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AUTOMATIC BEVERAGE ATTENDANT

[0001] The present application relates to an automatic beverage attendant. The application also relates one or more methods for making, assembling, disassembling, installing, configuring, maintaining, repairing and using the automatic beverage attendant.

[0002] The present application relates to an automatic beverage attendant, such as an automatic coffee machine or automatic coffee server. Coffee houses, cafés, bars, restaurants, canteens or clubs are places where coffees, alcohols or other diverse types of beverages are often served. For example, a coffee house is conventionally seen as a place of relaxation or social gathering. Often, a customer enters the coffee house and takes a seat, whilst a server or waiter will take an order of coffee from the customer. The order of coffee is then conveyed to a workstation where another worker known as a barista will prepare the coffee to fulfil the order. After which, the prepared order of coffee is served by the server to the customer. When the customer is done, the server is summoned to serve the bill to make a payment. Some coffeehouses even take a step further by demanding the customer to place the order by joining a queue before finding the seat. Again in the latter coffeehouses, there is usually one person who is the cashier taking the order and receiving payment. The barista then receives the order and prepares the order who then serves the customer in the queue. Noting that in the two types of coffee houses as described, there are at least two service crew attending to the one customer at any given time, which is laborious to the coffee houses. Also, the quality of the coffee served is difficult to be kept with high quality consistently because an experienced barista is difficult to find and keep. After all, the barista is also a human with emotions and may not be in the best of moods daily or may fall sick. Even though, a recipe for preparing a good coffee is provided, consistency of following the recipe on making the coffee is still questionable. Furthermore, the coffee houses also do not have the capability to acquire information of all visiting customers which make customer profiling a challenge. In fact, coffee houses do not have accurate or detailed information on customers' preference or profiles. Normally, the server would not ask the customers for personal details and is sometimes considered intrusive. Therefore, it is the object of the present application to address the above mentioned issues with an automatic beverage attendant.

[0003] The present application aims to provide one or more new and useful automatic beverage attendants. The present application further aims to provide one or more new and useful methods for making, assembling, disassembling, installing, configuring, maintaining, repairing and using the one or more automatic beverage attendants. Essential features of the application are provided by one or more independent claims, whilst advantageous features are presented by their dependent claims respectively.

[0004] According to an aspect, the present application provides an automatic beverage attendant for dispensing a consistent quality coffee. The automatic beverage attendant comprises a customer terminal for a customer to place an order and make payment; a POS (Point of Sale) terminal for a staff to perform operations relating to the automatic coffee machine; and a coffee maker for fulfilling the order. The customer terminal and the coffee maker is communicatively connected to the POS terminal providing consistent quality coffee with no human intervention and tracks customers' preferences by storing related information in a storage means.

[0005] The POS terminal is also known as an AIBoss (a capital "a" and a capital "i") which oversees the overall operation of the automatic coffee machine. The POS terminal is possibly managed by a human staff or staff which has access rights thereto. Through the POS terminal, the human staff is able to control the coffee maker and the customer terminal if given permission by someone with higher authority like a supervisor or a manager. In other words, the staff can have different levels of access depending on roles and responsibilities.

[0006] The coffee maker comprises a robot for conveying one or more containers that contain one or more types of beverages; a beverage unit for containing at least one ingredient for making the beverage; a container unit for storing a plurality of the containers; and a dispenser unit for discharging the at least one ingredient into the container.

[0007] The coffee maker is optionally controlled by the POS terminal received instruction therefrom to produce the beverage. The beverage unit itself contains a plurality of ingredient. The ingredient can be a liquid or a solid form. The liquid can be an orange juice, an apple juice or a cordial, an alcohol, and a milk. The solid can be coffee powder, coffee beans and tea leaves in sachets. The container unit provides a storage of different

kinds of cups or receptacles. The customer has the option to choose what container he or she desires. The staff can place ornamental or commemorative cups in the container unit for special occasions to increase sales. Some of the material of the cups include plastic, paper, metal or glass. The dispenser unit which comprises a conduit, a pump and a valve provides the discharging of the ingredients into the container either pre-mixed before discharging or post-mixed after discharging.

[0008] The POS terminal and/or the customer terminal further having a plurality of peripherals each comprises a microphone for receiving an audio signal; a camera for receiving an image; a tactile display screen for receiving a haptic input from a finger; a speaker for projecting an audible signal; a reader for receiving a detail from an external device (smart card, mobile phone) belonging to the customer or the staff; and a processor for connecting and controlling the mentioned peripherals. Advantages of separating the POS terminal and the customer terminal is firstly, security. The transactions performed on the customer terminal is solely confined thereto. Similarly, for the POS terminal. Secondly, it provides faster and ease of maintenance, upgrading hardware or software (Operating System, BIOS) of the automatic coffee machine. If the customer terminal is down, a replacement customer terminal can be deployed in a short time.

[0009] The POS terminal is capable to control more than one customer terminal. Therefore, the POS terminal demands a better hardware which provides faster throughput between the terminals in terms of processing speed and stability compare to the customer terminal.

[0010] Alternatively, the POS terminal and the customer terminal can exist in a terminal since both share the same hardware. An access card for the staff is used to differentiate between the staff access and the customer access.

[0011] The storage means comprises a cloud server which is communicatively connected to the POS terminal and/or to the customer terminal for transmitting and receiving of data relating to the customer(s) and the operations of the automatic coffee machine. The storage means may also comprise a hard disk drive that is residing within the POS terminal and the customer terminal. The hard disk drive stores data that is frequently accessed by the POS terminal and the customer terminal. Data may include frequent visited customer, items on offer, prices of items, recipe of beverages and so on.

[0012] The automatic coffee machine is either remotely controlled via the cloud server or locally controlled by the POS terminal through wired and wireless connections. An authorized staff who is remotely accessing the POS terminal has the rights to operate the automatic coffee machine. The purpose of the remote access is to perform a diagnostic or maintenance of the automatic coffee machine or to update the recipe. The authorized staff can do the tasks on site as well by downloading the relevant data from the remote cloud server.

[0013] The robot of the coffee maker comprises an anthropomorphic robotic arm with a plurality of end effector. The end effector comprises a suction means and a plurality of dexterous digit. There is also a robotic camera attached on the anthropomorphic robotic arm for monitoring the process of conveying the cup of beverage from the dispensing unit to the customer. In the event of a dispute, the video footage can be play backed.

[0014] The beverage unit may comprise processed water (hot, tepid or cold), coffee powder, tea leaves in sachets, juices, alcohol and dairy (low fat milk, skim milk, full milk) for different concoction of beverages.

[0015] The dispenser unit comprises at least a conduit for transference of the ingredient, a pump for creating an air pressure difference and a valve for regulating a flow of the ingredient.

[0016] Another aspect of the automatic coffee machine relates to a method of identifying a user using at least one biological data or biometric data. The user can be referred as a customer and a staff. The method comprises firstly, receiving at least one input from at least one input means. The input and input means comprises an image (a human face and two eyes) from a camera, a human voice from a microphone, a finger or thumb input from a tactile display. Secondly, distinguishing the inputs by identifying the status of the input means. For example, if the status of the speaker were on, an interrupt is triggered which signals to a processor that a voice has been detected. The same applies for the camera and the tactile display. If all the input means were triggered, the processor will have more input biological data to operate on to identify the user accurately and quickly. Thirdly, computing the inputs with rules. The rules are set into algorithm or sets of instructions for the processor to compute statistically the likelihood of the input data

relating to one distinctive user. Finally, a result from the computation is able to predict the identity of the user with a high accuracy and quickly.

[0017] Notably, the tactile display provides an input means as well as an output means. The tactile display displays instructions to guide the user as well as receiving haptic inputs by finger or thumb touching thereon. As the user begins to touch the tactile display, the algorithm is in fact learning a response time of the user following each instruction be it from the tactile display or from the speaker. The algorithm also detects a speed between each pressed or touched key (letters or numbers or punctuations). The algorithm also detects the finger print for every touch on the tactile display which also contributes to the data accumulation over a period of time. All these inputs are captured and associated with the one unique user.

[0018] The advantage of using biological data of the user is firstly, the uniqueness thereof. Every individual has his or her own features which are different from another individual. Secondly, biological data provides an easy way to authenticate and verify one's identify without using another device. The device can be a mobile phone or a smart card carried by the user. As a result of its uniqueness and ease biological data provides a safe and secure way to making payment online using payment cards. For increased security, the algorithm can be programmed to demand all biological data be authenticated and verified before the purchase is deemed complete.

[0019] Alternatively, smart card and mobile phone can be used to authenticate and verify the identity of the user. However, if the smart card and the mobile phone is misplaced, there will be a likelihood of unauthorized use of the automatic coffee machine. Another scenario may be it is a deliberate honest use by the user who is using the smart card of another person to purchase an item from the automatic coffee machine. For such cases, the algorithm is programmed to either accept biological data authentication or mobile devices including card n phone ca be used. Therefore, the level of security can be programmed depending on the requirements.

[0020] Another aspect of the automatic coffee machine includes a method of predicting at least one choice of the user. The method comprises firstly, providing the user's details, for example, an age, a gender, and an ethnicity. Secondly, providing a purchase. The purchase refers to a past purchase for a repeated user or no-purchase for a first time

user. Thirdly, providing at least one parameter (time, temperature) relating to the automatic coffee machine at a point (time) of the purchase.

[0021] The algorithm is designed to learn from the many different input data (face, eyes, fingerprint and voice). At a first stage of acquiring biometric data from the customer terminal or the POS terminal or in short terminal. The algorithm is instructed to save the input data of every visit to the terminal. The saved input data over time creates a large data bank for the algorithm to learn about the user (staff or customer). The learning extends to the shopping behavior of the user. These behaviours are determined by the user's purchase at a specific time of the day, a climate of that day (hot, cold, raining, sunny), an ethnicity of the user (Chinese, Indian, Malay, Caucasian, African, Aborigines), an age of the user, a gender of the user, a skin temperature of the user, a tonality of the user's voice, an emotion expressed by the facial features of the user. For example, in a scenario where the user standing in front of the terminal wanting to purchase a coffee from the automatic coffee machine. It is a hot and sunny day, the user is seemingly undecided and irritable. The automatic coffee machine packed with input peripherals including a plurality of sensor (temperature sensor) are able to pick up heat signature from the user and the ambient, images captured by the camera detect an irritable user. The algorithm is able to predict what the user is going to order. The algorithm then displays the predicted items according to a priority in a menu on the tactile display for the user to select.

[0022] Another aspect of the automatic coffee machine includes a method of making payment. The method comprises firstly identifying the user. Secondly, associating the purchase with the user. Thirdly, associating a payment mode with the user. Finally, fulfilling the payment.

[0023] The algorithm after identifying and verifying the user attempts to determine if it were a first time user or a repeat user. For a first time user, a registration has to be done. The algorithm will instruct the first time user to gaze forward at the tactile display and followed by gazing to the left and right side maintaining a steady posture for a period of time. This is to allow the camera to capture the facial feature of the first time user as well as locating the eyes. As the first time user touch the tactile display, the fingerprint is acquired therefrom. The algorithm will also require the first time user to have a thumbprint taken on the tactile display. The algorithm will also instruct the first time user to speak

following the words displayed on the tactile display in which the voice is received by a microphone. The words for example, should contain all the vowels and consonants in an English speaking language. Other languages can be added as well. After taking all the biological data, the first time user can proceed to view the menu at the tactile display. When a selection is made, and the selection is confirmed by the first time user, the payment details are to be provided to effect the purchase. Unless the first time user chose to pay by cash or debit card (NETS) or by e-wallet (DBS Paylah), the first timer user will be prompted to enter credit card details to facilitate future transaction. For e-wallet payment, the tactile display will display a QR (Quick Response) code to effect the payment.

[0024] For a repeat user, the automatic coffee machine contains the information of the payment details. The information includes a name on the card, an expiry date of the card, a three-digit card verification value (CVV) and the card number. The payment details may also include the user's preferred payment mode. The repeat user may use his or her mobile phone to make payment using Near Field Communication (NFC). The payment is then charged to the telephone bill of the repeat user. In both instances, a connection to a remote server of a bank or a credit card facility is established using Internet data connection (digital) or telephony (analogue) or both (hybrid). A merchant in this case is the company or entity that owns the automatic coffee machine has a credit facility which enables the transfer of monies from the user's primary account (bank or credit card) or proxy account (telco if making payment by mobile phone) to an account of the merchants.

[0025] The accompanying figures (Figs.) illustrate embodiments and serve to explain principles of the disclosed embodiments. It is to be understood, however, that these figures are presented for purposes of illustration only, and not for defining limits of relevant inventions.

Fig. 1 illustrates a schematic of an automatic coffee machine;

Fig. 2 illustrates a schematic of a microphone and a speaker interacting with a POS;

Fig. 3 illustrates a schematic of a camera and a tactile display interacting with the POS;

Fig. 4 illustrates a schematic of a reader interacting with the POS;

Fig. 5 illustrates a process of recognizing a voice

Fig. 6 illustrates a process of tracking and recognizing biological data;

Fig. 7 illustrates a process of determining a payment mode;

Fig. 8 illustrates a process of suggesting items; and

Fig. 9 illustrates a model of a neutral network;

[0026] Exemplary, non-limiting embodiments of the present application will now be described with references to the above-mentioned figures.

[0027] Fig. 1 illustrates a schematic of an automatic coffee machine 100 which comprises a POS (Point of Sale) terminal, a customer terminal, and a coffee maker. The POS terminal comprises a staff interface. The staff interface is communicatively connected to the POS terminal. A staff communicates with the staff interface. The customer terminal comprises a customer interface. The customer interface is communicatively connected to the customer terminal.

[0028] The POS terminal is also communicatively connected to the customer terminal, a cloud server and the coffee maker. The customer terminal is communicatively connected to the cloud server and to the customer interface. A customer communicates with the customer interface.

[0029] The term “communicatively connected” describes a bi-directional exchange of information between at least two devices as shown in the double arrow heads in Fig. 1. The information can either be digital signals between devices or analogue signals between the staff, the customer and the staff and customer interfaces respectively. The devices being the staff interface, the customer interface, the POS terminal, the customer terminal, the coffee maker, and the cloud server. The staff and the customer are actors in the schematic. Actor is a term used in software modelling.

[0030] The staff interface comprises at least one staff camera, at least one staff microphone, a staff card reader, at least one staff speaker and a staff tactile display.

[0031] The customer interface comprises at least one customer camera, at least one customer microphone, a customer card reader, at least one customer speaker and a customer tactile display.

[0032] The coffee maker which is connected to the POS terminal comprises an anthropomorphic robotic arm, a beverage unit, a container unit and a dispensing unit (not shown). The anthropomorphic robotic arm comprises a plurality of digits and a suction

cup. The beverage unit comprises a coffee compartment, a tea compartment, a juice compartment, an alcohol compartment and a dairy compartment. The container unit comprises a paper cup compartment, a plastic cup compartment and a glass compartment. The dispenser unit comprises at least a conduit, at least a pump and at least a valve.

[0033] Fig. 2 illustrates a schematic of the staff microphone and the staff speaker interacting with the POS terminal. The staff microphone and the staff speaker are electrically connected to the POS terminal. A human voice who is the staff speaks into the microphone. The human voice is an analogue signal. The voiced speech of a typical adult male will have a fundamental frequency from 85 to 180 Hz, and that of a typical adult female from 165 to 255 Hz. The staff microphone receives the analogue signal which goes through an ADC (Analogue to Digital Converter) and convert to a digital signal to be processed by the POS terminal.

[0034] The POS terminal can also generate a digital signal which corresponds to the frequencies of the human voice. The POS terminal has a DAC (Digital Analogue Converter) to convert the digital signal to an analogue signal and an audible sound is projected from the staff speaker.

[0035] Fig. 3 illustrates a schematic of the staff camera and the staff tactile display interacting with the POS terminal. The staff camera and the staff tactile display are electrically connected to the POS terminal. A face of the staff is acquired by the staff camera. A fingerprint of the staff is acquired by the staff tactile display. The acquired images of the face and the fingerprint is processed by the POS terminal.

[0036] Fig. 4 illustrates a schematic of the staff reader interacting with the POS terminal. The staff reader is electrically connected to the POS terminal. Information of the staff which is stored in a card or on a mobile phone is read by the staff reader and transmitted to the POS terminal.

[0037] Functionally, the automatic coffee machine provides an improved coffee machine that enables the customer to place an order via the customer interface on the customer terminal. After payment is made, the customer terminal then relays the order to the POS terminal. The POS terminal communicates with the coffee maker which prepares the

order and fulfil the order. The coffee maker is autonomous and controlled by the POS terminal. Occasionally, the staff will check on the status of the automatic coffee machine to perform maintenance, diagnostics and updating of software via the staff interface at the POS terminal.

[0038] The POS terminal provides a channel for the interaction between the staff and a computer within via the staff interface. The computer provides a storage of algorithm (instructions), processing of the inputs from the staff interface based on the algorithm and generate relevant output to the staff interface or to the coffee maker or to the cloud server or to the customer terminal or in combination. The staff interface comprises at least one staff camera, at least one staff microphone, a staff card reader, at least one staff speaker and a staff tactile display. The computer comprises a hard disk drive (HDD), a printed circuit board with sockets and electrical connections embedded within connected to a plurality of surface mounted integrated circuit. The surface mounted integrated circuits comprising a microprocessor, a plurality of memory storage and a plurality of connector. The term "memory storage", meaning "primary storage" or "main memory", is often associated with addressable semiconductor memory, i.e. integrated circuits consisting of silicon-based transistors, used for example as primary storage but also other purposes in computers and other digital electronic devices. There are two main kinds of semiconductor memory, volatile and non-volatile. Examples of non-volatile memory are flash memory (used as secondary memory) and ROM, PROM, EPROM and EEPROM memory (used for storing firmware such as BIOS). Examples of volatile memory are primary storage, which is typically dynamic random-access memory (DRAM), and fast CPU cache memory, which is typically static random-access memory (SRAM) that is fast but energy-consuming, offering lower memory areal density than DRAM.

[0039] The staff tactile display provides a haptic input to the POS terminal as well as an output display for visually displaying information for the staff to read. The staff tactile display has an approximate length of three hundred millimetres and an approximate breadth of two hundred millimetres. A plastic frame which circumscribes the staff tactile display with a border of approximately twenty millimetres on four sides.

[0040] The staff camera is located in a top length of the plastic frame specifically at the middle thereof. The staff camera being a CMOS image sensor an input channel for

acquiring at least one image singularly or sequentially over a determined time frame. The staff camera is primarily for taking the facial image of the staff and the eye of the staff.

[0041] The staff microphone provides an input channel for acquiring the voice of the staff and is located inside the plastic frame at a lower length thereof. At the lower length of the plastic frame are a plurality of perforation. The perforations allow the voice of the staff to be received by the staff microphone residing inside the plastic frame. The staff speaker provides an output channel for the projection of an audible signal to the staff. The staff speaker is located inside the plastic frame at the lower length of the plastic frame which is the same as the staff microphone.

[0042] The staff card reader provides an input channel for reading of information from a card or a mobile phone of the staff via NFC (Near Field Communication). The staff card reader is attached at the right breadth of the plastic frame providing convenience to a right-handed staff when using a card to swipe across the staff card reader through a slit. One of the ways the card reader reads information is by swiping of the card. The card size typically measures 85.60 by 53.98 mm with rounded corners with a radius of 2.88 to 3.48 mm, which is in accordance with ISO/IEC 7810#ID-1. The card has a magnetic strip on either surface thereof.

[0043] The other way is using NFC which employs electromagnetic induction between two loop antennas when NFC-enabled devices, in this case is the staff card reader and the mobile phone of the staff which exchange information, operating within the globally available unlicensed radio frequency ISM band of 13.56 MHz on ISO/IEC 18000-3 air interface at rates ranging from 106 to 424 kbit/s. The mobile phone can also be replaced by a smart card which uses either contact or contactless technology. The smart card is embedded with a microprocessor and memory. The microprocessor on the smart card has an embedded operating system and can handle multiple applications such as a cash card, a pre-paid membership card, or an access control card. The difference between the two types of smart cards is the manner with which the microprocessor on the card communicates with the outside world. A contact smart card has eight contact points, which must physically touch the contacts on the staff reader to convey information between them. Since contact cards must be inserted into staff readers carefully in the proper orientation, the speed and convenience of such a transaction is not acceptable for most access control applications. The use of contact smart cards as physical access

control is limited mostly to parking applications when payment data is stored in card memory, and when the speed of transactions is not as important.

[0044] A contactless smart card uses the same radio-based technology at a higher frequency (13.56 MHz instead of 125 kHz), which allows the transfer of more data, and communication with several cards at the same time. A contactless card does not have to touch the staff reader or even be taken out of a wallet or purse. Most access control systems only read serial numbers of contactless smart cards and do not utilize the available memory. Card memory may be used for storing biometric data (i.e. fingerprint template) of a user. In such case a biometric reader first reads the template on the card and then compares it to the finger (hand, eye, etc.) presented by the user. In this way biometric data of users does not have to be distributed and stored in the memory of controllers or staff readers, which simplifies the system and reduces memory requirements.

[0045] Alternatively, the staff card reader is a portable modular device that is separate from the staff tactile display. The portable staff card reader has keypad thereon providing the entry of alphanumeric characters.

[0046] Fig. 5 illustrates a process of recognizing a voice and associating the voice with an identity of a user. Do note that the term “user” can be referring to the staff or the customer. The staff microphone receives the voice of the user which is transmitted to the computer at the POS terminal. The analogue signal is converted to a digital voice signal for processing. An algorithm for processing and analysing digital voice signal. The processing involves converting the analogue signal with respect to time into digital signal with respect to frequency using Fast Fourier Transform that samples a signal over a period of time (or space) and divides it into its frequency components. The analysing involves comparing the processed digital voice signal with a set of determined parameters that is inherent in the human voice. The set of determined parameters is saved in a database in the hard disk drive for fast access. The parameters are limited and is compartmentalised in a table known as a “human voice table” of the database so that only a partial of the database is accessed.

[0047] Once the human voice is determined, the acquired digital signal is then compared with another table known as a “known voice table” that contains the voices of past users

in the database. The algorithm checks whether the acquired digital signal is a first time user. For the first time user, the algorithm initiates a voice acquisition protocol which instructs the first time user to recite a sentence displayed on the staff tactile display. For example, the sentence is “the quick brown fox jumps over the lazy dog”. Alternatively, the instruction can be verbalised through the staff speaker and display on the staff tactile display at the same time. The algorithm will learn and predict the accent and diction of the spoken words of the first time user and saved into the “known voice table”. The first time user recorded voice is associated with a name of the first time user.

[0048] For subsequent users, the voice is analysed as well. The voices of the subsequent user will be recorded for every use so as to build a massive data of that user so as to create a more accurate prediction based on more saved data. The algorithm for processing voice signal compares the past saved voice with the current voice to identify and confirm the fundamental frequency that is stable. There can be times when the user had a cold and the voice changes. The algorithm is able to identify the user despite a change in the voice. This is possible only with iterations of learning based on data. The more data there is, the more accurate the prediction will be.

[0049] Fig. 6 illustrates a process of tracking and recognizing biological data. The biological data comprises fingerprint, iris and facial features). The commonality is the acquisition of the biological data requires an image sensor. In the case of acquiring a face or an eye, a camera is required. In the case of a fingerprint, the staff tactile display screen suffices. The staff tactile display screen comprises a display panel at a bottom layer, a fingerprint panel (optical sensor) in-between the bottom layer and a cover window at a top layer.

[0050] The user standing in front of the staff terminal intuitively positions his or her face in front of the staff camera which can be seen on the staff tactile display. Depending on the placement of the staff tactile display, the staff camera ought to point at the face of the user in a plane that is in line with the face. To achieve that, more than one staff camera may be required to be installed to accurately capture an image of the user from different angles.

[0051] The acquired image is then digitally sampled and send to the computer for processing specifically an algorithm for processing image. The digitally sampled image

is then compared with a table in the database known as “human face” which contains parameters that define a human face. The human face has landmark features like one nose somewhere in the middle of the acquired image, two eyes above the nose forming a triangular shape and a mouth below the nose. There are dimensions affixed to each landmark feature to differentiate the human face with others. Once the user is confirmed as a human face, the algorithm will assess whether the user is a first time user by looking through a table in the database known as a “known faces”.

[0052] If the user were a first time user, the algorithm will instruct the first time user to remain still in looking at the staff camera in front at the staff tactile display for a period of time (2 seconds) until further instruction. The follow up instruction is to gaze to the right by rolling the eyes to the right with the face kept still. The next instruction is to gaze to the left by rolling the eyes to the left with the face kept still. This is to further confirm the position of the eyes and to scan the iris. When the first time user fixed his head position, the camera captures the face as well as the eyes. It is the algorithm that will detect the eyes and the features of the face. After which, the algorithm learns and store the data into the “known faces” table in the database. For non-first time users, the facial and iris are also detected and saved in the database for learning and predicting. The same process applies for acquiring of the fingerprint of the user.

[0053] During the data collation in Figs. 5 and 6, different algorithms in the computer perform additional steps of first, an algorithm automatically landmarks facial scans—labelling the tip of the nose, the two eyes, the mouth and other points. Second, another algorithm lines up all the scans according to their landmarks and combines them into a model. Third, an algorithm detects and removes bad scans. This allows the automation of constructing facial pattern for different expressions. For voice, allowing the construction of different tones, articulations etc. For fingerprint, allowing the construction of variation of fingerprint when the finger is placed in different positions on the staff tactile display.

[0054] The processes of Figs 5 and 6 are applicable for both the staff and the customer. Fig. 5 is for voice recognition which is statistical learning whilst Fig. 6 is primarily relates to vision which falls under symbolic learning. Therefore, the algorithms for acquiring the two types of both biological data are different.

[0055] Fig. 7 illustrates a process of determining a payment mode specifically for the customer. When the customer stands in front of the customer interface, the input peripherals like the customer camera, the customer microphone and the customer tactile display are awaiting instructions from the customer. The customer camera captures the image of the customer when the customer is in the customer camera zone. At the backend, the computer is already determining whether the customer is a first time user or a repeat customer without the knowledge of the customer. To initiate the process, the customer has to follow the instructions set out on the customer tactile display or the audible sound from the customer speaker. The customer can either touch the customer tactile display or blinking of the eye twice in rapid succession. The latter input method is to facilitate the handicapped people who has no hands.

[0056] For a registered customer also known as a member, the biological data as well as the card (if any) and mobile phone information have been stored in the database in a table called “member”. The past payment method is retrieved from the database. The order that the customer made and confirmed is effected immediately. For first time customer, registration is done to obtain details like a name (first name, last name), a date of birth, a gender, an electronic mail and a mobile phone number which are acquired on the customer tactile display having an alphanumeric keypad on the screen. The biological data of the first time customer is acquired by the customer camera (facial features and iris), the customer microphone (voice) and the customer tactile display (fingerprint acquisition). The confirmed purchase after payment is recorded in the database associating with the customer. This is to facilitate future item suggestion for purchase in the next visit by the customer and to improve customer loyalty.

[0057] Fig. 8 illustrates a process of suggesting items to the customer. The items herein describe a coffee. The algorithm initiates by confirming whether the customer is a registered customer or known member in the database. Once it is confirmed that the customer is known member, the past transactions are retrieved. Suggestions of items are made available on the customer tactile display. The suggestion can be based on any of the following first, a present user profile. The present user profile based on gender provides gender specific items like a red cup for a female customer’s beverage. Second, a past shopping record. The past shopping record relates to the last purchasing habit and suggests the past items for the current selection list. Third, a present environment. The present environment relates to the weather of the present time as well as the time of

the day. For example, suggesting a cold drink on a hot day at twelve o'clock. Fourth, a prediction by the algorithm. Fifth, a current pre-determined menu. The current pre-determined menu is when none of the above suggestion is available. For example, a non-registered customer is able to see a list of items on the menu which is not specifically targeted for the non-registered customer. The predetermined menu is updated by the staff though the staff interface or updated remotely using the cloud server.

[0058] All the above suggestions can also be incorporated together and operate in unison providing a more accurate suggestion for the customer be it registered or not. The confirmed order associating with the customer together with the date of purchase, the ambient temperature, the weather condition et cetera are saved in the database.

[0059] Fig. 9 illustrates a model of a neutral network. For example, we would like to know the likelihood that the customer will order a cup of hot latte. The likelihood or probability relates to an output layer as shown in Fig. 9. All the likelihood or variations can be listed as outputs. For example, besides hot latte, there is iced latte as well. Therefore, there are two possible outputs.

[0060] The input layer relates to the input parameters. The input parameters include but not limited to one shot of coffee measuring thirty millilitres (30 ml), steamed fresh milk measuring one hundred millilitres (100 ml), a cup of ice, the ambient temperature and the time of the day. Based on these input parameters, the system is able to predict what the customer prefer. Again, the algorithm can only predict. Eventually, the customer has to make a decision which latte to choose. The chosen latte by the customer provides the algorithm a learning input so as to learn more about the customer's decision making and behaviour.

[0061] In the application, unless specified otherwise, the terms "comprising", "comprise", and grammatical variants thereof, intended to represent "open" or "inclusive" language such that they include recited elements but also permit inclusion of additional, non-explicitly recited elements.

[0062] As used herein, the term "about", in the context of concentrations of components of the formulations, typically means +/- 5% of the stated value, more typically +/- 4% of the stated value, more typically +/- 3% of the stated value, more typically, +/- 2% of the

stated value, even more typically +/- 1% of the stated value, and even more typically +/- 0.5% of the stated value.

[0063] Throughout this disclosure, certain embodiments may be disclosed in a range format. The description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the disclosed ranges. Accordingly, the description of a range should be considered to have specifically disclosed all the possible sub-ranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed sub-ranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

[0064] It will be apparent that various other modifications and adaptations of the application will be apparent to the person skilled in the art after reading the foregoing disclosure without departing from the spirit and scope of the application and it is intended that all such modifications and adaptations come within the scope of the appended claims.

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Claims

1. An automatic beverage attendant for serving beverage to a customer, the automatic beverage attendant comprising
   - a beverage maker for concocting a beverage;
   - a payment terminal (point of sale terminal) connected to the beverage maker for receiving payment of the beverage;
   - wherein the beverage maker comprises a user terminal for receiving order of the beverage from a customer.

2. The automatic beverage attendant of claim 1 further comprising
   a conveyor for transferring the beverage to the customer.

3. The automatic beverage attendant of claim 2, wherein
   the conveyor comprises a robot for fetching the beverage.

4. The automatic beverage attendant of any of the preceding claims further comprising
   a CRM server (e.g. computer installed with customer relationship management programme) that is connected to the beverage maker, the payment terminal, the user terminal or a combination of any of these.

5. The automatic beverage attendant of any of the preceding claims further comprising
   a detector (connected to one or more parts of the automatic beverage attendant) for sensing input from a human (e.g. customer, waiter).

6. The automatic beverage attendant of claim 5, wherein
   the detector comprises at least one touchscreen for receiving the input.

7. The automatic beverage attendant of claim 5, wherein
   the detector comprises a biometric device (e.g. camera) for recognizing identity of a person based on physiological or behavioral characteristics of the person.

8. The automatic beverage attendant of any of the preceding claims further comprising
a communication terminal (e.g. network interface) for transferring information with an external electronic device (a remote computer, other automatic beverage attendants, cloud computing servers).

9. The automatic beverage attendant of claim 1, wherein
the beverage maker comprises a thermal container for providing the beverage to the customer at a predetermined temperature.

10. The automatic beverage attendant of any of the preceding claims further comprising
a security device (e.g. barrier) for protecting (of safekeeping) at least one part (e.g. payment terminal, robot) of the automatic beverage attendant.

11. A method of serving a beverage automatically, the method comprising
- receiving an order of beverage at a user terminal of an automatic beverage attendant;
- making the beverage according to the order by a beverage maker; and
- transacting the beverage automatically at a payment terminal of the automatic attendant.

12. The method of claim 11 further comprising
conveying the beverage to a customer of the beverage.

13. The method of claim 11 or 12 further comprising
detecting presence of the user automatically.

14. The method of any of the preceding claims 11 to 13, wherein
the detecting presence of the user comprises recognizing identity of a person based on physiological or behavioral characteristics of the person.

15. The method of any of the preceding claims 11 to 14 further comprising
interacting with the user configuring (e.g. selecting) the beverage.