

An Abstract Tangible Object for Mobile Augmented Reality

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Abstract: Smartphones and Tablets are commonplace in private living environments and suited well to serve as a platform for Augmented Reality (AR). With this, new options for man-machine interaction become available at home. However, this is not exploited well because a substantial part of AR applications limit themselves to just showing virtual models on top of a tracked marker or on top of a detected plane. For some of these AR applications, interaction with the AR environments is not intuitive or limited to few possibilities. If interactions are not intuitive, users might be unaware of them or only be aware of few ones. This can result in frustration if users wish to interact with virtual content but do not know how or if it is possible. User interaction in AR gets a lot more intuitive when a tangible real-world object serves as user interface so users can manipulate objects in their real world to manipulate virtual content [BKP].

One idea is to use a dedicated real-world object (e.g. a 3d-printed object) as a tangible representation of virtual content or abstract IT system features. Based on literature research and design rationale, we identify requirements for a tangible object that can be used as a user interface for AR environments. Such an object should not only be easily trackable with today's tracking algorithms but also be versatile in order to be used in different application scenarios. We designed and developed a tangible object (shown in Fig. 1) to realize an AR-supported tangible user interface, that e.g., allows to trigger actions of virtual content or to manipulate virtual content. Our tangible object has an abstract form and combines different surfaces and shapes which each offer various interaction possibilities. For instance, if users want to press a virtual button, it is indicated that it feels more intuitive for them to touch something that has the form of a button.

We identified a challenge for users in their hands' placement when interacting with a handheld AR device and a tangible object at the same time. Some interactions can be performed holding the tangible object in one hand and the device in the other hand. This can be difficult for other interactions where it makes more sense to use both hands for either the tangible object or the device. In this case, the device can be put on a table or into a stand and vice versa. We explore these three setup possibilities for the tangible object's and the device's placement and discuss advantages as well as disadvantages.

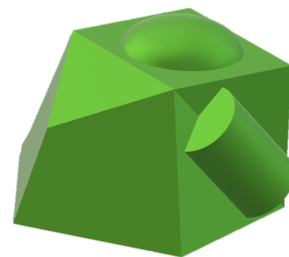


Fig. 1: Abstract tangible object for intuitively manipulating virtual content of an AR

References

[BKP] Billinghamurst, M.; Kato, H.; Poupyrev, I.: Tangible Augmented Reality. In: ACM SIGGRAPH ASIA 2008 Courses.

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