display interface 502 which performs operations for rendering images to an associated display 530 and an audio interface 532 for performing operations for playing audio content via associated speaker(s) 534.

[0079] As used herein, the term "computer program product" may refer, in part, to removable storage medium 518, removable storage unit 522, a hard disk installed in storage drive 512, or a carrier wave carrying software over communication path 526 (wireless link or cable) to communication interface 524. Computer readable storage media refers to any non-transitory, non-volatile tangible storage medium that provides recorded instructions and/or data to the computing device 500 for execution and/or processing. Examples of such storage media include magnetic tape, CD-ROM, DVD, Blu-ray™ Disc, a hard disk drive, a ROM or integrated circuit, a solid state storage drive (such as a USB flash drive, a flash memory device, a solid state drive or a memory card), a hybrid drive, a magneto-optical disk, or a computer readable card such as a PCMCIA card and the like, whether or not such devices are internal or external of the computing device 500. Examples of transitory or non-tangible computer readable transmission media that may also participate in the provision of software, application programs, instructions and/or data to the computing device 500 include radio or infra-red transmission channels as well as a network connection to another computer or networked device, and the Internet or Intranets including e-mail transmissions and information recorded on Websites and the like.

[0080] The computer programs (also called computer program code) are stored in main memory 508 and/or secondary memory 510. Computer programs can also be received via the communication interface 524. Such computer programs, when executed, enable the computing device 500 to perform one or more features of embodiments discussed herein. In various embodiments, the computer programs, when executed, enable the processor 504 to perform features of the above-described embodiments. Accordingly, such computer programs represent controllers of the computer system 500.

[0081] Software may be stored in a computer program product and loaded into the computing device 500 using the removable storage drive 514, the storage drive 512, or the interface 520. The computer program product may be a non-transitory computer readable medium. Alternatively, the computer program product may be downloaded to the computer system 500

over the communications path 526. The software, when executed by the processor 504, causes the computing device 500 to perform functions of embodiments described herein.

[0082] It is to be understood that the embodiment of Figure 5 is presented merely by way of example. Therefore, in some embodiments one or more features of the computing device 500 may be omitted. Also, in some embodiments, one or more features of the computing device 500 may be combined together. Additionally, in some embodiments, one or more features of the computing device 500 may be split into one or more component parts. The main memory 508 and/or the secondary memory 510 may serve(s) as the memory for the payment network server 102; while the processor 504 may serve as the processor of the payment network server 102.

[0083] It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. For example, the above description mainly discusses the use of a Bluetooth connection, but it will be appreciated that another type of secure wireless connection, such as Wi-Fi, can be used in alternate embodiments to implement the method. Some modifications, e.g. adding an access point, changing the log-in routine, etc. may be considered and incorporated. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

[0084] Figure 6 shows a schematic diagram 600 of functional modules present in the payment network server 102 of Figure 1, according to an example embodiment. The payment network server 102 may include a processor 602, a memory 604, a database module 606, a transaction module 608, a user device module 610, a merchant server module 612, an Artificial Intelligence (AI) module 614, a sensor module 616 and a calculation module 618. Each of the memory 604, the database module 606, the transaction module 608, the user device module 610, the merchant server module 612, the Artificial Intelligence (AI) module 614, the sensor module 616 and the calculation module 618 is coupled to the processor 602, so that their respective operations can be controlled by the processor 602. The memory 604 stores computer program code that the processor 602 compiles to have each of the database module 606, the transaction module 608, the user device module 610, the merchant server module 612, the Artificial

Intelligence (AI) module 614, the sensor module 616 and the calculation module 618 perform their respective functions. Each of the database module 606, the transaction module 608, the user device module 610, the merchant server module 612, the Artificial Intelligence (AI) module 614, the sensor module 616 and the calculation module 618 can be implemented using one or more processors present in the payment network server 102. With reference to Figure 1, the database module 606 is configured to update and retrieve historical transaction data including transactions settled for the plurality of users having the profile characteristic of the target user. The transaction module 608 is configured to process transaction requests received from the target user while the user device module 610 is configured to transmit the plurality of determined transactions to the user device 104. The merchant server module 612 is configured to transmit the transaction request to the merchant server 106 and receive the transaction completion message from the merchant server 106. The Artificial Intelligence (AI) module 614 is configured to store an AI for predicting the purchasing behavior of the target user while the sensor module 616 is configured to receive sensor data from the plurality of sensors 108a-108c. The calculation module 618 is configured to calculate (or aggregate) a weighted score based on the received parameters (or sensor data).

[0085] Advantageously, embodiments of the present invention may provide a platform for initiating ambient commerce which may provide new services and personalized commerce solutions to merchants and consumers. It may also bridge the gap between merchants and consumers by developing a positive relationship that can increase revenues for merchants and advertisers.

Use Case Examples

[0086] Some examples of use case of the system 100 will now be described. These examples are illustrative and not restrictive.

First Use Case of the System 100

[0087] In the first use case, the user (or target user) is a Sales Manager aged 45 and a gadget savvy person. He likes to use new technology and services that comes into the market. He is

very health conscious and likes to spend some time in the gym. His working hours is from 9 am - 6pm, and prefers to travel using ride-sharing transportation. He frequently orders his food online and usually visits clubs with his friends after a day's work. He has a girlfriend but he usually forgets her birthday.

[0088] The user may register himself to the payment network server 102 via a mobile application installed in a user device 104 such as his smartphone. He may provide user identity data and preferences such as name, address, age, gender, a photograph, place of birth, contact number, date of birth, occupation, credit card details, shoe size, a preference for a specific brand of shoes, a preference to purchase protein powder, a preference for using ride-sharing transportation and a preference for eating pizza during registration. Further, he has also signed in to the mobile application after his registration.

[0089] In this example, the user wakes up in the morning and goes for a walk. He brings along his smartphone which tracks the number of steps he has taken using a pedometer that is installed in the smartphone. During his walk, the pedometer tracks that the total number of steps the user has taken this year has exceeded a pre-determined threshold. The pedometer transmits this data to the payment network server 102 which in turn recognizes that the user's shoes may be worn. The payment network server 102 predicts the user may wish to purchase a new pair of shoes based on the pedometer data and preference data previously provided.

[0090] The payment network server 102 further transmits a push notification via the mobile application in the user's smartphone to ask if he would like to purchase a new pair of shoes of his preferred brand. The user looks at his shoes and realizes that indeed they have worn off. He indicates "Yes" in the mobile application and the payment network server 102 transmits a purchase request of the new pair of shoes to a shoe merchant via the merchant server 106. The shoe merchant receives the purchase request and proceeds to deduct the corresponding amount of the shoes from the user's account. After the successful deduction, the merchant server 106 transmits a transaction completion message to the payment network server 102 to indicate that the transaction is settled. The payment network server 102 subsequently transmits a notification message to the user via the user device 104 to notify that the purchase of the new shoes is completed and will arrive in two days.

Second Use Case of the System 100

[0091] In this example, the user opens his refrigerator in the evening and an illumination sensor, which may be installed in his smartphone, detects that the refrigerator door is open due to higher illumination. The illumination data and time data are transmitted to the payment network server 102 which in turn recognizes that the user has just opened his refrigerator in the evening. The payment network server 102 predicts the user may wish to purchase food, drinks or protein powder.

[0092] The payment network server 102 further transmits a push notification via the mobile application in the user's smartphone to ask if he would like to purchase pizza for dinner, to purchase drinks and/or to purchase protein powder. The user looks at his refrigerator and realizes that his refrigerator is empty. He indicates "Yes" in the mobile application to purchase pizza for dinner and to purchase protein powder. The payment network server 102 transmits two purchase requests, one for purchasing the pizza to a pizza restaurant and the other for purchasing a tub of protein powder, via the merchant server 106. After receiving the purchasing requests and the successful deduction of the corresponding amount, the merchant server 106 transmits a transaction completion message to the payment network server 102 to indicate that the transactions are settled. The payment network server 102 subsequently transmits a notification message to the user via the user device 104 to notify that the purchase of the pizza and the tub of protein powder is completed and will arrive to his house in approximately two hours.

Third Use Case of the System 100

[0093] In this example, the user finishes his work at 6pm and taps his office access card at an access card reader to exit his office. The office access card reader transmits user identity data, location data and time data to the payment network server 102, which in turn recognizes that the user has just left his office at 6pm. The payment network server 102 predicts the user may wish to hire a ride-sharing transport to meet his friends.

[0094] The payment network server 102 further transmits a push notification via the mobile application in the user's smartphone to ask if he would like to call for a ride-sharing

transport. As the user has arranged to meet his friends, he indicates “Yes” in the mobile application to call for the ride-share. The payment network server 102 transmits a purchase request to the ride-share company to call for a ride from the user’s office. The ride-share company receives the purchasing request transmits a notification message to the payment network server 102 to indicate that a ride-share company driver is on his way and will arrive in ten minutes. The payment network server 102 subsequently notifies the user via the mobile application that the ride-share company driver and will arrive at his office in approximately ten minutes.

[0095] The foregoing describes only some embodiments of the present invention, and modifications and/or changes can be made thereto without departing from the scope and spirit of the invention, the embodiments being illustrative and not restrictive.

CLAIMS

What is claimed is:

1. A system for predicting purchasing behaviour of a target user, the system comprising:
 - a server having at least one processor and
 - at least one memory including computer program code,
 - the at least one memory and the computer program code configured to, with the at least one processor, cause the server at least to:
 - receive user identity data, the user identity data comprising a user identifier identifying a profile characteristic of the target user and/or location data identifying a location of the target user;
 - receive, from at least one sensor device, sensor data based on the location data, the sensor data comprising ambience data associated with the location identified by the location data, the ambience data representing a state of the location of the target user;
 - retrieve historical transaction data by querying a transaction database, the historical transaction data including transactions settled for a plurality of users having the profile characteristic of the target user; and
 - predict the purchasing behaviour of the target user based on the retrieved historical transaction data and the received sensor data.
2. The system of claim 1, wherein the ambience data further comprises a plurality of parameters and the server is further configured to:
 - calculate a weighted score for each of the plurality of parameters after receiving the sensor data; and
 - determine the state of the location of the target user based on the weighted score for each of the plurality of parameters.
3. The system of claim 1 or 2, wherein the server is further configured to:
 - determine a plurality of transactions to recommend to the target user based on the predicted purchasing behaviour of the target user; and

transmit, via a user device, the plurality of determined transactions to the target user.

4. The system of claim 3, wherein the server is further configured to:
 - identify a plurality of transaction amounts by querying the transaction database having stored thereon the transaction amounts corresponding to the plurality of historical transaction data, each of the corresponding transaction amount relating to an amount that the identified users have spent in each of a plurality of transaction categories; and
 - identify a corresponding transaction amount that the target user is likely to spend in each of the plurality of transaction categories based on the identified corresponding transaction amount of the identified users;
 - wherein the determination of the plurality of transactions to recommend is based on the identified transaction amount.
5. The system of claim 4, wherein the server is further configured to:
 - receive, from the user device, a transaction request, the transaction request including one of the determined transaction selected by the target user.
6. The system of claim 5, wherein the server is further configured to, after predicting the purchasing behaviour of the target user:
 - transmit the transaction request to a merchant server based on the selection by the target user;
 - receive, from the merchant server, a transaction completion message to indicate settlement of the transaction; and
 - update, in the transaction database, the historical transaction data corresponding to the profile characteristic of the target user in response to a receipt of the transaction completion message.
7. The system of claim 3, wherein the server is further configured to transmit the plurality of determined transactions to the target user via a push notification.
8. The system of claim 2, wherein the plurality of parameters comprises at least one of temperature, illumination, weather, humidity level, sound level and/or pressure.

9. The system of any one of the preceding claims, wherein the server is further configured to:
- receive a facial image of the target user; and
 - determine the profile characteristic of the target user based on the facial image of the target user.
10. The system of claim 9, wherein the server is further configured to predict the purchasing behaviour of the target user based on the received facial image.
11. A computer-implemented method for predicting purchasing behaviour of a target user, the method comprising:
- receiving user identity data, the user identity data comprising a user identifier identifying a profile characteristic of the target user and location data identifying a location of the target user;
 - receiving, from at least one sensor device, sensor data based on the location data, the sensor data comprising ambience data associated with the location identified by the location data, the ambience data representing a state of the location of the target user;
 - retrieving historical transaction data by querying a transaction database, the historical transaction data including transactions settled for a plurality of users having the profile characteristic of the target user; and
 - predicting the purchasing behaviour of the target user based on the retrieved historical transaction data and the received sensor data.
12. The method of claim 11, wherein the ambience data further comprises a plurality of parameters, the method further comprising:
- calculating a weighted score for each of the plurality of parameters after receiving the sensor data; and
 - determining the state of the location of the target user based on the weighted score for each of the plurality of parameters.

13. The method of claim 11 or 12, the method further comprising:
 - determining a plurality of transactions to recommend to the target user based on the predicted purchasing behaviour of the target user; and
 - transmitting, via a target user device, the plurality of determined transactions to the target user.
14. The method of claim 13, the method further comprising:
 - receiving, from the target user device, a transaction request, the transaction request including one of the determined transaction selected by the target user.
15. The method of any one of claims 11 to 14, the method further comprising:
 - identifying a plurality of transaction amounts by querying the transaction database having stored thereon the transaction amounts corresponding to the plurality of historical transaction data, each of the corresponding transaction amount relating to an amount that the identified users have spent in each of a plurality of transaction categories; and
 - identifying a corresponding transaction amount that the target user is likely to spend in each of the plurality of transaction categories based on the identified corresponding transaction amount of the identified users;
 - wherein determining the plurality of transactions to recommend is based on the identified transaction amount.
16. The method of claim 13, the method further comprising:
 - after predicting the purchasing behaviour of the target user,
 - transmitting a transaction request to a merchant server based on the selection by the target user;
 - receiving, from the merchant server, a transaction completion message to indicate settlement of the transaction; and
 - updating, in the transaction database, the historical transaction data corresponding to the profile characteristic of the target user in response to a receipt of the transaction completion message.

17. The method of claim 13, wherein the step of transmitting the plurality of determined transactions to the target user comprises transmitting via a push notification.
18. The method of claim 12, wherein the plurality of parameters comprises at least one of temperature, illumination, weather, humidity level, sound level and/or pressure.
19. The method of any one of claims 11 to 19, wherein the step of identifying the profile characteristic of the target user comprises:
 - receiving a facial image of the target user; and
 - determining the profile characteristic of the target user based on the facial image of the target user.
20. The method of claim 19, wherein the step of predicting the purchasing behaviour of the target user is based on the received facial image.