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(54) **METHODS AND SYSTEMS FOR AUGMENTING VISUAL CONTENT**

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***G06Q 30/0251*** (2023.01)
***G06T 19/00*** (2011.01)

(52) **U.S. Cl.**
CPC ..... ***G06T 11/00*** (2013.01); ***G06Q 30/0261*** (2013.01)

(58) **Field of Classification Search**
CPC .... G06T 11/00; G06T 19/006; G06Q 30/0631
See application file for complete search history.

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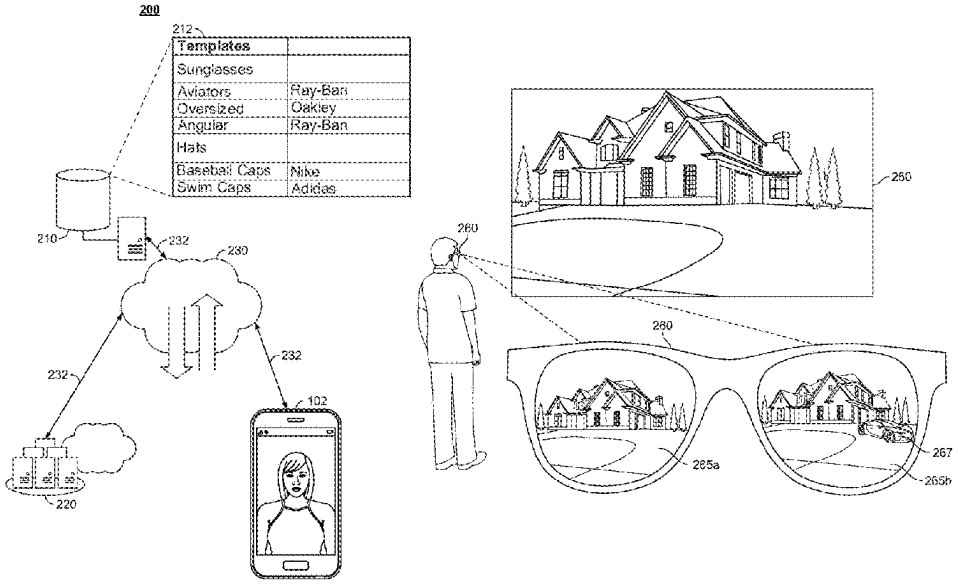
(57) **ABSTRACT**

Systems and methods are described for augmenting visual content with a sponsored object instead of a selected object. An illustrative method receives an input selecting an object for augmenting visual content, determines whether a property of the selected object matches a property of a sponsored object included in a database of sponsored objects, and in response to determining that the property of the selected object matches the property of the sponsored object, augments the visual content with the sponsored object.

**18 Claims, 10 Drawing Sheets**



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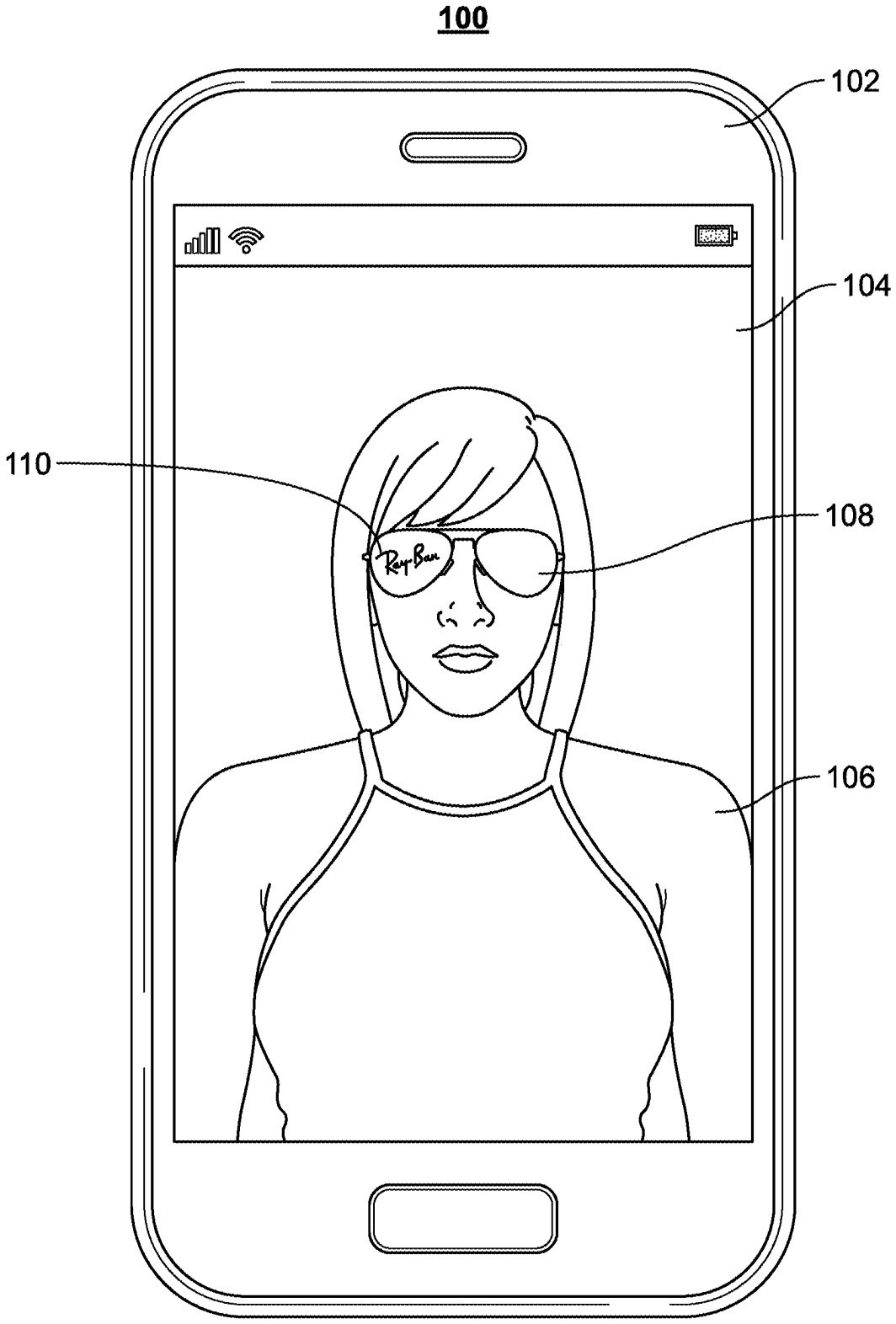



FIG. 1

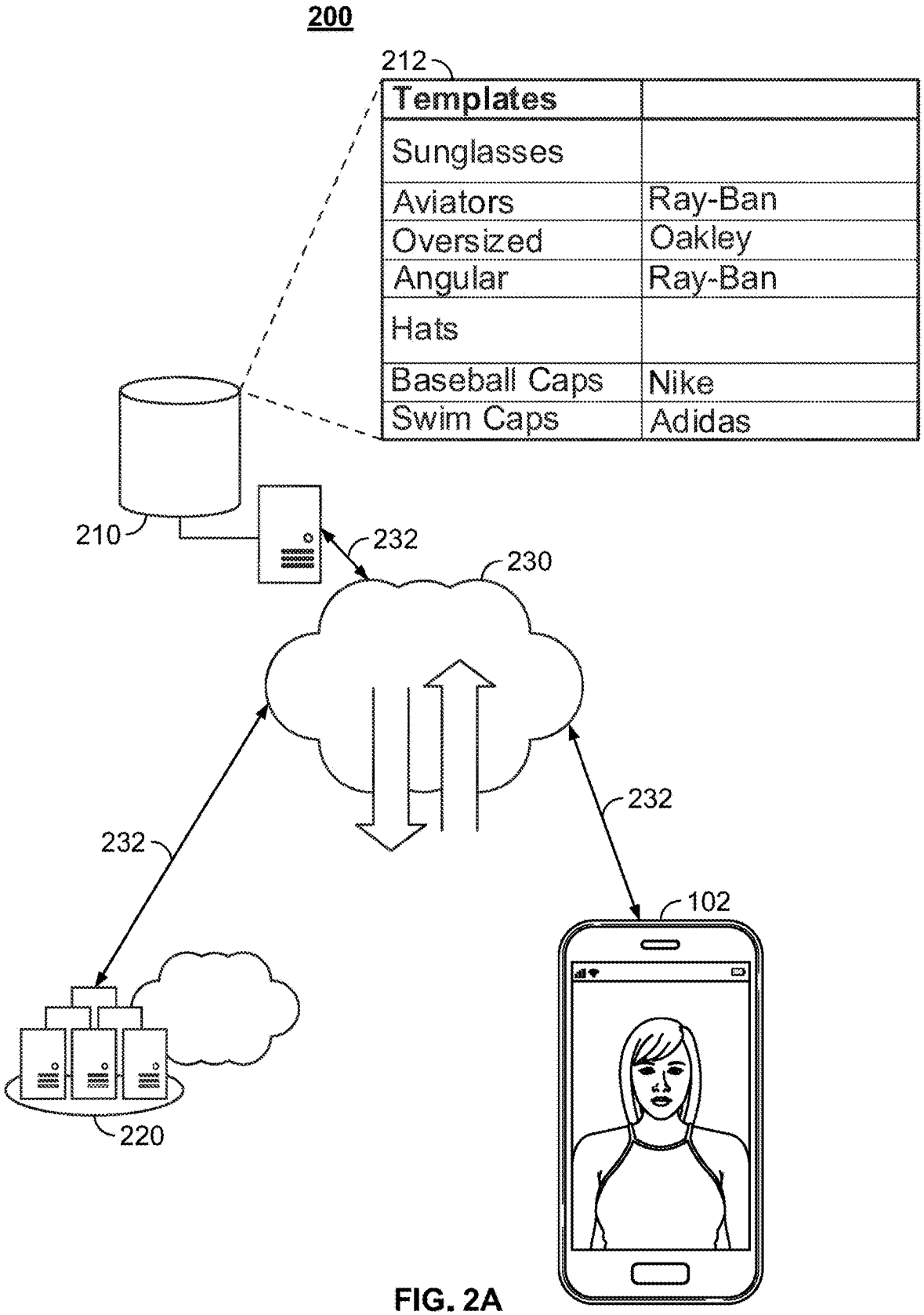

200
212
Templates
Sunglasses
Aviators
Ray-Ban
Oversized
Oakley
Angular
Ray-Ban
Hats
Baseball Caps
Nike
Swim Caps
Adidas
210
232
230
232
232
102
220

FIG. 2A

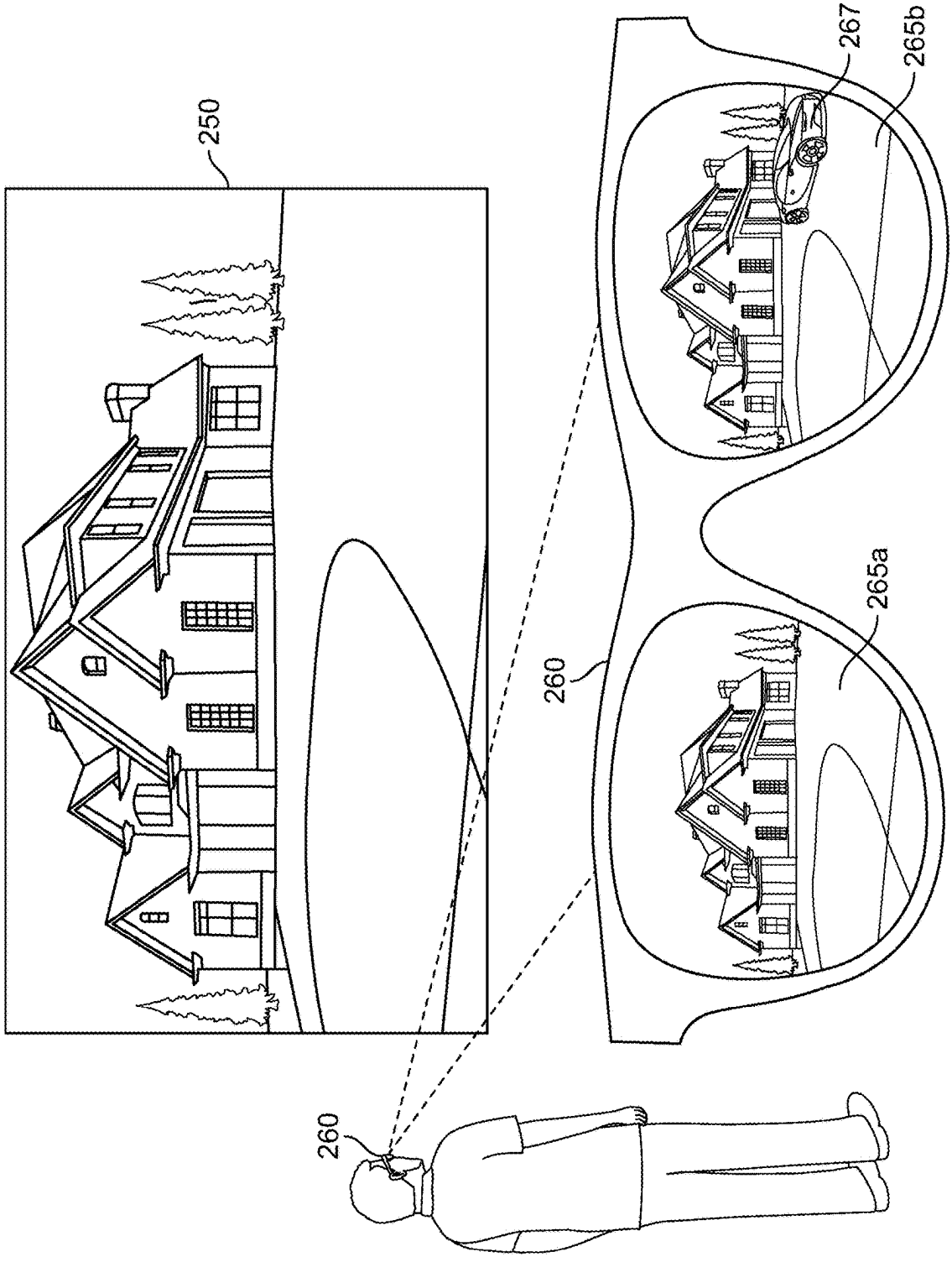
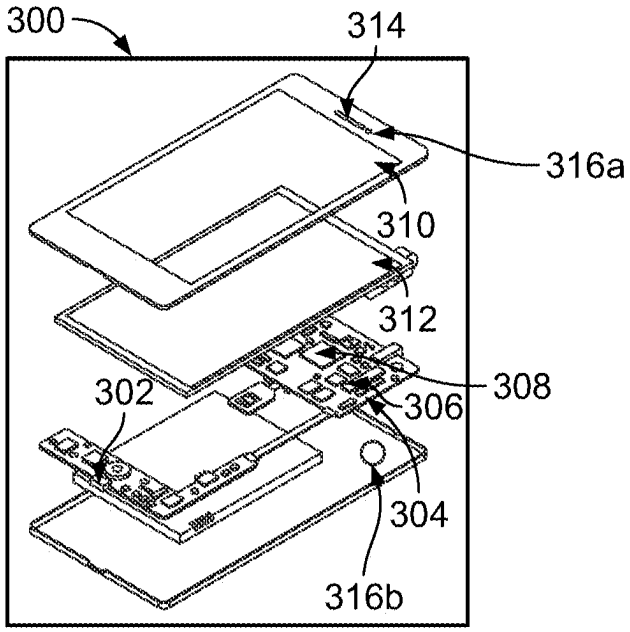



FIG. 2B


300
314
316a
310
312
308
306
302
304
316b

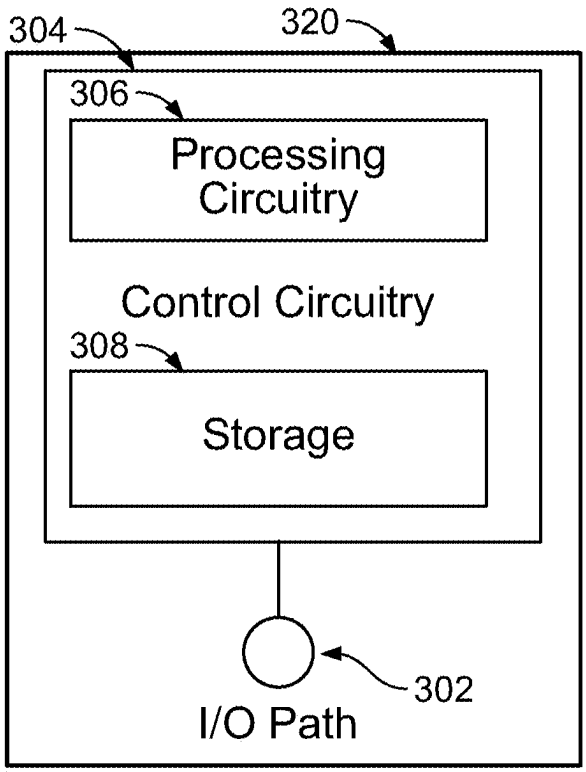

304
320
306
Processing Circuitry
Control Circuitry
308
Storage
302
I/O Path

FIG. 3

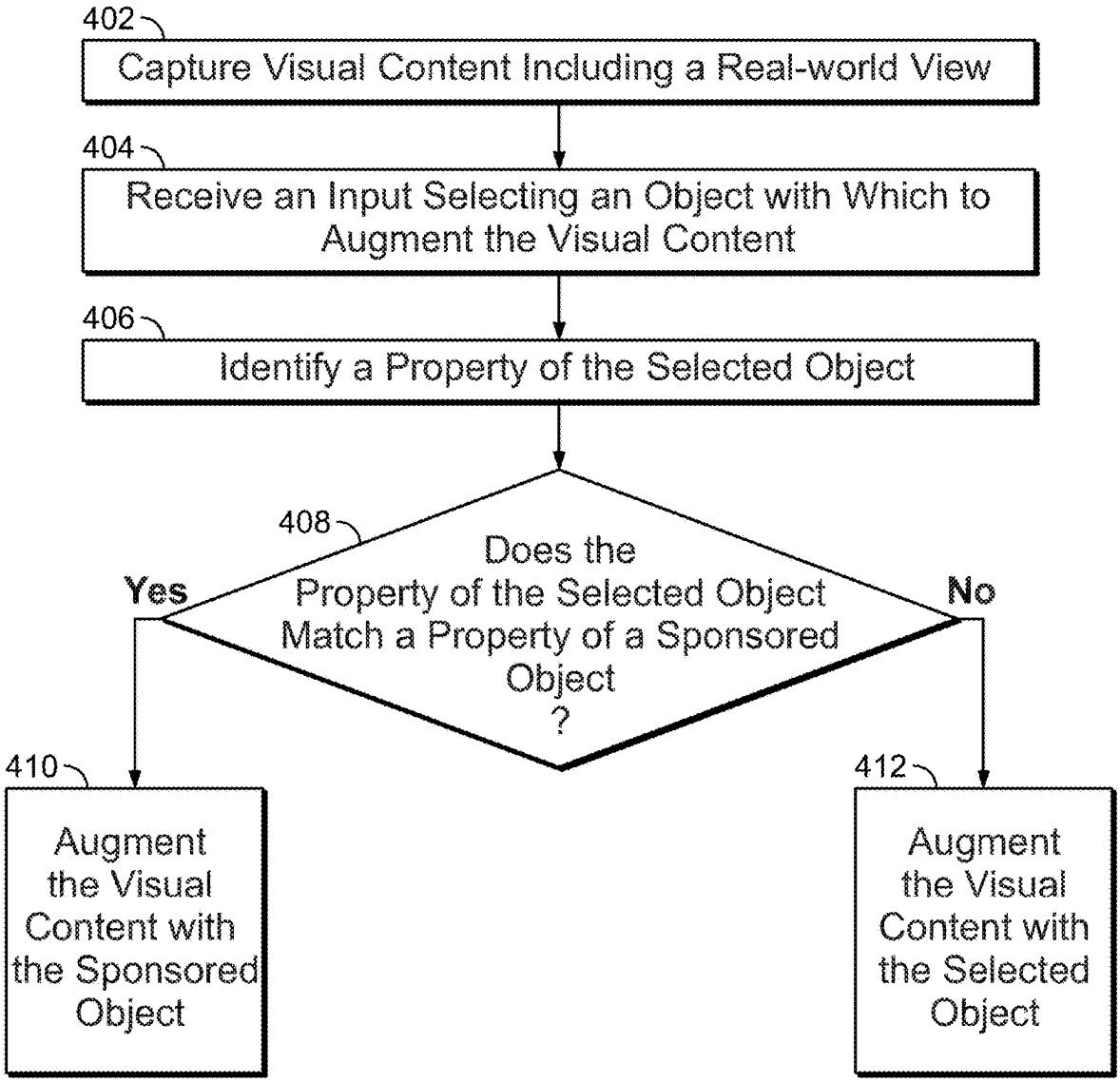

402
Capture Visual Content Including a Real-world View
404
Receive an Input Selecting an Object with Which to Augment the Visual Content
406
Identify a Property of the Selected Object
408
Does the Property of the Selected Object Match a Property of a Sponsored Object ?
Yes
No
410
Augment the Visual Content with the Sponsored Object
412
Augment the Visual Content with the Selected Object

FIG. 4

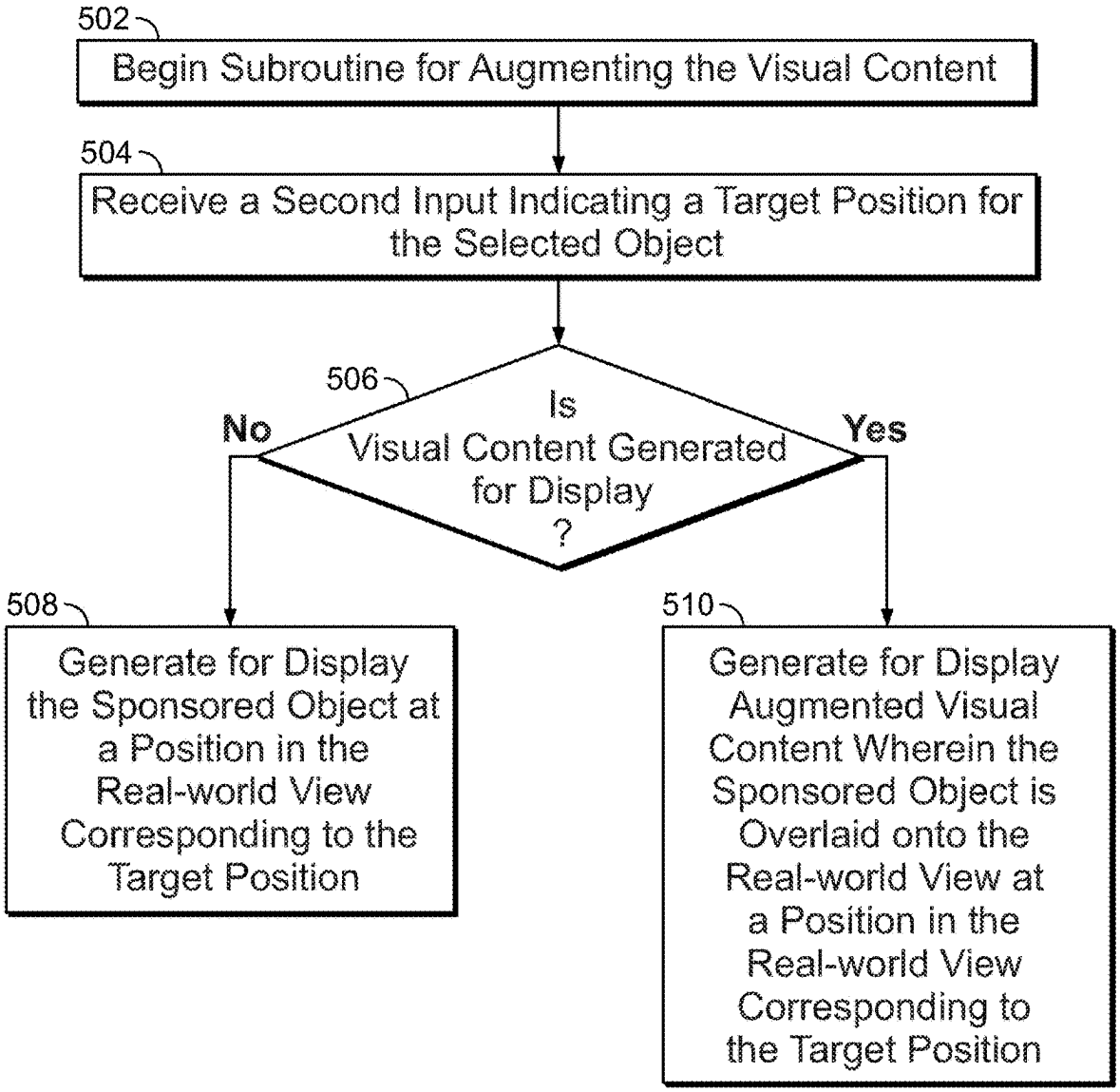

502
Begin Subroutine for Augmenting the Visual Content
504
Receive a Second Input Indicating a Target Position for the Selected Object
506
Is Visual Content Generated for Display ?
No
Yes
508
Generate for Display the Sponsored Object at a Position in the Real-world View Corresponding to the Target Position
510
Generate for Display Augmented Visual Content Wherein the Sponsored Object is Overlaid onto the Real-world View at a Position in the Real-world View Corresponding to the Target Position

FIG. 5

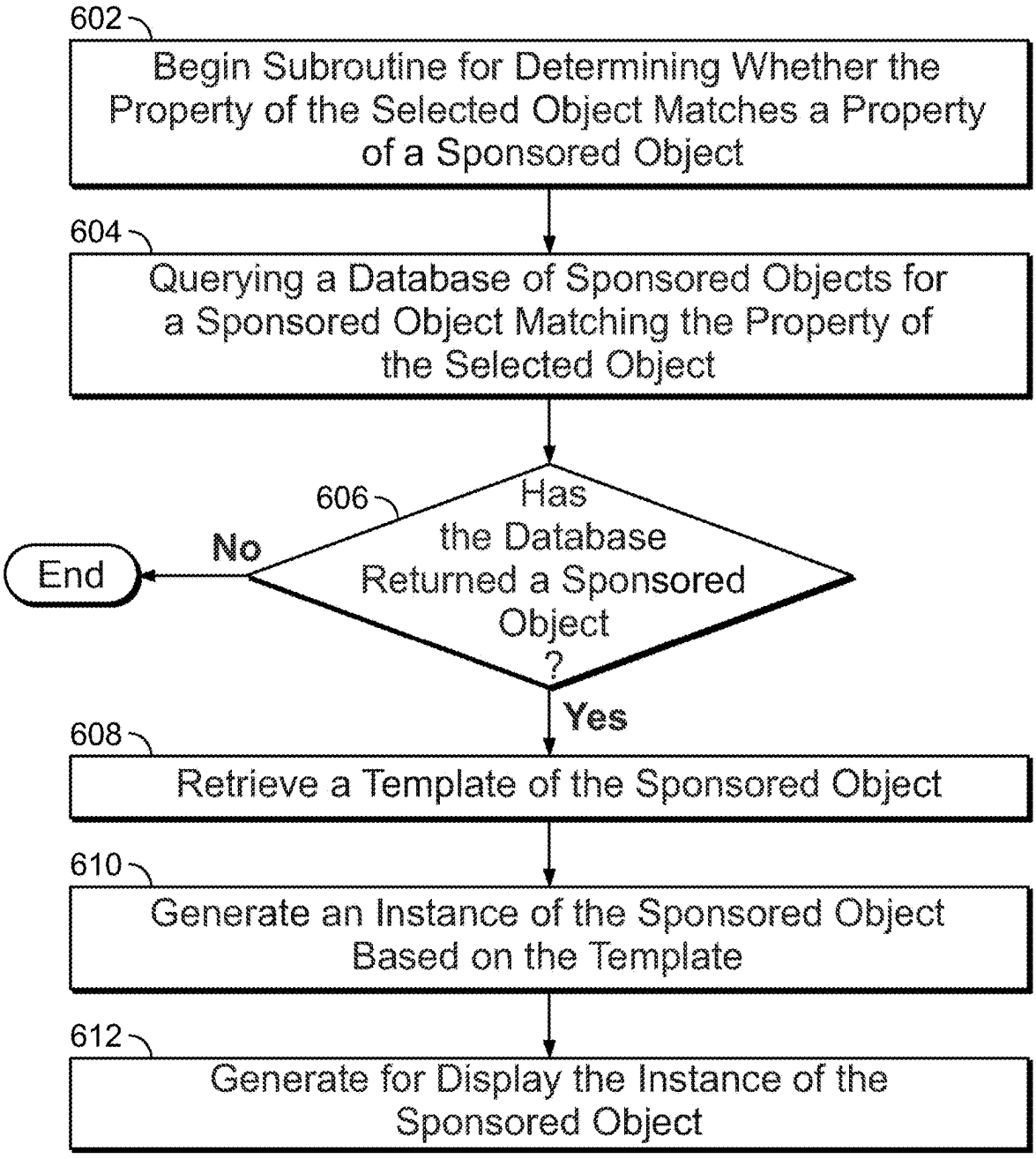

602
Begin Subroutine for Determining Whether the Property of the Selected Object Matches a Property of a Sponsored Object
604
Querying a Database of Sponsored Objects for a Sponsored Object Matching the Property of the Selected Object
606
Has the Database Returned a Sponsored Object ?
No
End
Yes
608
Retrieve a Template of the Sponsored Object
610
Generate an Instance of the Sponsored Object Based on the Template
612
Generate for Display the Instance of the Sponsored Object

FIG. 6

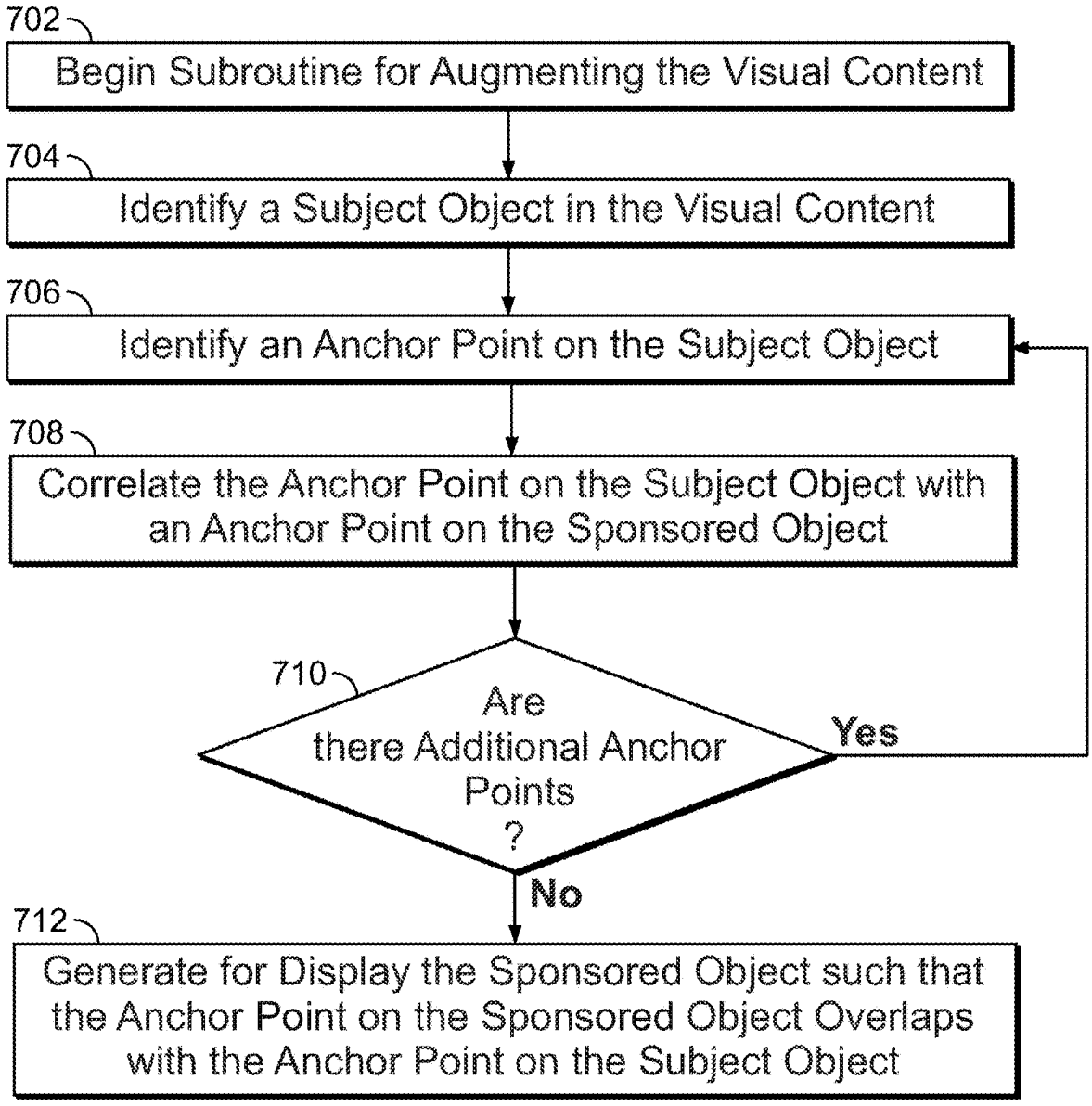

702
Begin Subroutine for Augmenting the Visual Content
704
Identify a Subject Object in the Visual Content
706
Identify an Anchor Point on the Subject Object
708
Correlate the Anchor Point on the Subject Object with an Anchor Point on the Sponsored Object
710
Are there Additional Anchor Points ?
Yes
No
712
Generate for Display the Sponsored Object such that the Anchor Point on the Sponsored Object Overlaps with the Anchor Point on the Subject Object

FIG. 7

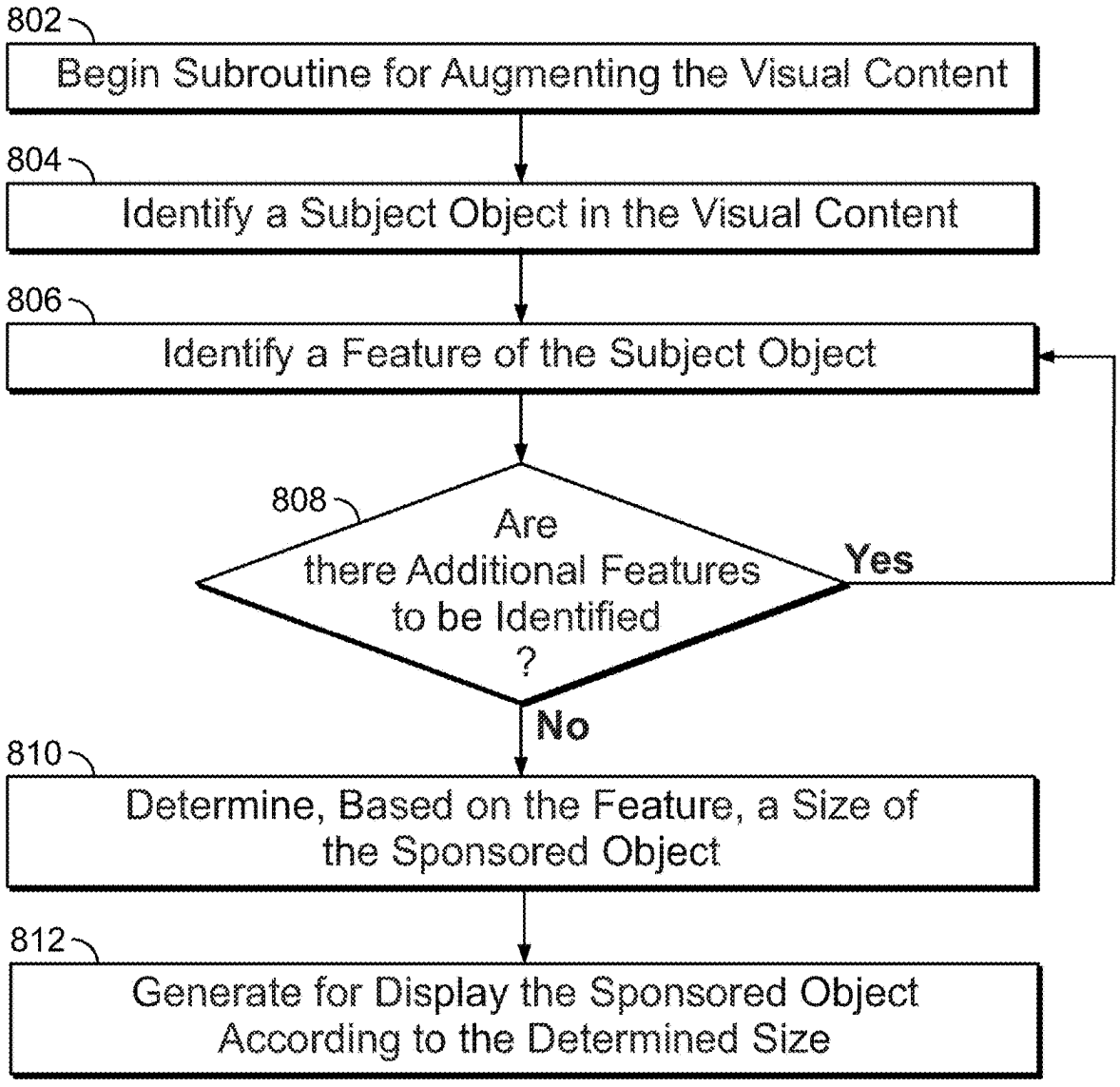

802
Begin Subroutine for Augmenting the Visual Content
804
Identify a Subject Object in the Visual Content
806
Identify a Feature of the Subject Object
808
Are there Additional Features to be Identified ?
Yes
No
810
Determine, Based on the Feature, a Size of the Sponsored Object
812
Generate for Display the Sponsored Object According to the Determined Size

FIG. 8

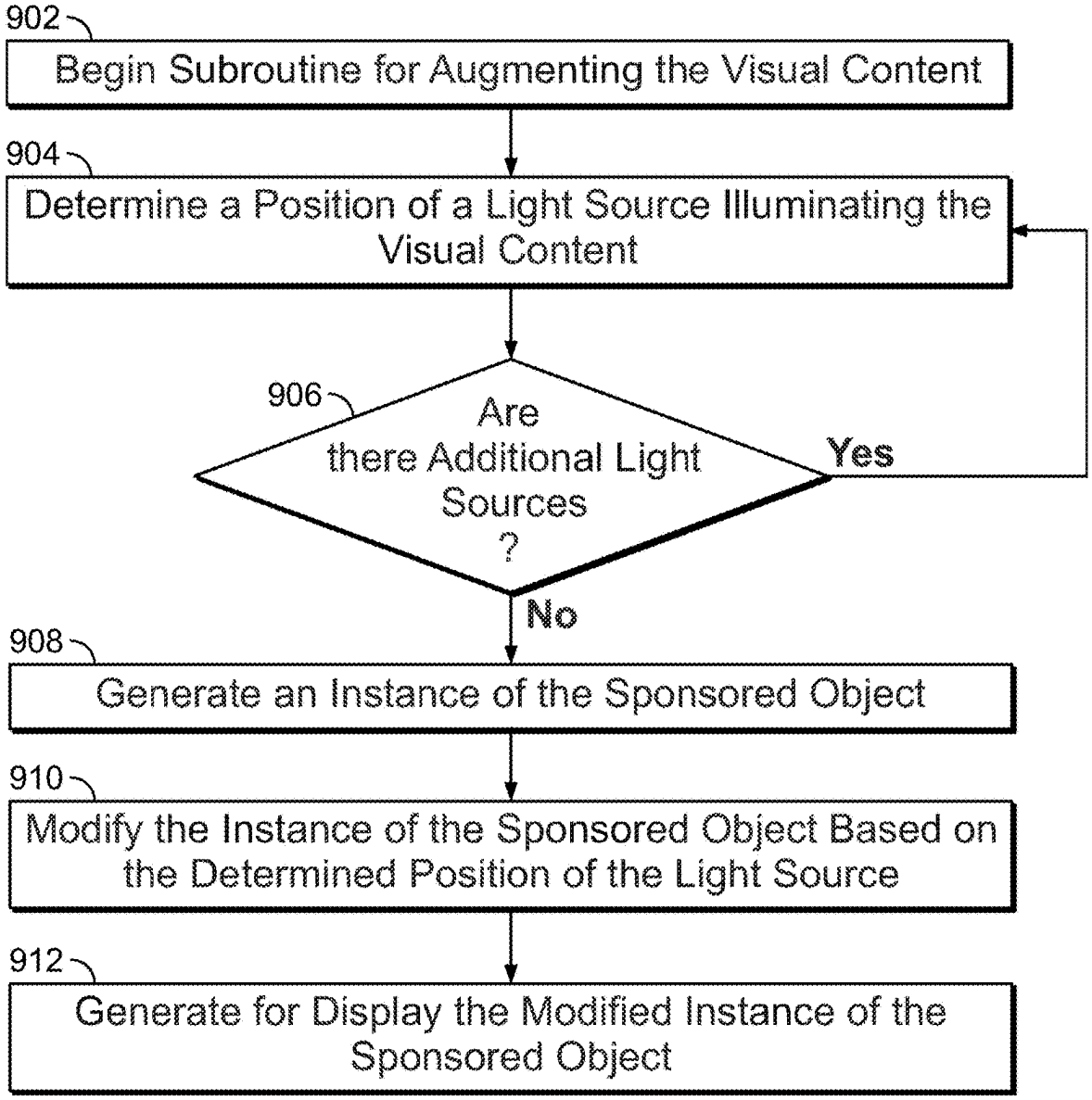

902
Begin Subroutine for Augmenting the Visual Content
904
Determine a Position of a Light Source Illuminating the Visual Content
906
Are there Additional Light Sources ?
Yes
No
908
Generate an Instance of the Sponsored Object
910
Modify the Instance of the Sponsored Object Based on the Determined Position of the Light Source
912
Generate for Display the Modified Instance of the Sponsored Object

FIG. 9

# METHODS AND SYSTEMS FOR AUGMENTING VISUAL CONTENT

## CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 17/253,454, filed Dec. 17, 2020, which is a national stage application under 35 U.S.C. § 371 of International Application PCT/US2018/059753, filed Nov. 8, 2018, each of which is hereby incorporated by reference herein in their entirety.

## BACKGROUND

The present disclosure relates to augmenting visual content, and more particularly, to methods and systems for generating for display sponsored augmented reality objects on a user display device in real time or in post-processing.

## SUMMARY

Augmented reality (AR) allows a user to view supplemental content superimposed onto an image or view of the real world. For example, in embodiments where the user views an image of the real world on an AR display (such as a smartphone), the supplemental content is overlaid on top of the real-world image as to appear to be part of the real-world image. In other embodiments, where the user views the real world through an AR display (such as AR glasses), the supplemental content is displayed in a portion of the AR display where the user would otherwise see a part of the real world. Such supplemental content enhances the user experience and allows the user to interact with and/or customize the real-world image to their liking. For example, the user can view and/or capture images of the real world with user-selected supplemental content superimposed thereon and/or integrated therein.

This creates an opportunity for application developers to generate revenue from marketers wishing to promote products to the user of the AR display. For example, a common method by which application developers provide free-to-use applications to users is by making the applications "ad-supported," meaning the developers generate income by advertisements placed in the applications instead of the users having to pay to use the applications. However, users often do not like unsolicited or intrusive advertisements appearing in applications. Conventional banner advertisements or pop-up advertisements can be especially bothersome to users of AR displays who want to view images of the real world that are being obscured by intrusive advertisements. There exists, therefore, a need for a way to insert advertisements or other revenue-generating content into images displayed on AR displays that is non-intrusive, and thus preferable, to users of the AR displays.

Accordingly, to overcome such problems, methods and systems are disclosed herein for augmenting visual content with promotional content that is both non-intrusive and specifically tailored to a user. In particular, the embodiments described herein provide for substituting sponsored objects for generic objects selected by a user when augmenting visual content. The sponsored objects may be branded and/or designed to accurately represent products promoted by marketers, thereby allowing the marketers to insert advertisements into the AR content requested by the user, and because the sponsored object is substituted for a generic object selected by the user, the advertisement is both non-intrusive (it is, after all, an object requested by the user) and specifically tailored to the user since the user requested that particular object to be placed in the AR content.

In one illustrative embodiment, a real-world image is displayed on an AR device, such as a smartphone. The real-world image may include a person. The AR device receives a selection of an object with which to augment the real-world image. For example, the AR device displays a list of objects with which the real-world image can be augmented, and a user may select a pair of generic aviator glasses from the list to add to the image of the person. Upon receiving the selection of the object (e.g., the generic aviator glasses), the AR device queries a database of sponsored objects for a sponsored object matching a property of the selected object. For example, a marketer may be promoting aviator glasses of a particular brand, and when the AR device queries the database of sponsored objects for aviator glasses, the database returns the sponsored aviator glasses. The AR device then augments the real-world image with the sponsored aviator glasses instead of the generic aviator glasses selected by the user. For example, the AR device displays the sponsored aviator glasses overlaid onto the image of the person. The AR device may further store the augmented real-world image. This allows the marketer to insert an advertisement (e.g., the sponsored aviator glasses) into augmented content generated based on a selection provided by the user and in a way that is non-intrusive to the user.

In another illustrative embodiment, a real-world environment is viewed through an AR device, such as AR glasses. The real-world environment may include a house with a driveway. The AR device receives a voice command from a user to show a sports car in the house's driveway. A marketer may be promoting a particular sports car, and upon receiving the selection, the AR device queries a database of sponsored objects for a sports car. The database then returns the sponsored sports car, whereafter the AR device substitutes the sponsored sports car for a generic sports car, and generates a display of the sponsored sports car such that when a user views the real-world environment through the AR glasses, the sponsored sports car appears in the house's driveway.

The present disclosure further describes methods and systems for receiving input specifying a target position where the object should be placed in the augmented content. For example, the user may specify that the aviator glasses should be placed on the face of the person in the image, or that the sports car should be placed in the house's driveway. In other embodiments, the methods and systems may automatically determine where to place the object in the augmented content. For example, the AR device may identify the face of the person in the image, retrieve a template of the aviator glasses from the database, and generate a display of the aviator glasses with a size relative to the size of the face of the person in the image, and at an appropriate position in the image (e.g., over the eyes and/or resting on the nose of the person in the image). In some embodiments, the appropriate position in which to place the object in the image may be determined based on one or more anchor points. For example, the nose and/or eyes of the person in the image may serve as anchor points for the aviator glasses, and may be correlated with corresponding anchor points included in the template of the aviator glasses, so as to guide placement and/or sizing of the aviator glasses. In still further embodiments, the methods and systems determine a position of a light source illuminating the real-world image. For example, the AR device determines a direction from which the sun is

shining on the house in the real-world environment. The AR device then adjusts a visual characteristic (e.g., a shadow) of the sports car based on the direction from which the sun is shining on the house, such that the shadow generated by the sports car is appropriate for the real-world environment.

## BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the disclosure will be apparent upon consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

FIG. **1** shows an illustrative example of a user interface for augmenting visual content with a sponsored object, in accordance with some embodiments of the disclosure;

FIG. **2**A shows an illustrative system for augmenting visual content with a sponsored object, in accordance with some embodiments of the disclosure;

FIG. **2**B shows an illustrative scenario for augmenting visual content with a sponsored object, in accordance with some embodiments of the disclosure;

FIG. **3** shows a diagram of illustrative devices of the system of FIG. **2**A, in accordance with some embodiments of the disclosure;

FIG. **4** is a flowchart of an illustrative process for augmenting visual content with a sponsored object, in accordance with some embodiments of the disclosure;

FIG. **5** is a flowchart of a detailed illustrative process for generating augmented visual content, in accordance with some embodiments of the disclosure;

FIG. **6** is a flowchart of a detailed illustrative process for determining whether a property of a selected object matches a property of a sponsored object, in accordance with some embodiments of the disclosure;

FIG. **7** is a flowchart of a detailed illustrative process for positioning a sponsored object in visual content, in accordance with some embodiments of the disclosure;

FIG. **8** is a flowchart of another detailed illustrative process for positioning a sponsored object in visual content, in accordance with some embodiments of the disclosure;

FIG. **9** is a flowchart of a detailed illustrative process for modifying a sponsored object based on a light source illuminating visual content, in accordance with some embodiments of the disclosure.

## DETAILED DESCRIPTION

FIG. **1** shows an illustrative example of a user interface for augmenting visual content with a sponsored object, in accordance with some embodiments of the disclosure. In particular, FIG. **1** shows a scenario **100** where an augmented reality (AR) device **102** displays visual content **104**, including a subject object **106**, that has been augmented with a sponsored object **108** having a branding **110**. AR device **102** may be any device capable of displaying visual and/or augmented content, such as a smartphone, tablet computer, AR glasses, AR head-mounted display (HMD), virtual reality (VR) HMD, or any other user equipment usable to display visual content **104**, and/or combination of the same.

In that regard, visual content **104** is a live video or other live-captured moving image, three-dimensional image, panoramic or other immersive image (e.g., a 360-degree image or series of live images surrounding a particular viewpoint), live VR or AR renderings, and/or any other live-captured visual media or combination of the same. For example, visual content **104** may be a live-capture or live-stream of images received from one or more lenses or image-capturing devices.

Subject object **106** may be any feature or element included in visual content **104**. Subject object **106** may be the focus of visual content **104** (e.g., the visual content may be an image of a person, as shown in FIG. **1**), or may be one of a plurality of features or elements included in the visual content. Sponsored object **108** may correspond to a generic object that a user has selected for augmenting visual content **104**, as further described below. In some embodiments, sponsored object **108** represents a product that is being promoted by a marketer. For example, as shown in FIG. **1**, sponsored object **108** is a pair of aviator glasses with branding **110** "RAY-BAN" included thereon. In an illustrative embodiment described below, the user selects a generic pair of aviator sunglasses with which to augment visual content **104**, and AR device **102** instead augments visual content **104** with sponsored object **108** (e.g., the RAY-BAN aviator glasses).

FIG. **2**A shows an illustrative system for augmenting visual content. In particular, FIG. **2**A shows a system **200** where AR device **102** displays visual content **104**. Visual content **104** may be captured by AR device **102**, or may be received from a content source **210** via a communication link **232**. Content source **210** may be any server or storage device from which visual content **104** may be retrieved by AR device **102**. The communication link **232** may be any network or communication equipment or medium by means of which visual content **104** can be retrieved from content source **210**. In one illustrative example, the communication link **232** includes devices connected via the Internet.

One or more applications for augmenting visual content may be implemented on any one or a combination of AR device **102**, content source **210**, and/or an application server **220**, each of which may function as a stand-alone device or may be part of a network of devices. Various network configurations of devices may be implemented and are discussed in more detail below. In the system **200**, there may be multiple AR devices **102**, but only one is shown in FIG. **2** to avoid overcomplicating the drawing.

AR device **102** may be coupled to a communication network **230**. Communication network **230** may be one or more networks including the Internet, a mobile phone network, mobile voice or data network (e.g., a 4G or LTE network), cable network, public switched telephone network, or other types of communication network or combinations of communication networks. Content source **210**, application server **220**, and AR device **102** may be connected to communication network **230** via one or more communication paths **232**, such as, a satellite path, a fiber-optic path, a cable path, free-space connections (e.g., for wireless signals), or any other suitable wired or wireless communication path or combination of such paths.

Although communication paths **232** are not drawn directly between AR device **102** and content source **210** or application server **220**, these devices may communicate directly with each other via communication paths **232**, such as short-range point-to-point communication paths, such as USB cables, IEEE 1394 cables, wireless paths (e.g., Bluetooth, infrared, IEEE 802-11x, etc.), or other short-range communication via wired or wireless paths. BLUETOOTH is a certification mark owned by Bluetooth SIG, INC. The devices may also communicate with each other directly through an indirect path via communication network **230**.

The system **200** may include more than one content source **210**, but only one is shown in FIG. **2** to avoid

overcomplicating the drawing. In addition to being a source for visual content **104**, content source **210** may include one or more databases **212** of sponsored objects **108**. Database **212** includes one or more tables of sponsored objects **108** and their corresponding brandings **110**. In some embodiments, database **212** includes a table of properties associated with a sponsored object **108**. For example, as shown in FIG. **2**A, database **212** includes a table in which two types of sponsored objects (e.g., sunglasses and hats) are listed with various properties (e.g., aviators, oversized, angular) and brandings **110** (e.g., RAY-BAN, OAKLEY, NIKE, ADIDAS) associated with each. In some embodiments, content source **210** stores a plurality of templates of sponsored objects **108** associated with each of the sponsored objects **108** included in database **212**. The templates of the sponsored objects **108** may include design parameters and/or other data enabling AR device **102** and/or application server **220** to generate an instance (e.g., a rendering) of the associated sponsored object **108**. Content source **210** may also include different types of content (including visual content stored by a user), in a location remote from AR device **102**.

Metadata may be associated with visual content **104** and/or the selected or sponsored object **108**. The metadata may include indications or properties of subject object **106**, one or more anchor points or features of subject object **106**, properties of sponsored object **108**, user preferences, user profile information, and/or any other type of data that enables a computer to match a selected object with a sponsored object **108** and/or determine an appropriate size for and position at which to place sponsored object **108** in visual content **104**.

The augmented content generation application may be, for example, a stand-alone application implemented on one or more of the devices described above. For example, the augmented content generation application may be implemented as software or a set of executable instructions which may be stored in storage **308** (described below with reference to FIG. **3**), and executed by control circuitry **304** (described below with reference to FIG. **3**) of AR device **102**. In some embodiments, the augmented content generation application is a client/server application where only a client application resides on AR device **102**, and a server application resides on application server **220**. For example, an augmented content generation application may be implemented partially as a client application on control circuitry **304** of AR device **102** and partially on application server **220** as a server application running on control circuitry **304** of application server **220**. When executed by control circuitry **304** of application server **220**, the augmented content generation application may instruct control circuitry **304** to generate the augmented content generation application output (e.g., sponsored object **108** or the augmented visual content) and transmit the generated output to AR device **102**. The server application may instruct control circuitry **304** of content source **210** to transmit a template for and/or metadata associated with sponsored object **108** to application server **220** and/or AR device **102**. The client application may instruct control circuitry **304** of AR device **102** to generate the augmented content generation application output (e.g., sponsored object **108** and/or the augmented content).

AR device **102** may operate in a cloud computing environment to access cloud services. In a cloud computing environment, various types of computing services for content sharing, storage or distribution (e.g., informational sites or social networking sites) are provided by a collection of network-accessible computing and storage resources, referred to as "the cloud." For example, content source **210** and application server **220** provide computing and storage resources to AR device **102**. Cloud resources may be accessed by AR device **102** using, for example, a web browser, a desktop application, a mobile application, and/or any combination of access applications of the same. AR device **102** may be a cloud client that relies on cloud computing for application delivery, or AR device **102** may have some functionality without access to cloud resources. In some embodiments, the AR device **102** uses cloud resources for processing operations, such as the processing operations performed by the processing circuitry **306** of application server **220**, described in relation to FIG. **3**. Some applications running on AR device **102** may be cloud applications, that is, applications delivered as a service over the Internet, while other applications may be stored and run on AR device **102**. An example of such an embodiment is further described below with reference to FIG. **2**B.

FIG. **2**B shows a scenario wherein visual content is augmented with a sponsored object, in accordance with some embodiments of the disclosure. In FIG. **2**B, visual content **104** is a real-world view **250** as viewed with an AR device **260**. In the example shown in FIG. **2**B, real-world view **250** includes a house with a driveway, and a user views real-world view **250** via AR glasses. The user then provides, and AR device **260** receives, an instruction (e.g., a voice command) to augment real-world view **250** with an object. For example, the user may provide a voice command to "show a sports car in the driveway."

Upon receiving the instruction, AR device **260** sends a request to application server **220** to augment real-world view **250** with the object selected by the user. Application server **220** identifies a property of the selected object (e.g., that the object is a sports car), and queries database **212** of the content server **210** for a sponsored object **108** matching the property of the selected object. The content server **210** then returns a matching sponsored object **108** (e.g., a template of a sponsored sports car) to application server **220**. Upon receiving sponsored object **108**, application server **220** generates an instance of sponsored object **108** based on the template to provide to AR device **260** or provides the template of sponsored object **108** to AR device **260**.

AR device **260** then generates for display sponsored object **108**. For example, as shown in FIG. **2**B, the AR glasses includes a left view **265***a* and a right view **265***b*. Left view **265***a* matches real-world view **250**. Right view **265***b* shows real-world view **250** with an instance **267** of sponsored object **108** overlaid thereon. For example, right view **265***b* shows a sports car **267** in the driveway of the house. In some embodiments, both left view **265***a* and right view **265***b* of AR device **260** display instance **267** of sponsored object **108**.

FIG. **3** shows a generalized embodiment of illustrative user device **300** and server device **320**. As depicted, user device **300** may be a smartphone or tablet, although those skilled in the art will appreciate that various other devices, such as cameras, AR or virtual reality glasses or other head-mounted displays, etc., may be also be used for augmenting visual content with a sponsored object, and may have the same or similar components to those of user device **300**. The user devices **300** may receive content and data via an input/output (hereinafter "I/O") path **302**. I/O path **302** may provide visual content (e.g., Internet content, content available over a local area network (LAN) or wide area network (WAN), and/or other content), objects for augmenting the visual content, and data to control circuitry **304**, which includes processing circuitry **306** and storage **308**. Control circuitry **304** may be used to send and receive

commands, requests, and other suitable data using I/O path **302**. I/O path **302** may connect control circuitry **304** (and specifically processing circuitry **306**) to one or more communication paths (described below). I/O functions may be provided by one or more of these communication paths, but are shown as a single path in FIG. **3** to avoid overcomplicating the drawing.

Control circuitry **304** may be based on any suitable processing circuitry such as processing circuitry **306**. As referred to herein, processing circuitry should be understood to mean circuitry based on one or more microprocessors, microcontrollers, digital signal processors, programmable logic devices, field-programmable gate arrays (FPGAs), application-specific integrated circuits (ASICs), etc., and may include a multi-core processor (e.g., dual-core, quad-core, hexa-core, or any suitable number of cores) or super-computer. In some embodiments, processing circuitry is distributed across multiple separate processors or processing units, for example, multiple of the same type of processing units (e.g., two Intel Core i7 processors) or multiple different processors (e.g., an Intel Core i5 processor and an Intel Core i7 processor). In some embodiments, control circuitry **304** executes instructions for an augmented content generation application stored in memory (i.e., storage circuitry **308**). Specifically, control circuitry **304** may be instructed by the augmented content generation application to perform the functions discussed above and below.

In client/server-based embodiments, control circuitry **304** includes communication circuitry suitable for communicating with an augmented content generation application server or other networks or servers. The instructions for carrying out the above-mentioned functionality may be stored on a server. The communication circuitry may include a cable modem, an integrated services digital network (ISDN) modem, a digital subscriber line (DSL) modem, a telephone modem, Ethernet card, or a wireless modem for communication with other equipment, or any other suitable communication circuitry. Such communication may involve the Internet or any other suitable communication networks or paths. In addition, communication circuitry may include circuitry that enables peer-to-peer communication of devices, or communication of devices in locations remote from each other.

Memory may be an electronic storage device provided as storage circuitry **308** that is part of control circuitry **304**. As referred to herein, the phrase "electronic storage device" or "storage device" should be understood to mean any device for storing electronic data, computer software, or firmware, such as random-access memory, hard drives, optical drives, solid state devices, quantum storage devices, or any other suitable fixed or removable storage devices, and/or any combination of the same. Nonvolatile memory may also be used (e.g., to launch a boot-up routine and other instructions). Cloud-based storage, described in relation to FIG. **2**, may be used to supplement storage circuitry **308** or instead of storage circuitry **308**.

Control circuitry **304** may include image-generating circuitry and/or image-processing circuitry. Control circuitry **304** may be used by user device **300** to receive and to display, to play, and/or to record visual content and/or augmented content. The circuitry described herein, including, for example, the image-generating circuitry or image-processing circuitry, may be implemented using software running on one or more general purpose or specialized processors. If storage circuitry **308** is provided as a separate device from user device **300**, the image-generating circuitry or image-processing circuitry may be associated with storage circuitry **308**.

Server device **320** may be implemented in a single, array, and/or cloud architecture. Server device **320** includes an I/O path **302** connected to control circuitry **304** including processing circuitry **306** and storage circuitry **308**. I/O path **302**, control circuitry **304**, processing circuitry **306**, and storage circuitry **308** of server device **320** may be similar to I/O path **302**, control circuitry **304**, processing circuitry **306**, and storage circuitry **308** of user device **300**, and may have similar features and functionality.

A user may send instructions to control circuitry **304** using a user input interface **310** of user device **300**. User input interface **310** may be any suitable user interface, such as a remote control, mouse, trackball, keypad, keyboard, touchscreen, touchpad, stylus input, joystick, voice recognition interface, or other user input interfaces. Display **312** may be a touchscreen or touch-sensitive display. In such circumstances, user input interface **310** may be integrated with or combined with display **312**. Speakers **314** may be provided as integrated with other elements of user device **300**. User device **300** may further include one or more lenses **316***a* and/or **316***b*. Lenses **316***a*, **316***b* may be used to capture visual content, as described herein.

The augmented content generation application may be implemented using any suitable architecture. For example, it may be a stand-alone application wholly implemented on user device **300**. The augmented content generation application and/or any instructions for performing any of the embodiments described herein may be encoded on computer-readable media. Computer-readable media includes any media capable of storing data. In some embodiments, the content generation application is a client/server-based application. Data for use by a thick or thin client implemented on user device **300** is retrieved on demand by issuing requests to a server, such as server device **320**, remote from user device **300**. For example, user device **300** may receive inputs from the user via the input interface **310** and transmit those inputs to the remote server for processing and generating the corresponding outputs. The generated output is then transmitted to the user device **300** for presentation to the user. Those skilled in the art will appreciate that AR device **102** of FIG. **1** and AR device **260** of FIG. **2**B may be implemented as user device **300** of FIG. **3**.

FIG. **4** is a flowchart of an illustrative process for augmenting visual content with a sponsored object, in accordance with some embodiments of the disclosure. A process **400** for providing augmenting visual content with a sponsored object may begin at block **402**, where control circuitry, such as control circuitry **304** described above, captures visual content **104** including a real-world view **250**. Control circuitry **304** may capture visual content **104** via one or more lenses **316**. In some embodiments, control circuitry **304** retrieves visual content **104** from storage **308**. For example, control circuitry **304** may capture an image of a person.

At block **404**, control circuitry **304** receives an input selecting a generic object with which to augment visual content **104**. Control circuitry **304** may receive the input via user input interface **310**. For example, control circuitry **304** receives a touch input from the user via user input interface **310** selecting the generic object with which to augment visual content **104** or receives a voice command selecting the generic object with which to augment visual content **104**. In some embodiments, display **312** displays a list of avail-

able generic objects, and control circuitry **304** then receives a selection via user input interface **310** of one of the available generic objects.

At block **406**, control circuitry **304** identifies a property of the selected object. Control circuitry **304** may analyze metadata associated with the selected object to identify the property of the selected object. In some embodiments, control circuitry **304** processes audio received as part of a voice command to identify the property of the selected object. The property of the selected object may be an explicit property (e.g., the voice command may specify the property of the selected object) or an implicit property (e.g., control circuitry **304** first needs to identify what the selected object is in order to identify the property of the selected object). For example, control circuitry **304** may receive a voice command from the user, determine that the voice command includes an instruction to augment visual content **104** with aviator glasses, and then identify a property of aviator glasses (e.g., a keyword, identifier, characteristic, etc.).

At block **408**, control circuitry **304** determines whether the property of the selected object matches a property of a sponsored object **108**. As further described below with reference to FIG. **6**, control circuitry **304** may query a database **212** of sponsored objects for a sponsored object matching the property of the selected object identified at block **406**. In response to determining that the property of the selected object matches a property of a sponsored object **108**, the process **400** proceeds to block **410**. In response to determining that the property of the selected object does not match a property of any sponsored objects, the process **400** proceeds to block **412**.

At block **410**, control circuitry **304** augments visual content **104** with sponsored object **108** instead of the selected object. As described further below with reference to FIGS. **5** and **7-9**, control circuitry **304** may overlay sponsored object **108** onto visual content **104**, or may generate augmented content including sponsored object **108** and visual content **104**. For example, control circuitry **304** may overlay sponsored aviator glasses onto the image of the person.

At block **412**, control circuitry **304** augments the visual content with the selected object. For example, control circuitry **304** overlays the generic object selected at block **404** onto visual content **104**.

FIG. **5** is a flowchart of a detailed illustrative process for augmenting visual content **104** with a sponsored object **108**, in accordance with some embodiments of the disclosure. A process **500** for augmenting visual content may begin at block **502**.

At block **504**, control circuitry **304** receives a second input indicating a target position for the selected object. Control circuitry **304** may receive the second input via user input interface **310**, such as via a touch input from the user specifying a position in visual content **104** in which to place the selected object. In some embodiments, control circuitry **304** receives the second input as a voice command, either together with or separate from the first voice command selecting the object, specifying where to place the selected object. For example, control circuitry **304** receives a voice command instructing control circuitry **304** to "show a sports car in the driveway." Control circuitry **304** may then process the voice command to determine that the sports car is the selected object and the driveway is the target position.

At block **506**, control circuitry **304** determines whether visual content **104** is being generated for display. Control circuitry **304** may determine whether visual content **104** captured at block **402** is being generated for display (e.g., visual content **104** is displayed on AR device **102**), or was merely captured for processing purposes (e.g., visual content **104** is not displayed, that is, real-world view **250** is viewed through AR device **260**). In response to determining that visual content **104** is not being generated for display, the process **500** proceeds to block **508**. In response to determining that visual content **104** is being generated for display, the process **500** proceeds to block **510**.

At block **508**, control circuitry **304** generates for display sponsored object **108** at a position in real-world view **250** corresponding to the target position. For example, control circuitry **304** generates for display the sponsored sports car such that it appears to be in the driveway. In that regard, the target position, once identified, may be a fixed position in real-world view **250**, and control circuitry **304** determines where on the display of AR device **260** to display sponsored object **108** such that it appears to be at the target position in real-world view **250**.

At block **510**, control circuitry **304** generates for display augmented visual content wherein the sponsored object is overlaid onto real-world view **250** at a position in real-world view **250** corresponding to the target position. For example, control circuitry **304** identifies a position on visual content **104** matching the target position, and overlays sponsored object **108** onto visual content **104** at the position matching the target position.

FIG. **6** is a flowchart of a detailed illustrative process for determining whether a property of a selected object matches a property of a sponsored object **108**, in accordance with some embodiments of the disclosure. A process **600** for determining whether a property of a selected object matches a property of a sponsored object **108** may begin at block **602**.

At block **604**, control circuitry **304** queries a database **212** of sponsored objects **108** for a sponsored object **108** matching the property of the selected object identified at block **406**. In some embodiments, control circuitry **304** sends a request for a sponsored object **108** matching the property of the selected object identified at block **406** to the content server **210**, and the content server **210** queries database **212** for sponsored objects **108** matching the identified property.

At block **606**, control circuitry **304** determines whether database **212** has returned a sponsored object **108** matching property of the selected object identified at block **406**. For example, control circuitry **304** determines whether any objects were returned in response to the query of block **604**. In response to determining that database **212** has not returned any sponsored objects **108**, the process **600** ends. In response to determining that database **212** has returned a sponsored object **108**, the process **600** proceeds to block **608**.

At block **608**, control circuitry **304** retrieves a template of sponsored object **108** matching the property of the selected object identified at block **406**. Control circuitry **304** may retrieve the template of sponsored object **108** from content source **210** and/or from database **212**. For example, database **212** may return an identifier of a sponsored object **108** in response to the query of block **604**, and control circuitry **304** then retrieves a sponsored object **108** matching the identifier from content source **210**.

At block **610**, control circuitry **304** generates an instance of sponsored object **108** based on the template retrieved at block **608**. For example, the template may include design specifications and/or other data describing sponsored object **108**, and control circuitry **304** may generate the instance of sponsored object **108** according to the design specifications.

At block **612**, control circuitry **304** generates for display the instance of sponsored object **108** generated at block **610**.

For example, control circuitry **304** may cause AR device **102** and/or AR device **260** to display the instance of sponsored object **108**, as described at blocks **410**, **508**, and/or **510**.

FIG. **7** is a flowchart of a detailed illustrative process for augmenting visual content **104** with a sponsored object **108**, in accordance with some embodiments of the disclosure. A process **700** for augmenting visual content may begin at block **702**.

At block **704**, control circuitry **304** identifies a subject object **106** in visual content **104**. For example, control circuitry **304** processes visual content **104**, such as by using object detection and/or pattern recognition algorithms, to identify a subject object **106** in visual content **104**. In some embodiments, subject object **106** is a focus of visual content **104**. For example, in an embodiment where visual content **104** is an image of a person, the person is subject object **106** in visual content **104**. In another example where the visual content is a real-world view **250** of a house with a driveway, the driveway may be subject object **106**. Subject object **106** may be specified in input received from a user or may be automatically determined based on visual content **104**. For example, if the user provides a command instructing AR device **260** to "show a sports car in the driveway," control circuitry **304** may determine that the user's specification of the driveway indicates subject object **106** in visual content **104**, and may then process visual content **104** to identify the driveway.

At block **706**, control circuitry **304** identifies an anchor point on subject object **106**. For example, control circuitry **304** determines whether subject object **106** includes any identifiable landmarks. In embodiments where subject object **106** is a person, the landmarks may be facial features, such as the person's eyes or nose, and control circuitry **304** may identify the person's eyes or nose in visual content **104**. Control circuitry **304** may then identify one or more of the facial features as an anchor point. In some embodiments, control circuitry **304** determines the landmarks to identify based on a type of subject object **106** identified at block **704**. For example, if control circuitry **304** identifies subject object **106** as being a person, control circuitry **304** may query a database for potential landmarks and/or templates of landmarks that may be included in an image of a person, and then process visual content **104** to identify the potential landmarks in visual content **104**, and therefrom the anchor points.

At block **708**, control circuitry **304** correlates the anchor point on subject object **106** with an anchor point on sponsored object **108**. For example, control circuitry **304** may retrieve metadata associated with sponsored object **108** to identify anchor points on sponsored object **108**. The metadata may further indicate which anchor points on sponsored object **108** correspond to which types of anchor points on subject object **106**. For example, the metadata may indicate that a particular anchor point on sponsored object **108** should be correlated with an anchor point on the bridge of a person's nose. Control circuitry **304** then determines which anchor points on sponsored object **108** has been identified, and whether those anchor points match any of the anchor points indicated in the metadata.

At block **710**, control circuitry **304** determines whether there are any additional anchor points on subject object **106** to be identified. For example, control circuitry **304** may determine, based on the type of the subject object identified at block **704**, whether there are any known potential landmarks remaining to be identified, and that, if so, there are thus additional anchor points associated with those landmarks to be identified. In response to determining that there are additional anchor points on subject object **106** to be identified, the process **700** returns to block **706**. In response to determining that there are no additional anchor points on subject object **106** to be identified, the process **700** proceeds to block **712**.

At block **712**, control circuitry **304** generates for display sponsored object **108** such that the anchor points on sponsored object **108** identified at block **708** overlap with the anchor points on subject object **106** identified at block **706**. For example, control circuitry **304** overlays sponsored object **108** onto visual content **104** such that the anchor points on sponsored object **108** overlap with the anchor points on subject object **106**.

FIG. **8** is a flowchart of a detailed illustrative process for augmenting visual content **104** with a sponsored object **108**, in accordance with some embodiments of the disclosure. A process **800** for augmenting visual content may begin at block **802**.

At block **804**, control circuitry **304** identifies subject object **106** in the visual content **104**. The process for identifying subject object **106** may be similar to the process described at block **704**, and will not be repeated for the purpose of brevity.

At block **806**, control circuitry **304** identifies a feature of subject object **106**. In some embodiments, after identifying subject object **106** in visual content **104**, control circuitry **304** retrieves data indicating potential features of subject object **106**. For example, if control circuitry **304** identifies subject object **106** as being a person, control circuitry **304** may retrieve data from content source **210** indicating the types of features found on a person. The features of subject object **106** may be the head of subject object **106** or some other part indicative of a relative size of subject object **106**. Control circuitry **304** may then identify the features in the visual content.

At block **808**, control circuitry **304** determines whether there are additional features to be identified. For example, control circuitry **304** may determine whether each of the potential features of subject object **106** retrieved from content source **210** have been identified or determined to be unidentifiable in visual content **104**. In response to determining that there are additional features of subject object **106** to be identified, the process **800** returns to block **806**. In response to determining that there are no additional features of subject object **106** left to be identified, the process **800** proceeds to block **810**.

At block **810**, control circuitry **304** determines a size of sponsored object **108**. For example, control circuitry **304** may determine, based on the size of a feature of subject object **106** identified at block **806**, what the relative size of sponsored object **108** should be. In some embodiments, control circuitry **304** retrieves data (e.g., from the metadata associated with sponsored object **108**) indicating the relative size of sponsored object **108** to the feature of the subject object **106**.

At block **812**, control circuitry **304** generates for display sponsored object **108** according to the size determined at block **810**. For example, control circuitry **304** generates an instance of sponsored object **108** based on a template retrieved from content source **210**, and scales the instance according to the data indicating the relative size of sponsored object **108** to the feature of subject object **106**.

FIG. **9** is a flowchart of a detailed illustrative process for augmenting visual content **104** with a sponsored object **108**, in accordance with some embodiments of the disclosure. A process **900** for augmenting visual content may begin at block **902**.

At block **904**, control circuitry **304** determines a position of a light source illuminating visual content **104**. For example, control circuitry **304** processes visual content **104** to identify shadows or areas of relatively high luminosity and areas of relatively low luminosity. Control circuitry **304** then determines an angle of the shadows, or determines a relative position of the areas of high luminosity to the areas of low luminosity, and determines, based on the angle of the shadows, or the relative position of the areas of high luminosity to the areas of low luminosity, a position of a light source illuminating visual content **104**.

At block **906**, control circuitry **304** determines whether there are additional light sources illuminating visual content **104**. For example, control circuitry **304** determines whether the angle of the shadows and/or relative position of the areas of high luminosity to the areas of low luminosity indicate that an unidentified light source is illuminating visual content **104**. In response to determining that there are additional light sources illuminating visual content **104**, the process **900** returns to block **904**. In response to determining that there are no additional light sources illuminating visual content **104**, the process **900** proceeds to block **908**.

At block **908**, control circuitry **304** generates an instance of sponsored object **108**. For example, as described at block **610**, control circuitry **304** retrieves a template of sponsored object **108** and generates for display the instance of sponsored object **108** based on design specifications included in the template.

At block **910**, control circuitry **304** modifies the instance of sponsored object **108** based on the position of the light source determined at block **904**. For example, control circuitry **304** may adjust the color, brightness, luminosity, and/or shadows of the instance of sponsored object **108** based on the determined position of the light source.

At block **912**, control circuitry **304** generates for display the modified instance of sponsored object **108**. For example, as described at block **612**, control circuitry **304** overlays the modified instance of sponsored object **108** onto visual content **104**.

It should be noted that processes **400-900** or any step thereof could be performed on, or provided by, any of the devices shown in FIGS. **1-3**. For example, the processes may be executed by control circuitry **304** (FIG. **3**) as instructed by an augmented content generation application implemented on an AR device **102**, content source **210**, and/or application server **220**. In addition, one or more steps of a process may be omitted, modified, and/or incorporated into or combined with one or more steps of any other process or embodiment (e.g., steps from process **600** may be combined with steps from process **800**). In addition, the steps and descriptions described in relation to FIGS. **4-9** may be done in alternative orders or in parallel to further the purposes of this disclosure. For example, each of these steps may be performed in any order or in parallel or substantially simultaneously to reduce lag or increase the speed of the system or method.

It will be apparent to those of ordinary skill in the art that methods involved in the present invention may be embodied in a computer program product that includes a computer-usable and/or -readable medium. For example, such a computer-usable medium may consist of a read-only memory device, such as a CD-ROM disk or conventional ROM device, or a random-access memory, such as a hard drive device or a computer diskette, having a computer-readable program code stored thereon. It should also be understood that methods, techniques, and processes involved in the present disclosure may be executed using processing circuitry.

The processes discussed above are intended to be illustrative and not limiting. More generally, the above disclosure is meant to be exemplary and not limiting. Only the claims that follow are meant to set bounds as to what the present invention includes. Furthermore, it should be noted that the features and limitations described in any one embodiment may be applied to any other embodiment herein, and flowcharts or examples relating to one embodiment may be combined with any other embodiment in a suitable manner, done in different orders, or done in parallel. In addition, the systems and methods described herein may be performed in real time. It should also be noted, the systems and/or methods described above may be applied to, or used in accordance with, other systems and/or methods.

What is claimed is:

**1**. A computer-implemented method comprising:

generating for display an image of a person;

receiving, via a user interface, a selection of an object to be overlaid on the image of the person, wherein the selected object is associated with a first table of properties for rendering the selected object;

identifying an anchor point on the image of the person where the object is to be overlaid;

determining whether the first table of properties of the selected object comprises a feature that is also included in a second table of properties, different from the first table of properties, for rendering a sponsored object, wherein the second table of properties is included in an augmentation database storing indications of sponsored objects and corresponding properties; and

in response to determining that the first table of properties of the selected object comprises the feature that is also included in the second table of properties for rendering the sponsored object:

generating for display the sponsored object at the identified anchor point by automatically causing the image of the person to be overlaid with the sponsored object, wherein the sponsored object is rendered using the second table of properties instead of the first table of properties associated with the selected object, wherein the sponsored object is displayed without user interface selection of the sponsored object, and wherein the sponsored object is visually distinguishable from the selected object.

**2**. The method of claim **1**, wherein the image of the person is included in a live video captured by a camera and being generated for display.

**3**. The method of claim **1**, wherein:

the feature of the selected object is a type of the object,

the sponsored object is of the same type as the selected object, and

the sponsored object comprises an indication of a branding.

**4**. The method of claim **1**, wherein the sponsored object is selected at least in part based on a user profile associated with the person depicted in the image.

**5**. The method of claim **1**, further comprising:

in response to determining that the selected object is not associated with the feature that is included in the second table of properties included in the augmentation database, automatically causing the image of the person to be overlaid with the selected object.

6. The method of claim 1, wherein generating for display the sponsored object based at least in part on the anchor point comprises:

correlating the anchor point on the image of the person with an anchor point on the sponsored object; and

generating for display the sponsored object such that the anchor point on the sponsored object overlaps the anchor point on the image of the person.

7. The method of claim 1, wherein the anchor point is associated with facial features or a head of the person in the image.

8. The method of claim 1, further comprising:

receiving input specifying a target position where the selected object should be placed, wherein the sponsored object is overlaid on the image of the person at the specified target position.

9. The method of claim 1, further comprising:

automatically determining an appropriate position where the sponsored object should be overlaid on the image of the person, based at least in part on a size of a depicted portion of the person in the image and a type of sponsored object.

10. A computer-implemented system comprising:

an augmentation database configured to store indications of sponsored objects and corresponding features;

control circuitry configured to:

generate for display an image of a person;

receive, via a user interface, a selection of an object to be overlaid on the image of the person, wherein the selected object is associated with a first table of properties for rendering the selected object;

identify an anchor point on the image of the person where the object is to be overlaid; and

determine whether the first table of properties of the selected object comprises a feature that is also included in a second table of properties, different from the first table of properties, for rendering a sponsored object, wherein the second table of properties is included in the augmentation database storing the indications of the sponsored objects and the corresponding properties; and

input/output (I/O) circuitry configured to:

in response to determining that the first table of properties of the selected object comprises the feature that is also included in the second table of properties for rendering the sponsored object:

generate for display the sponsored object at the anchor point by automatically causing the image of the person to be overlaid with the sponsored object, wherein the sponsored object is rendered using the second table of properties instead of the first table of properties associated with the selected object, wherein the sponsored object is displayed without user interface selection of the sponsored object, and wherein the sponsored object is visually distinguishable from the selected object.

11. The system of claim 10, wherein the image of the person is included in a live video captured by a camera and being generated for display.

12. The system of claim 10, wherein:

the feature of the selected object is a type of the object,

the sponsored object is of the same type as the selected object, and

the sponsored object comprises an indication of a branding.

13. The system of claim 10, wherein the sponsored object is selected at least in part based on a user profile associated with the person depicted in the image.

14. The system of claim 10, wherein the I/O circuitry is further configured to:

in response to determining that the selected object is not associated with the feature that is included in the second table of properties included in the augmentation database, automatically cause the image of the person to be overlaid with the selected object.

15. The system of claim 10, wherein the I/O circuitry is configured to generate for display the sponsored object based at least in part on the anchor point by:

correlating the anchor point on the image of the person with an anchor point on the sponsored object; and

generating for display the sponsored object such that the anchor point on the sponsored object overlaps the anchor point on the image of the person.

16. The system of claim 10, wherein the anchor point is associated with facial features or a head of the person in the image.

17. The system of claim 10, wherein the control circuitry is further configured to:

receive input specifying a target position where the selected object should be placed, wherein the sponsored object is overlaid on the image of the person at the specified target position.

18. The system of claim 10, wherein the control circuitry is further configured to:

automatically determine an appropriate position where the sponsored object should be overlaid on the image of the person, based at least in part on a size of a depicted portion of the person in the image and a type of sponsored object.

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