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Determining the background plane in augmented reality

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ABSTRACT

To place a virtual object in a real field of view, present techniques typically require a user to move their mobile device in a roughly circular fashion near the point of the landing of the virtual object. The movement of the mobile device is used to gauge the orientation of the background plane on which the virtual object lands. This is a cumbersome operation and it can take a substantial amount of time for the user to perform the gesture. It also breaks the experience between a 2D to AR mode. This disclosure describes techniques to determine the orientation of a virtual object to be placed in a real field by turning on the camera just prior to an anticipated start of AR mode. The camera feed is used to automatically determine the background plane.

KEYWORDS

- Augmented reality
- Virtual object
- Background plane
- Virtual object orientation
- Surface detection

BACKGROUND

To place a virtual object in a real field of view, present techniques typically require a user to move their mobile device in a roughly circular fashion near the point of the landing of the virtual object. The movement of the mobile device is used to gauge the background plane, so that the virtual object is landed with correct horizontal and vertical orientation.

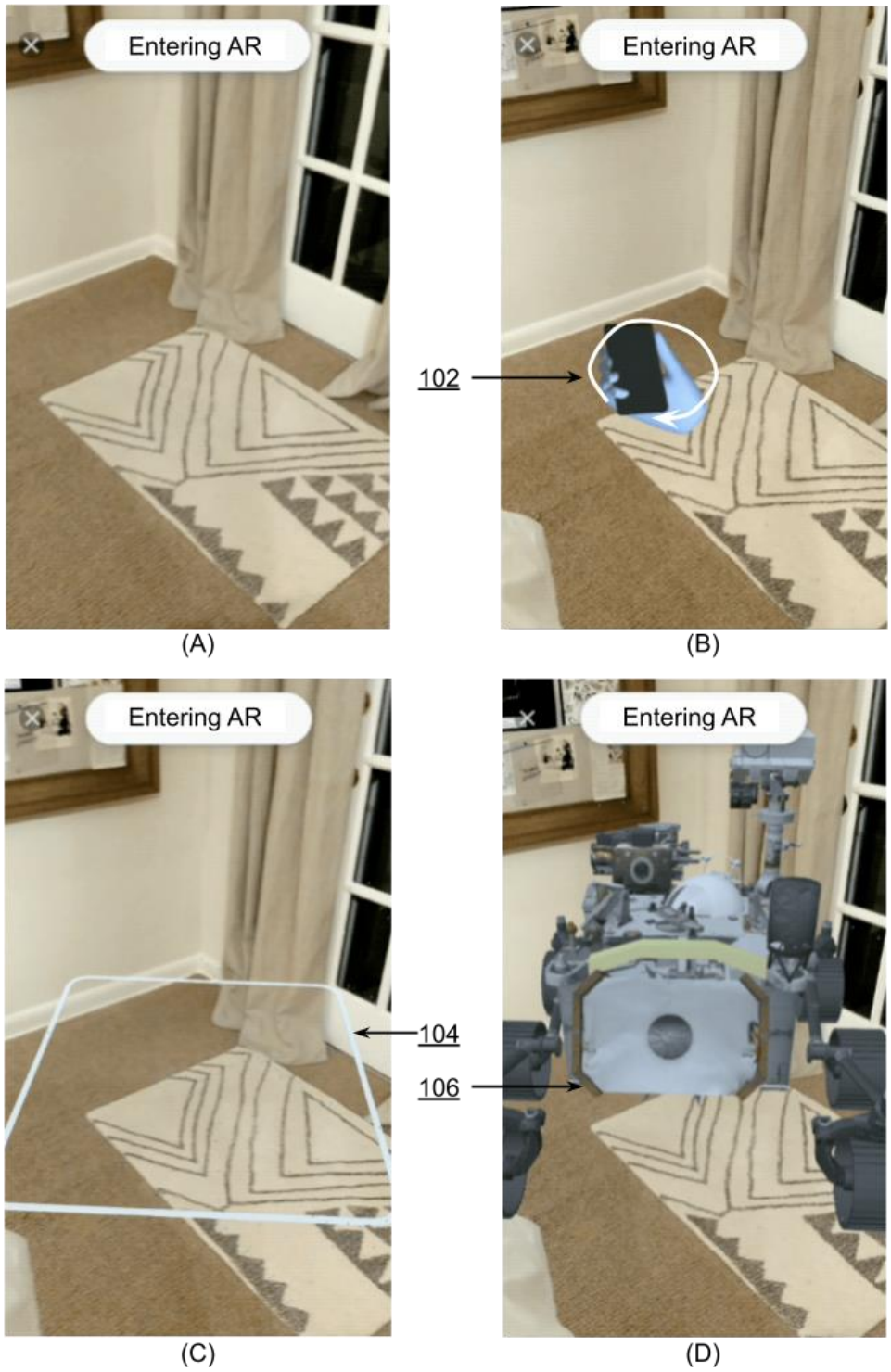

Fig. 1: Requesting the user to move mobile device to establish correct orientation of virtual object

Fig. 1 illustrates steps for the user to move their mobile device to establish correct orientation of a virtual object, per current techniques. In Fig. 1(A), the mobile device camera

captures a video of the space it is pointed at. To enter augmented reality (AR) mode, a request is made (Fig. 1B) to the user to move their mobile device in a roughly circular fashion (102) at the spot where the virtual object is to be landed. When the user executes the requested circular motion, the camera feed is used to establish a background plane (104) where the virtual object is to be landed (Fig. 1C). The background plane establishes the vertical orientation of the virtual object. Using the background plane, a virtual object (106) is landed with proper orientation (Fig. 1D).

This is a cumbersome operation and it can take a substantial amount of time for the user to perform the gesture. It also breaks the experience between a 2D to AR mode. The acquisition of the background plane can sometimes take several seconds of mobile-device movement which is too long for some users. Users also report that the requirement to move the phone prior to entering AR mode is confusing.

DESCRIPTION

Per techniques of this disclosure, the orientation of the virtual object is determined by turning on the camera just prior to an anticipated start of AR mode, and by using the camera feed to automatically determine the background plane.

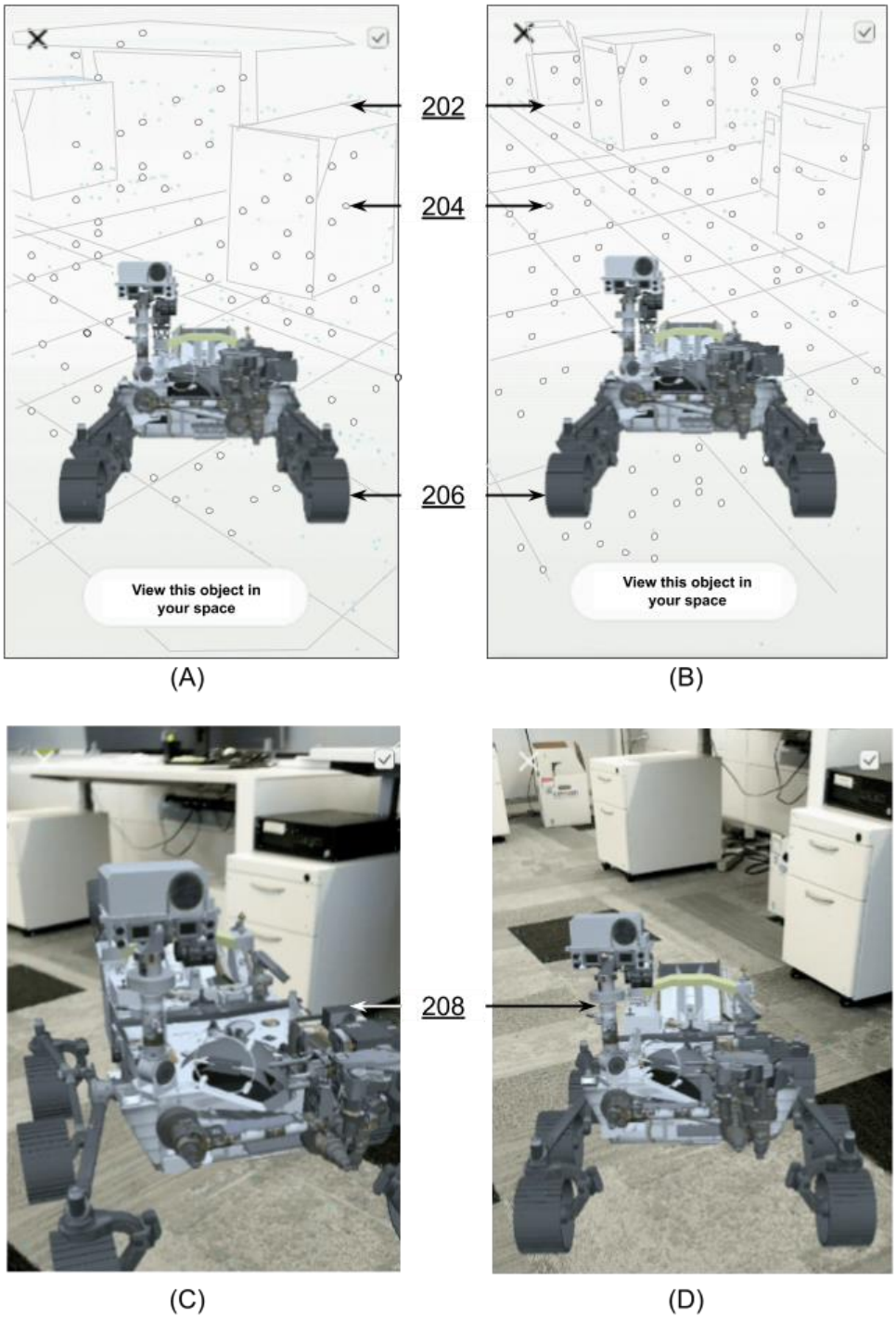

Fig. 2: Determining the background plane

Fig. 2 illustrates determining the background plane for AR applications, per techniques of this disclosure. Figures 2A-B illustrate operation prior to start of AR mode, when the camera of the mobile device takes readings (204) of the space (202) around the mobile device with user

permission. In Fig. 2A-B, the readings are schematically depicted as small circles, and are used (with user permission) to detect horizontal and vertical surfaces in the field of view.

During the time when readings are taken, a virtual object (206) can be presented to the user for the purposes of examination, for example, the user can spin around one or more candidate virtual objects to view the objects from several angles. Several frames of readings are gathered during the natural movement of the mobile device that occurs while being held in the user's hand. Prior to start of AR mode, no images are captured, stored, or transmitted.

Figures 2C-D illustrate operation just after the start of AR mode. By the time the user switches on AR mode, the readings and the computations needed to determine the background plane are complete. Based on those readings and computations, the AR object (208) is landed on a correctly oriented background plane.

The start of AR mode can be predicted (with user permission) based on various events. For example, it can be detected by certain touch interaction patterns that are a leading indicator of incipient AR mode. As another example, the act of a user examining one or more virtual objects, e.g., spinning the objects around and viewing the objects is a leading indicator of incipient AR mode where the objects are inserted into a real field of view. In such a case, during the transition to AR, the virtual object doesn't disappear; rather it interpolates toward a plane that has already been tracked. Alternatively, the camera can be turned on as soon as the user starts an AR viewer, even before actual insertion of virtual object. Still alternatively, with user permission, the camera can be turned on in the background for periods that are sufficient for the purposes of taking readings that assure proper and immediate orientation of inserted virtual objects upon start of AR mode.

In this manner, virtual objects are landed in real field of view with minimal user intervention, thereby smoothing the real (3D) to augmented reality transition. User permission is obtained prior to activation of the camera to determine the landing plane. No images are captured or stored without user permission.

CONCLUSION

This disclosure describes techniques to determine the orientation of a virtual object to be placed in a real field by turning on the camera just prior to an anticipated start of AR mode. The camera feed is used to automatically determine the background plane.