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(54) **Title:** METHODS AND SYSTEMS FOR ENABLING CREATION OF AUGMENTED REALITY CONTENT

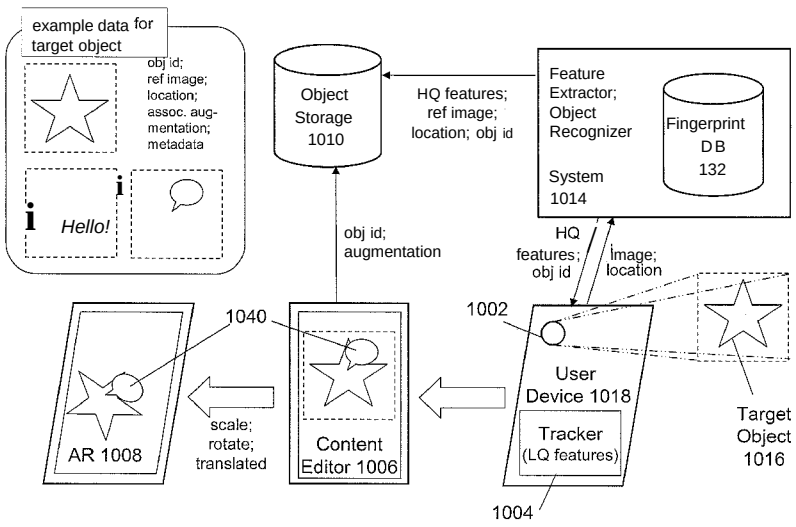

FIG. 1

(57) **Abstract:** Methods and systems for enabling creation of augmented reality content on a user device including a digital imaging part, a display, a user input part and an augmented reality client, wherein said augmented reality client is configured to provide an augmented reality view on the display of the user device using an live image data stream from the digital imaging part are disclosed. User input is received from the user input part to augment a target object that is at least partially seen on the display while in the augmented reality view. **A** graphical user interface is rendered to the display part of the user device, said graphical user interface en-

Methods and Systems for Enabling Creation of Augmented Reality Content

RELATED APPLICATIONS

This application is related to co-pending to an International (Patent Cooperation Treaty) Patent Application No. XXXXXXXXXXXX, filed on August 18, 2011, entitled "Computer-vision based augmented reality system" which application is incorporated herein by reference and made a part hereof in its entirety.

FIELD OF INVENTION

The disclosure generally relates to methods and systems that enable the authoring and management of augmented reality content. In particular, though not necessarily, the disclosure relates to methods and systems for enabling a user to author augmented reality content onto real world objects.

BACKGROUND

Due to the increasing capabilities of multimedia equipment, mobile augmented reality (AR) applications are rapidly expanding. These AR applications allow enrichment of a real scene with additional content (also referred to as "augmentation" or "augmented reality content"), which may be displayed to a user in the form of a graphical layer overlaying the real-world scenery.

Example augmented reality content may include two-dimensional graphics, three-dimensional objects that aims to augment a real world object with virtual content. Augmented reality content may exist in a three-dimensional (virtual) space. In particular, at least one of placement /position, shape, size, movement and any other spatial attributes of the augmented reality content correspond to a virtual three-

poster as augmented reality content has at least properties related to: position, orientation, size and shape that exists in a three-dimensional augmented reality space.

While an experienced user may program and create three-dimensional objects easily using sophisticated three-dimensional graphics software running on a computer, a person without experience in creating virtual three-dimensional objects would find it difficult to create augmented reality content using devices such as a handheld tablet or mobile phone. The limited user interface offered by user devices hinders the authoring of three-dimensional objects because the user input methods and user interfaces does not easily allow the manipulation of objects in a three-dimensional space.

Hence, it is desirable to provide methods and systems that facilitate the creation of augmented reality content that at least alleviate the problems disclosed herein. Furthermore, it is desirable to provide a platform that manages a collection of augmented reality content created by users .

SUMMARY

Augmented reality systems enable the visual presentation of augmented reality content over real objects in the real-world. Within the system, augmented reality content may be represented as objects occupying a three-dimensional virtual space of the real world. The .augmented reality content may have a particular spatial relationship with the objects in the real world. For instance, a virtual billboard poster used as augmented reality content may be positioned on the North side of an office building, with the front of the poster facing outward from the office building. Accordingly, the poster has a position, size, shape, and/or orientation properties in relation to the virtual three-dimensional augmented reality space. In the context of this disclosure, the augmented reality space may include a virtual representation of the three-dimensional environment that represents the real world. Augmented reality content exists

An augmented reality system or an augmented reality device may include a display part (e.g., LED screen) that shows the augmented reality space (referred to as "augmented reality view") by combining image frames from an live image data stream from a digital imaging part (e.g., camera) with the augmented reality content. Furthermore, the augmented reality system includes a user input part where a user may provide user input. For example, the user input part may include a touch screen. Typically, the touch screen or the user input part is limited to receiving user input in a two-dimensional space (e.g., receiving user input events associated with x, y coordinates) . This poses a problem for users wanting to create three-dimensional objects in the virtual augmented reality space, because the two-dimensional user input does not correspond directly to the three-dimensional virtual space as seen by the user through the display part of the augmented reality device. If the user input is mapped to the three-dimensional space that is unnatural for the user (e.g., a user clicks on one of two buttons, the intended button does not become activated but the other button becomes activated due to a poor transformation of the user input event into three-dimensional space) , user experience is degraded.

Furthermore, from the augmented reality system's perspective, there is a technical problem with processing user input that exists in the two-dimensional space. When the user input was intended to interact with objects in the three-dimensional virtual space, the user input received by the augmented reality system only exists in two-dimensional space, thereby leaving one degree of freedom where the system is free to interpret how the two-dimensional point may be projected into a three dimensional space. A coarse projection could be performed. But when a user is performing a task where precision matters, such as drawing or creating objects in three-dimensional space, user inputs may not be projected properly onto the real world objects existing in the augmented reality space. The situation may be worsened when the user device and the user may be continuously making small or large

movements, causing further jitter in the accuracy of the projection .

When creating augmented reality content (e.g., drawing, sketching, etc.) on a two-dimensional plane, taking the user input and projecting the user input in three-dimensional space, the projection can be workable and drawing in three-dimensional context is possible in theory if given sufficient information about the user input in two-dimensional space and the user and surroundings hold still. If the projection processes has jitter, this jitter will also be visually apparent and present in the augmented reality content (e.g., drawing or sketch) itself. Touching the screen or providing any user input requiring physical input on a mobile user device generally also causes slight movement of the user device, causing even more problems in accuracy.

The user input in two-dimensional space may not provide sufficient information to accurately translate/project the two-dimensional user inputs into a three-dimensional space. For example, a user taps on the screen at position x, y. The augmented reality system is lacking information such as the desired direction of the tap (e.g., is the user directing the tap upwards or downwards and at what angle?) such that the x, y coordinates may be more accurately projected into a three-dimensional space. Accordingly, it is desirable to have methods and systems that enables users to create augmented reality content that at least alleviates some of the problems disclosed herein.

A method for enabling creation of augmented reality content (also referred to as user-generated content) on a user device including a digital imaging part, a display output, a user input part and an augmented reality client is disclosed. An example user device may be a mobile phone or a mobile computing tablet having a touch-sensitive or pressure-sensitive screen. Said augmented reality client is configured to provide an augmented reality view on the display output using an live image data stream from the digital imaging part. An augmented reality client, implemented at least in part as software running on the user device, preferably includes a

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