Multi-Modal Integrated Mobile E-Commerce Recommendations

BACKGROUND

1. Unlike traditional brick-and-mortar businesses, companies utilizing e-commerce websites often do not have a physical store or location where a salesperson can help both novice and knowledgeable customers find sought-after products. Instead, a customer navigating an e-commerce website typically attempts to identify a product that meets the customer's needs. Even a customer with considerable experience navigating e-commerce websites sometimes experiences difficulty in choosing a product from among tens or hundreds of similar products. For novice customers, meanwhile, the task of shopping online via the web can be unproductive and even frustrating. In response to these difficulties, these companies continually strive to make their e-commerce websites more dynamic, compelling, informative, and easier for users to navigate and locate products and related information. One way to improve a customer's experience includes providing forums (or discussion boards) that allow customers to exchange information with other people via dialogue in a discussion. The ever-enlarging product catalog makes forums helpful when a customer tries to distinguish between products, seek out impartial advice, learn more about a product or category, or obtain other information.

BRIEF DESCRIPTION OF THE DRAWINGS

1. Various embodiments in accordance with the present disclosure will be described with reference to the drawings, in which:
2. FIG. 1 illustrates an example computing device providing access to an electronic marketplace, in accordance with various embodiments.
3. FIG. 2 illustrates an example environment in which aspects of the various embodiments can be implemented.
4. FIG. 7 example computing device that can be use in accordance with various embodiments.
5. FIG. 8 illustrates a set of basic components of one or more devices of the present disclosure.
6. FIG. 9 illustrates an example environment for implementing aspects in accordance with various embodiments.

SUMMARY

1. In an embodiment of the present disclosure, a computer implemented method includes
2. In another embodiment of the present disclosure, a computer implemented method includes
3. In another embodiment of the present disclosure, a computer implemented method includes

DETAILED DESCRIPTION

1. In the following description, various embodiments will be described. For purposes of explanation, specific configurations and details are set forth in order to provide a thorough understanding of the embodiments. However, it will also be apparent to one skilled in the art that the embodiments may be practiced without the specific details. Furthermore, well-known features may be omitted or simplified in order not to obscure the embodiment being described.
2. Systems and methods in accordance with various embodiments of the present disclosure may overcome one or more of the aforementioned and other deficiencies experienced in conventional approaches for ­­­\_\_\_\_\_\_\_\_\_\_. In particular, various embodiments \_\_\_\_\_\_\_\_\_\_.
3. [*Provide Invention Overview/Summary Here*]
4. [*Technical Improvement / Practical Application for 101, if needed*] Various other features and application can be implemented based on, and thus practice, the above described technology and presently disclosed techniques. Accordingly, approaches in accordance with such embodiments improve the technology of \_\_\_\_\_\_\_\_\_. More specifically, \_\_\_\_\_\_\_\_\_\_. Various other applications, processes, and uses are presented below with respect to the various embodiments, each of which improves the operation and performance of the computing device(s) on which they are implemented.
5. FIG. 1 illustrates an example 100 computing device 102 providing access to an electronic marketplace 104, in accordance with various embodiments. In this example, a computing device 102 provides access to an electronic marketplace 104, in accordance with various embodiments. Although a tablet computing device is shown in this example, it should be understood that various other types of electronic devices that are capable of determining and processing input and providing output can be used in accordance with various embodiments discussed herein. These devices can include, for example, smart phones, e-book readers, desktop computers, notebook computers, personal data assistants, video gaming consoles or controllers, smart televisions, and portable media players, wearable computers (e.g., glasses, watches, etc.) among others. Further, the elements illustrated can be part of a single device, while at least some elements illustrated and otherwise utilized for such a device can be provided as one or more peripheral devices or accessories within the scope of the various embodiments. As illustrated, the electronic marketplace 104 provides a plurality of items 106 available for consumption (e.g., purchase, rent, use, stream). in some embodiments, various descriptors 108 of an item are provided, such as images, price, name, among others.
6. FIG. 2 illustrates an example environment 200 in which aspects of the various embodiments can be implemented. Specifically, the example environment 200 includes a recommendation engine that can recommend \_\_\_\_\_. In this example, a computing device 202 is able to make a call or request across one or more networks 204 to a content provider environment 206. The network(s) can include any appropriate network, such as the Internet, a local area network (LAN), a cellular network, an Ethernet, or other such wired and/or wireless network. The content provider environment 206 can include any appropriate resources for providing content from a resource provider, as may include various servers, data stores, and other such components known or used for providing content from across a network (or from the "cloud"). In this example, a request received to the content provider environment 206 can be received by an interface layer 208 of the environment. As known for network environments, the interface layer can include components such as interfaces (e.g., APIs), load balancers, request and/or data routers, and the like. If the request is a request for content, such as for content for a page to be displayed in an application, information for the request can be directed to one or more content managers 210 and/or content servers, which can obtain the content from a content data store 214 or other such repository to be sent back across the network(s) to the computing device. In some embodiments, information for the request might also be compared against user data in a user data store 212 or other such location do determine, for example, whether the user has access rights to that content. In some embodiments user data might also be analyzed to determine which type of content to provide additional supplemental content to provide with the primary content, and the like. In various embodiments, \_\_\_\_\_ recommendations may be determined by a recommendation engine 216 and provider by the content server 210 based upon data stored in the data repository 218 or determined using a query component 224 or model component 226, among other such options. In some embodiments the recommendation engine 216 may access a weighting component 228 or other such mechanism to weigh the data, such as various components of training data, in determining the \_\_\_\_\_ recommendations. In various embodiments, determining the \_\_\_\_\_ recommendation may include ranking \_\_\_\_\_, in which all or a subset of the plurality of \_\_\_\_\_ are assigned a match score indicating how well matched (i.e., strongly associated) the respective \_\_\_\_ is with respect to \_\_\_\_\_. A recommended \_\_\_\_ may be a \_\_\_\_ whose match score is higher than a threshold score or ranked within a certain number of positions. The individual match scores or the recommended \_\_\_\_\_ can be determined at least in part using neural networks 222 such as a CNN through training on an appropriate data set. The training component 220 can perform the training on the models and provide the resulting results and/or trained models for use in determining the individual match scores or the recommended products. The training component 220 can be the same system or service that is used to train a localizer, as well as various face detectors or other models, networks, or algorithms discussed or suggested herein. In the example shown in FIG. 5, a neural network 222 such as a convolutional neural network (CNN) can be trained using, for example, \_\_\_\_\_. As mentioned, for CNN-based approaches there can be pairs of [[images]] submitted that are classified by a type of attribute (e.g., an association with a certain product), while for GAN-based approaches a series of [[images]] may be submitted for training that may include metadata or other information useful in classifying one or more aspects of each [[image]]. For example, a CNN may be trained to perform [[object recognition]] using [[images of different types of objects]], and then learn how the attributes relate to those [[objects]] using the provided training data. In certain embodiments, training a neural network may involve significant use of computation resources and time, such that this may correspond to a preparatory step to servicing search requests and/or performed relatively infrequently with respect to search request servicing and/or according to a schedule. According to some embodiments, training data and respective can be located in a data store 218. A training component 220 can utilize the training data set to train the neural network 222. As further described, neural networks can include several learning layers in their architecture. A query image from the training data set is analyzed using the neural network to extract a feature vector from the network before the classification layer. This feature vector describes the content of the training data. This process can be implemented for each piece of training data in the data set, and the resulting object feature vectors can be stored in a data store. In various embodiments, the resulting object feature vectors can be compressed for improved processing. For example, the object feature vectors generated by the neural network may include object feature vectors that have a large number of dimensions. The dimensions of these object feature vectors can be reduced by applying at least one of Principal Component Analysis (PCA) or Multi-Dimensional Scaling (MDS). Advantageously, such an approach can reduce storage demands and significantly improve latency performance. Additionally, such an approach can remove or at least reduce noise in the transformed space since the tailing dimensions generally correspond to noise and discarding them helps to focus on the useful signal when measuring similarities. The initial query image in some embodiments may be received from client device 202 over network 204 and processed by query component 224. In some embodiments, the [[query image]] can be received when a selection of an image from a third party provider 230 or content provider environment 206 is selected, such as through the selection of a content item. When a query image is received, for example, a set of query object descriptors may be obtained or determined for the query image. For example, if the query image is not part of an electronic catalog and does not already have associated feature descriptors, the system may generate feature descriptors (both local feature descriptors and object feature descriptors) for the query content in a same and/or similar manner that the feature descriptors are generated for the collection of images, as described. Also, for example, if the query image is part of the collection then the feature descriptors for the query image may be obtained from the appropriate data store. Additionally, the query image can be analyzed to determine local feature descriptors for the query image. Using the clustered feature vectors and corresponding visual words determined for the training images, a histogram for the query image can be determined. The query image can also be analyzed using the neural network 222 to extract a feature vector from the network before the classification layer. This feature vector describes the subject and/or objects shown in the image. Using the local feature descriptors and object feature descriptors, visually similar images (i.e., image data representing facial features of various other uses) and their values of associations with one or more products in content provider environment 206 can be identified.
7. FIG. 7 illustrates an example computing device 700 that can be used in accordance with various embodiments. Although a portable computing device (e.g., a smart phone, an electronic book reader, or tablet computer) is shown, it should be understood that any device capable of receiving and processing input can be used in accordance with various embodiments discussed herein. The devices can include, for example, desktop computers, notebook computers, electronic book readers, personal data assistants, cellular phones, video gaming consoles or controllers, wearable computers (e.g., smart watches or glasses), television set top boxes, and portable media players, among others. In this example, the computing device 700 has a display screen 702 and an outer casing. The display screen under normal operation will display information to a user (or viewer) facing the display screen (e.g., on the same side of the computing device as the display screen). As discussed herein, the device can include one or more communication components 704, such as may include a cellular communications subsystem, Wi-Fi communications subsystem, BLUETOOTH® communication subsystem, and the like.
8. FIG. 8 illustrates a set of basic components of one or more devices 800 of the present disclosure. In this example, the device includes at least one processor 802 for executing instructions that can be stored in a memory device or element 804. As would be apparent to one of ordinary skill in the art, the device can include many types of memory, data storage or computer-readable media, such as a first data storage for program instructions for execution by the at least one processor 802, the same or separate storage can be used for images or data, a removable memory can be available for sharing information with other devices, and any number of communication approaches can be available for sharing with other devices. The device typically will include at least one type of display element 806, such as a touch screen, electronic ink (e-ink), organic light emitting diode (OLED) or liquid crystal display (LCD), although devices such as portable media players might convey information via other means, such as through audio speakers. The device can include at least one communication component 808, as may enabled wired and/or wireless communication of voice and/or data signals, for example, over a network such as the Internet, a cellular network, a Wi-Fi network, BLUETOOTH®, and the like. The device can include at least one additional input device 810 able to receive conventional input from a user. This conventional input can include, for example, a push button, touch pad, touch screen, wheel, joystick, keyboard, mouse, trackball, camera, microphone, keypad or any other such device or element whereby a user can input a command to the device. These I/O devices could even be connected by a wireless infrared or Bluetooth or other link as well in some embodiments. In some embodiments, however, such a device might not include any buttons at all and might be controlled only through a combination of visual and audio commands such that a user can control the device without having to be in contact with the device. As discussed, different approaches can be implemented in various environments in accordance with the described embodiments.
9. FIG. 9 illustrates an example environment 900 for implementing aspects in accordance with various embodiments. As will be appreciated, although a Web-based environment is used for purposes of explanation, different environments may be used, as appropriate, to implement various embodiments. The system includes an electronic client device 902, which can include any appropriate device operable to send and receive requests, messages or information over an appropriate network 904 and convey information back to a user of the device. Examples of such client devices include personal computers, cell phones, handheld messaging devices, laptop computers, set-top boxes, personal data assistants, electronic book readers and the like. The network can include any appropriate network, including an intranet, the Internet, a cellular network, a local area network or any other such network or combination thereof. Components used for such a system can depend at least in part upon the type of network and/or environment selected. Protocols and components for communicating via such a network are well known and will not be discussed herein in detail. Communication over the network can be enabled via wired or wireless connections and combinations thereof. In this example, the network includes the Internet, as the environment includes a Web server 906 for receiving requests and serving content in response thereto, although for other networks, an alternative device serving a similar purpose could be used, as would be apparent to one of ordinary skill in the art. \n\nThe illustrative environment includes at least one application server 908 and a data store 910. It should be understood that there can be several application servers, layers or other elements, processes or components, which may be chained or otherwise configured, which can interact to perform tasks such as obtaining data from an appropriate data store. As used herein, the term data "store" refers to any device or combination of devices capable of storing, accessing and retrieving data, which may include any combination and number of data servers, databases, data storage devices and data storage media, in any standard, distributed or clustered environment. The application server 908 can include any appropriate hardware and software for integrating with the data store 910 as needed to execute aspects of one or more applications for the client device and handling a majority of the data access and business logic for an application. The application server provides access control services in cooperation with the data store and is able to generate content such as text, graphics, audio and/or video to be transferred to the user, which may be served to the user by the Web server 906 in the form of HTML, XML or another appropriate structured language in this example. The handling of all requests and responses, as well as the delivery of content between the client device 902 and the application server 908, can be handled by the Web server 906. It should be understood that the Web and application servers are not required and are merely example components, as structured code discussed herein can be executed on any appropriate device or host machine as discussed elsewhere herein.\n\nThe data store 910 can include several separate data tables, databases or other data storage mechanisms and media for storing data relating to a particular aspect. For example, the data store illustrated includes mechanisms for storing content (e.g., production data) 912 and user information 916, which can be used to serve content for the production side. The data store is also shown to include a mechanism for storing log or session data 914. It should be understood that there can be many other aspects that may need to be stored in the data store, such as page image information and access rights information, which can be stored in any of the above listed mechanisms as appropriate or in additional mechanisms in the data store 910. The data store 910 is operable, through logic associated therewith, to receive instructions from the application server 908 and obtain, update or otherwise process data in response thereto. In one example, a user might submit a search request for a certain type of item. In this case, the data store might access the user information to verify the identity of the user and can access the catalog detail information to obtain information about items of that type. The information can then be returned to the user, such as in a results listing on a Web page that the user is able to view via a browser on the user device 902. Information for a particular item of interest can be viewed in a dedicated page or window of the browser.\n\nEach server typically will include an operating system that provides executable program instructions for the general administration and operation of that server and typically will include computer-readable medium storing instructions that, when executed by a processor of the server, allow the server to perform its intended functions. Suitable implementations for the operating system and general functionality of the servers are known or commercially available and are readily implemented by persons having ordinary skill in the art, particularly in light of the disclosure herein. \n\nThe environment in one embodiment is a distributed computing environment utilizing several computer systems and components that are interconnected via communication links, using one or more computer networks or direct connections. However, it will be appreciated by those of ordinary skill in the art that such a system could operate equally well in a system having fewer or a greater number of components than are illustrated in FIG. 9. Thus, the depiction of the system 900 in FIG. 9 should be taken as being illustrative in nature and not limiting to the scope of the disclosure. \n\nThe various embodiments can be further implemented in a wide variety of operating environments, which in some cases can include one or more user computers or computing devices which can be used to operate any of a number of applications. User or client devices can include any of a number of general purpose personal computers, such as desktop or laptop computers running a standard operating system, as well as cellular, wireless and handheld devices running mobile software and capable of supporting a number of networking and messaging protocols. Such a system can also include a number of workstations running any of a variety of commercially-available operating systems and other known applications for purposes such as development and database management. These devices can also include other electronic devices, such as dummy terminals, thin-clients, gaming systems and other devices capable of communicating via a network.\n\nMost embodiments utilize at least one network that would be familiar to those skilled in the art for supporting communications using any of a variety of commercially-available protocols, such as TCP/IP, FTP, UPnP, NFS, and CIFS. The network can be, for example, a local area network, a wide-area network, a virtual private network, the Internet, an intranet, an extranet, a public switched telephone network, an infrared network, a wireless network and any combination thereof.\n\nIn embodiments utilizing a Web server, the Web server can run any of a variety of server or mid-tier applications, including HTTP servers, FTP servers, CGI servers, data servers, Java servers and business application servers. The server(s) may also be capable of executing programs or scripts in response requests from user devices, such as by executing one or more Web applications that may be implemented as one or more scripts or programs written in any programming language, such as Java®, C, C# or C++ or any scripting language, such as Perl, Python or TCL, as well as combinations thereof. The server(s) may also include database servers, including without limitation those commercially available from Oracle®, Microsoft®, Sybase® and IBM®. \n\nThe environment can include a variety of data stores and other memory and storage media as discussed above. These can reside in a variety of locations, such as on a storage medium local to (and/or resident in) one or more of the computers or remote from any or all of the computers across the network. In a particular set of embodiments, the information may reside in a storage-area network (SAN) familiar to those skilled in the art. Similarly, any necessary files for performing the functions attributed to the computers, servers or other network devices may be stored locally and/or remotely, as appropriate. Where a system includes computerized devices, each such device can include hardware elements that may be electrically coupled via a bus, the elements including, for example, at least one central processing unit (CPU), at least one input device (e.g., a mouse, keyboard, controller, touch-sensitive display element or keypad) and at least one output device (e.g., a display device, printer or speaker).
10. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense. It will, however, be evident that various modifications and changes may be made thereunto without departing from the broader spirit and scope of the invention as set forth in the claims.

CLAIMS:

1. A computer implemented method, comprising:

2. A computer implemented method, comprising:

3. A computer implemented method, comprising:

ABSTRACT

A computer implemented method includes