

# Apparatus and technique for tangible interaction in virtual and mixed reality systems

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## Value Proposition

Immersive Virtual Reality systems, especially of those that create immersive VR through Cave like environments, suffer from a lack of haptic devices for interacting with and manipulating virtual objects in the environment. The wand and joystick type devices used for these purposes suffer from a few major problems- they do not mimic natural human motions and they block the users view of the object being interacted with. These may demand cognitive resources and distract the user from the task at hand. A solution is therefore needed to let users interact with and manipulate objects in virtual environments that feels more natural and allows complete view of the object, thus allowing the user to concentrate on the task and not on the method of interaction.

## Technology

Inventors at Duke have designed a passive haptic device and an interaction technique for virtual environments that allows the users to manipulate virtual objects in a familiar natural fashion. A clear acrylic box, christened a 'specimen box' with a motion tracker can smooth the interaction with virtual objects by serving as a proxy for the object itself. The user feels the weight and physicality of the box, and associates it with the specimen. In a study by the inventors, the method has been shown to require less cognitive effort compared to other similar methods of interaction.

## Advantages

The primary advantage of this method is that it allows the user to manipulate an object as they naturally would. This takes away the effort involved in learning a new method of interaction. The weight of the 'specimen box' gives the user the illusion of handling a real object. Since the box is transparent, it provides full view of the object without any occlusion.

## Publications

- D. J. Zielinski, D. Nankivil and R. Kopper, "6 Degrees-of-freedom manipulation with a transparent, tangible object in world-fixed virtual reality displays," 2017 IEEE Virtual Reality (VR), Los Angeles, CA, 2017, pp. 221-222.
- D. J. Zielinski, D. Nankivil and R. Kopper, "Specimen Box: A tangible interaction technique for world-fixed virtual reality displays," 2017 IEEE Symposium on 3D User Interfaces (3DUI), Los Angeles, CA, 2017, pp.50-58.



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## Patents

Patent Number: 10,504,295

Title: SYSTEMS AND METHODS FOR USING SENSING OF REAL OBJECT POSITION, TRAJECTORY, OR ATTITUDE TO ENABLE USER INTERACTION WITH A VIRTUAL OBJECT

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