# A Gesture and Interaction Method for Inner Object Selection in AR Advertising

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In AR advertising on mobile devices, a user usually interacts with 3D objects through touchscreens. Most AR advertising so far, however, has stayed at the level of simply touching the object's outside, and little attention has been paid to interactions with 3D inner objects. This paper re-defines the gestures required to select an inner 3D object in AR advertising, and proposes interactions corresponding to each gesture.

## 1    Introduction

The AR (augmented reality) technology offers immersive experience to users by showing the real world combined with computer-generated virtual objects[1]. Because AR advertising can offer reality, as if a user saw a real product, although the product does not exist in reality, the AR advertising is expected to generate high advertising effect[2].

Existing one way advertising provides advertise content to users unilaterally. However, AR advertising offers advertising content through interactions between a user and a 3D object. In doing so, there are many cases that interactions between a user and the outside and inside of a product expressed using 3D objects are required. Most AR advertising so far, however, has stayed at the level of simply touching the object's outside, and a study on interactions to designate the 3D inner object has hardly been carried out.

Kim and Park[3] proposed CARDA, which is a system that manages and distributes auxiliary information needed for 3D objects and advertising using dynamic link in 3D. In [3], they designed CARDA asset, a basic unit to manage auxiliary information linked dynamically with 3D objects using an already existing 3D rendering engine. In [3], however, there was no explanation on the specific gesture interaction method to approach inner objects and interaction with a user, although it proposed a concept dynamically linking the 3D objects and auxiliary information.

This paper proposes gestures and actions required to experience AR advertising content in a smart device with a multi-touch screen.

## 2    Gesture Patterns for AR Advertising on Multi-Touch Screen

In this section, this paper proposes gestures and actions for manipulating AR advertising content including inner objects.

Users of smart devices have already experienced touch interactions due to increase in smart device penetration rate. As multi-touch screens are generally used in these devices, various touch interactions became possible. In this regard, studies on efficient touch interactions in the multi-touch screen environment are actively conducted. For instance, Dan Saffer used gesture patterns for touch screens and actions as shown in Table 1[4]. Although the number of simultaneous touches in Table 1 is two, the gesture interaction can be defined using much more number of simultaneous touches in the multi-touch environment.

**Table. 1.** Gesture patterns for touch screens and actions proposed by Dan Saffer

| Gesture | Action |
| --- | --- |
| Tap to open/activate | Touch to activate an object. |
| Tap to select | Touch to select an object. |
| Drag to move object | Drag an object and move it. |
| Slide to scroll | Touch the screen with a finer and slide it to scroll the screen. |
| Spin to scroll | Touch the screen with a finger and spin it to scroll the screen. |
| Slide and hold for continuous scroll | Slide and hold for continuous scroll. |
| Flick to nudge | Softly flick a finger and move an object. |
| Fling to scroll | Maintain a finger according to the flickering movement inertia of a finger. |
| Tap to stop | Touch once to stop the moving screen. |

Although gesture patterns in Table 1 are widely used in general smart device user interfaces, additional gesture pattern is needed to adapt to the interaction with an inner object in the AR environment. Even though various object selection and control methods such as a balloon/fishnet selection method and a corkscrew selection method in the 3D environment have been studied[5, 6], there has rarely been a study on interactions with inner objects.

A complex object can be modeled as a hierarchical structure, which is a way of representing the relationship between linked objects. An object which controls one or more child objects is called a parent object. A child object can be a parent object to other child objects. For example, a car can be divided into several parent objects such as car body, wheel, interior part and motor unit, and each parent object can have several child objects, as interior part in turn can have another child objects: seat and dashboard. Figure 1 shows an example car model represented with a hierarchical structure.
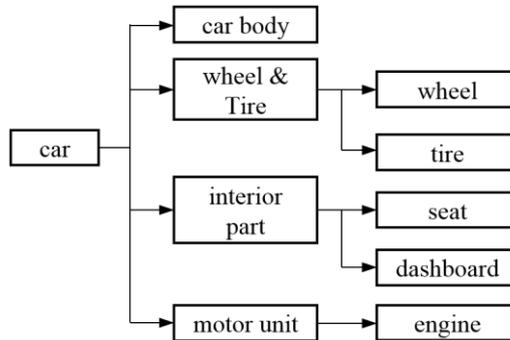
**Fig. 1.** An example hierarchical structure of a car model.

Although the model consists of hierarchical structure, where inner and outer objects are combined together to make up the model, a user can only see the outer appearance of the model in the 3D environment, but cannot see the inner objects. Therefore, separate actions need to be taken for a user to see or approach the 3D inner objects, and this paper proposes the method.

When navigating AR content, sometimes a user has to select child objects and view auxiliary information. Table 2 shows the gestures and actions proposed in this paper for the purpose of efficient manipulation of AR advertise content.

**Table 2.** Gesture Interactions for 3D Model of AR Advertising

| Gesture | | Action |
|---|---|---|
| | Tap to select | Select a nearby object. |
| | Tap to activate | Activate an event to display or play auxiliary information about product: text, sound and video clip. |
| x2 | Double tab to approach child objects | A selectable inner object is indicated, and it returns to the original state after certain time. |
| x2 | Double tab to fit into the screen | Enlarge/reduce to make the selected object fit into the screen. |
| | Pinch to shrink and spread to enlarge | Pinch two fingers to shrink an object and spread two fingers to enlarge an object |
| | Long touch | Select the nearby child object |
| x2 | Two point double tap | Select the objects containing auxiliary information. |

Selecting an object by a single tap on an object or turning the object by sliding is similar to the general interaction method of Dan Saffer in Table 1. The proposed gestures and actions in Table 2 have focused on selecting and viewing the inner objects and auxiliary information, which are surrounded by opaque outer objects.

When the touch is maintained (long touch), movement is made to the inner direction per 0.5 sec along the viewing axis, and thus the closest objects are selected sequentially. Once the user selects an inner object by long touch, he/she can interact with it by using the gestures in Table 2.

# 4    Conclusion

The advertising of a product using the AR technology can offer the commitment and reality to users, and therefore the AR advertising is expected to play a pivotal role in the future advertising market. A smart device with a multi-touch screen will become the most popular AR advertising terminal platform.

Although many users are accustomed to the user interaction using the touch in the multi-touch environment, there have been not many studies on the gestures and interactions to effectively experience AR advertise content. Also, studies on interactions to designate inner objects existing within the 3D objects have hardly been carried out. This paper actually proposed the gestures required for selecting inner objects and auxiliary information and proposed interactions corresponding to each gesture in AR advertising.

Future work includes re-definition of existing CARDA asset[3] by reflecting the gesture interaction, and implementation of the viewer to distribute the CARDA asset.

# References

1. Craig. Alan B.: Understanding Augmented Reality: Concepts and Applications, Morgan Kaufmann (2013)
2. Li, Daugherty and Biocca, "Impact of 3-D Advertising on Product Knowledge, Brand Attitude, and Purchase Intention: The Mediating Role of Presence," Journal of Advertising, vol. XXXI, no, 3, pp.43-57 (2002)
3. Byeong Jeong Kim, Seop Hyeong Park, "CARDA: Content Management System for Augmented Reality with Dynamic Annotation," Advanced Science and Technology Letters, vol. 90 (Multimedia 2015), pp.52-56 (2015)
4. Dan Saffer, Designing for Interaction: Creating Innovative Applications and Devices (2nd Edition), New Riders (2010)
5. Ferran Argelagueta and Carlos Andujar, A survey of 3D object selection techniques for virtual environments , Computers & Graphics Volume 37, Issue 3, Pages 121–136 (2013)
6. Jacek Jankowski and Martin Hachet, "A survey of interaction techniques for interactive 3D Environments," Proceedings of Eurographics 2013 - State of the Art Reports, pp. 65-93 (2013)
7. Edward Angel, Interactive computer graphics, 5th edition, Pearson (2009)