Use of Augmented Reality to Enable Comparisons between Physical and Virtual Objects

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ABSTRACT

Augmented reality (AR) shopping is typically thought of as the filling up of an empty space with virtual objects to assess the fit of that object to that space. This formulation ignores the portion of shopping that involves the replacement of an item. While a user can take a photo of an item, without an AR model of the item, the user cannot determine the fit or suitability of the item to their spaces. Current AR tools cannot identify and describe the key differences between what a user has and what the user wants to purchase. This disclosure describes techniques that enable the recognition of an object in an image and the automatic downloading and casting of AR models of that and related objects. A user can use the AR models to test the fit of the object in various spaces and virtually compare the object with its variants in various spaces.

KEYWORDS

- Augmented reality (AR)
- AR shopping
- Object recognition
- Comparison shopping

BACKGROUND

Augmented Reality (AR) shopping is typically thought of as the filling up of an empty space, e.g., a living room, with virtual objects, e.g., a virtual sofa set, to assess the fit of that object to that space. AR shopping is enabled by vendors providing AR models of their wares for customers to try out virtually. A good proportion of shopping involves the replacement of an item, e.g., a coffee table, an art poster, a television, etc. A user can take a photo of an item at a
physical store that they like, but, lacking an AR model, cannot determine the fit of the item to their space. AR tools lack the ability to describe the key differences between what a user has and what the user wants to purchase.

**DESCRIPTION**

This disclosure describes techniques that enable the recognition of an object in an image and automatic downloading and casting of AR models of that and related objects. A user can use the AR models to test the fit of the object and virtually compare the object with its variants in various spaces.

![Fig. 1: AR shopping by comparing a real object with a virtual object: (a) User takes a picture of a television he likes; (b) A close-up view of the user's phone, where the television under consideration (and competing models) are virtually overlaid over an existing television in a scene of the user’s living room](image-url)
As illustrated in the example of Fig. 1, a user sees at a physical store a television of a
certain screen size (say 42”) that they like (Fig. 1(a)), but is unsure whether a television of that
size will suit the space in their home. The user takes a photo of the television and, per the
techniques, AR models of televisions of nearby screen sizes, of competing makes and models,
etc. are downloaded to the user device or accessed otherwise.

The user can virtually cast the multiple downloaded AR models onto an image (or a live
camera feed) of their living-room space (Fig. 1(b)) to compare the different objects and to
determine the make, model, and screen-size that best fits the space. The relationship between the
two objects, e.g., their relative dimensions, color, or other attributes, can be visually cast or
shown textually. For example, in Fig. 1(b), the model that the user is considering is rendered in
color. Distances of the model to prominent objects in the living room can be textually rendered.
Differentiating features (“bezel-free”) of the model can be highlighted.

In general, the techniques of this disclosure enable an AR and object recognition module,
e.g., included in a smartphone, to identify the attributes of a first object in space and to present a
second virtual object in space in relation to the first object, e.g., side-by-side or overlaid. The
first object can be physical or virtual.

The differences between the two objects can also be displayed by one or more of the
following techniques.

- Transforming the visual properties (e.g., dimensions, color, bezel size) of the first object
  into the second object.
- Ghosting with transparency or outlines the first or second object as an overlay on the
  other object.
- Visual redlining with text describing the numeric or value delta, similar to architectural blueprints.

- Creating spots of magnification on the object, e.g., the bezel size at the corner of a television, that can be interacted with and previewed from various angles. This is similar to the zooming facility available, for example, for items in online stores. For the zooming scenario herein described, the magnification is derived from a downloaded AR model of the item, thus enabling a three-dimensional examination of the magnified detail.

- Providing user controls to swipe an AR slider that shows split-views of reality versus AR.

The attributes of the first object can be derived using bitmap analysis of its physical properties or a visual recognition of its type, make, or model. For example, in the case of a television, attributes such as dimensions, color, size of bezels, pixel resolution, etc., can be determined using bitmap analysis or visual analysis.

With user permission, the described techniques enable the capturing, saving, and bookmarking to a user's profile their historical scans (or purchases) and AR models thereof. With user permission, such a historical list can help in providing personalized information when they perform regular searches in the future. For example, having recognized amongst user photographs an image of the user's television, a search result or ad might describe a 70” television as “20 inches larger, yet fits your wall.” This is similar to feeds that attempt to predict interesting articles and new product releases for users.

In an example use-case, a user can photograph an item for sale, e.g., a toaster oven, at a retailer, come home, and cast an AR model of the item at an appropriate location, e.g., a kitchen countertop, within their home. In another example use-case, a user can photograph an item at
their home, triggering a download of AR models of competing or alternative items that can be virtually overlaid over their existing item.

In another example use-case, a user can photograph a car at a car dealership, then virtually add after-market items like spoilers or hubcaps to assess their fit to the car under consideration. The user can take home a photo of the car, and using the AR model of the car, virtually assess, in a 360-degree manner, its fit and look at the user’s driveway.

In this manner, the techniques enable a user to extract and compare, in real-time augmented reality, the features of objects, and view various alternative products, which assists them in comparing candidate replacements. Effectively, the techniques enable a virtual copy-paste-compare of real objects, e.g., copy an image of a real object, paste an AR model of it onto a camera-feed or a screen, and compare with existing objects on the screen. The techniques can be implemented on any AR platform, e.g., smartphone, smart glasses, AR or virtual reality (VR) headsets or goggles, etc.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs, or features described herein may enable the collection of user information (e.g., information about a user’s photos/videos, objects owned, augmented reality models, shopping information, or a user’s preferences), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user’s identity may be treated so that no personally identifiable information can be determined for the user, or a user’s geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of
a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

**CONCLUSION**

This disclosure describes techniques that enable the recognition of an object in an image and the automatic downloading and casting of AR models of that and related objects. A user can use the AR models to test the fit of the object in various spaces and virtually compare the object with its variants in various spaces.