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Augmented Reality Projection for Remote and Collaborative AR Experiences

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ABSTRACT

Augmented reality (AR) is used for shopping purposes, e.g., to display an augmented view of a user's home where the augmentation includes products inserted as they would appear in a user's home. However, a user may be at a different location, e.g., in the store, and want to use AR to preview products in the store as they would appear in their home. This disclosure describes techniques to record or otherwise share a media stream of a space (e.g., user's home) that includes depth data. The recorded media stream can be combined with other streams, e.g., live view in a store, to obtain an augmented view of the space. The use of a media stream in this manner eliminates the constraint for users to be at a particular location to obtain an augmented view of that location. By sharing recorded or live media streams with remote users, the user can collaborate to obtain AR views independent of their current location. Further, a user can use the stored media stream to collaborate with themselves at a later time when they are at a different location. Further, with user permission, augmented streams can be saved for later viewing and/or editing.

KEYWORDS

- Augmented reality (AR) projection
- Remote augmented reality
- Collaborative augmented reality
- Panoramic image
- 360 video

BACKGROUND

Augmented reality (AR) is used for many purposes, for example, to display an augmented view of a user's home where the augmentation places objects such as rugs, furniture, televisions, appliances, etc. as they would appear in a user's home. Such use of AR to preview objects before purchasing them can provide users with a better idea and greater confidence regarding the size, style, and fit of the objects in their space. However, a user may not be in their home when they want to use AR to preview objects in their space. For example the user may be in the store where the objects are for sale. Alternatively, a user may be at home but may want to share the augmented view of their home remotely, for example to collaborate with a roommate that is not at home or with an agent such as a designer or employee at a store to enable them to view or add augmentation without having the other person enter their space.

DESCRIPTION

This disclosure describes techniques to create an augmented reality media stream of a space that can be shared remotely or replayed at a later time. Per the techniques of this disclosure, 3D depth data of a space with media such as pictures, panoramas, 360 panoramic images, videos, or videos stitched within panoramas and 360 panoramic images are obtained. This helps the user preview AR objects in their space while they are away from home and also to share their space remotely and collaborate with others simultaneously or at a later time.

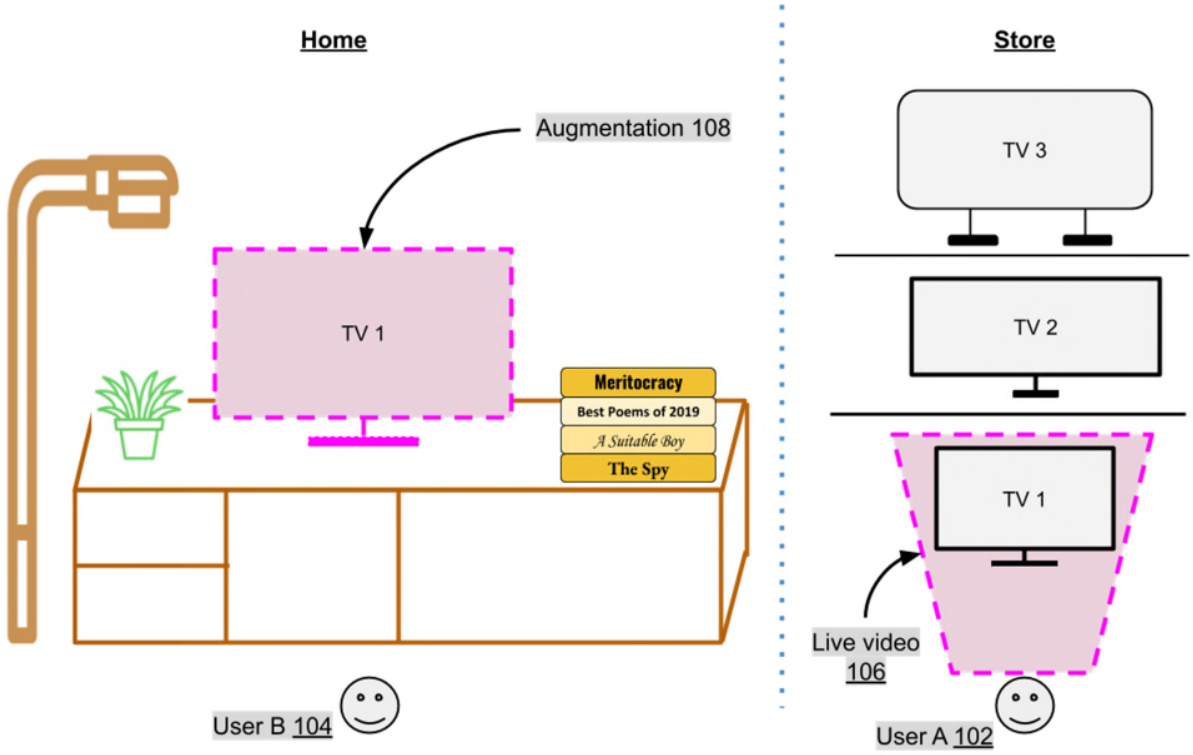

Fig. 1: Augmented reality media stream based on 360 panoramic images that can be shared remotely

Fig. 1 illustrates an example in which a user A (102) is at an electronics store shopping for a television and using their smart glasses to view various televisions (TVs) to see how they would fit in their living room. The user wants to collaborate on potential placements of the tv with her roommate B (194) who is at home in the living room and viewing the living room through his smart glasses. A live feed from user B is provided to user A who's in the store. Using the described techniques, the user A at the electronic store obtains a live video feed (106) from their smart glasses which is provided to user B. The live video feed from user A depicts a portion of the shelf at the store with a television set (TV1).

Per the techniques of this disclosure, each user's device combines their own video feed, e.g., TV1 in the store for user A and the living room for user B, with that from the other user.

Thus, user B that is at home can see a VIEW of the living room with the added augmentation (108) that depicts the television TV1 positioned on the stand . In this example, user B's view is augmented by placing the television set in their field of view. User A is shown user B's video feed, e.g., in virtual reality, and the feed is augmented with the local view of the television set. In this manner, both users are able to obtain a view of how the television set would look if placed in their living room.

While the foregoing illustration refers to a portion of the living room, user B can pan around the living room while wearing their smart glasses to obtain a 360 panoramic image of the living room and can share it with user A. For example, they may therefore try out different objects (e.g., other television sets TV2 and TV3) from the store as placed in different locations in the living room.

The shared AR media stream obtained as described herein can be a 3D spherical 360 image of the living room. Each user can interact with the image, e.g., using gestures to see other points of view. For example, the users can orient themselves spatially to a position effectively in the center of the 360 image to explore placing the TV or other objects in different parts of the room. The users can use a drag operation to drag to different points in space.

While the foregoing example is with reference to a live video obtained by user B, the techniques can also work as follows: user A, while at home, can record their home environment, e.g., as a 360 degree video that includes depth information. At a later time, user A can visit a store and augment the recorded view of the home environment with various objects in the store. In this case, the media captured while at home is replayed at a later time and augmented.

In another example, the user can be at home and interact with a sales representative at the store. The sales representative can provide a feed of various objects at the store that can be

combined with the user's live (or pre-recorded) media of their room to provide an augmented view of their room, e.g., with different TV sets placed on the stand. If the user permits, their view can be shared with the sales representative who can then provide AR modifications and recommendations to the user. For example, the sales representative can use AR to suggest and show placement of different TVs, or add on products (e.g., a soundbar) in the user's space. Alternatively, or in addition, the store can also provide recorded media streams of various showrooms that the user could use to preview the TV in various environments, e.g., bedroom, den, playroom, kitchen, office, etc.

Users can save the various AR media streams that include capture of various rooms and different placements of 3D objects within the rooms. They can view these previously captured streams later and share the streams with others.

The techniques described above can be applied in any setting that involves user interaction with 3D objects in a 3D viewer. For instance, the techniques can be implemented in online shopping websites or apps that allow users to examine models of a product being considered for purchase. The techniques improve user experience of virtual reality (VR) or augmented reality (AR). The techniques can be implemented in various devices that provide VR/AR, such as smartphones, tablets, headsets, smart glasses, etc., and corresponding viewer applications.

CONCLUSION

This disclosure describes techniques to record or otherwise share a media stream of a space (e.g., user's home) that includes depth data. The recorded media stream can be combined with other streams, e.g., live view in a store, to obtain an augmented view of the space. The use of a media stream in this manner eliminates the constraint for users to be at a particular location

to obtain an augmented view of that location. By sharing recorded or live media streams with remote users, the user can collaborate to obtain AR views independent of their current location. Further, a user can use the stored media stream to collaborate with themselves at a later time when they are at a different location. Further, with user permission, augmented streams can be saved for later viewing and/or editing.

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