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Text Field with Volumetric Input

Abstract:

Techniques are described that utilize a text field with volumetric input that can accept text or a virtual reality (VR) object that represents text. To use the text field with volumetric input, the user selects a virtual object that represents the environment that the user wants to be immersed in and puts the virtual object in the text field. For example, the user may speak, gesture, or use a controller (*e.g.*, a VR controller such as a laser pointer) to select a virtual object that represents a game.

Keywords:

Virtual reality, text field, volumetric interface, single application, virtual reality controls, affordance, user interface

Background:

Virtual reality (VR) environments rely on display, tracking, and VR-content systems. Through these systems, realistic images, sounds, and sometimes other sensations simulate a user's physical presence in an artificial environment. Each of these three systems are illustrated below in Fig. 1.

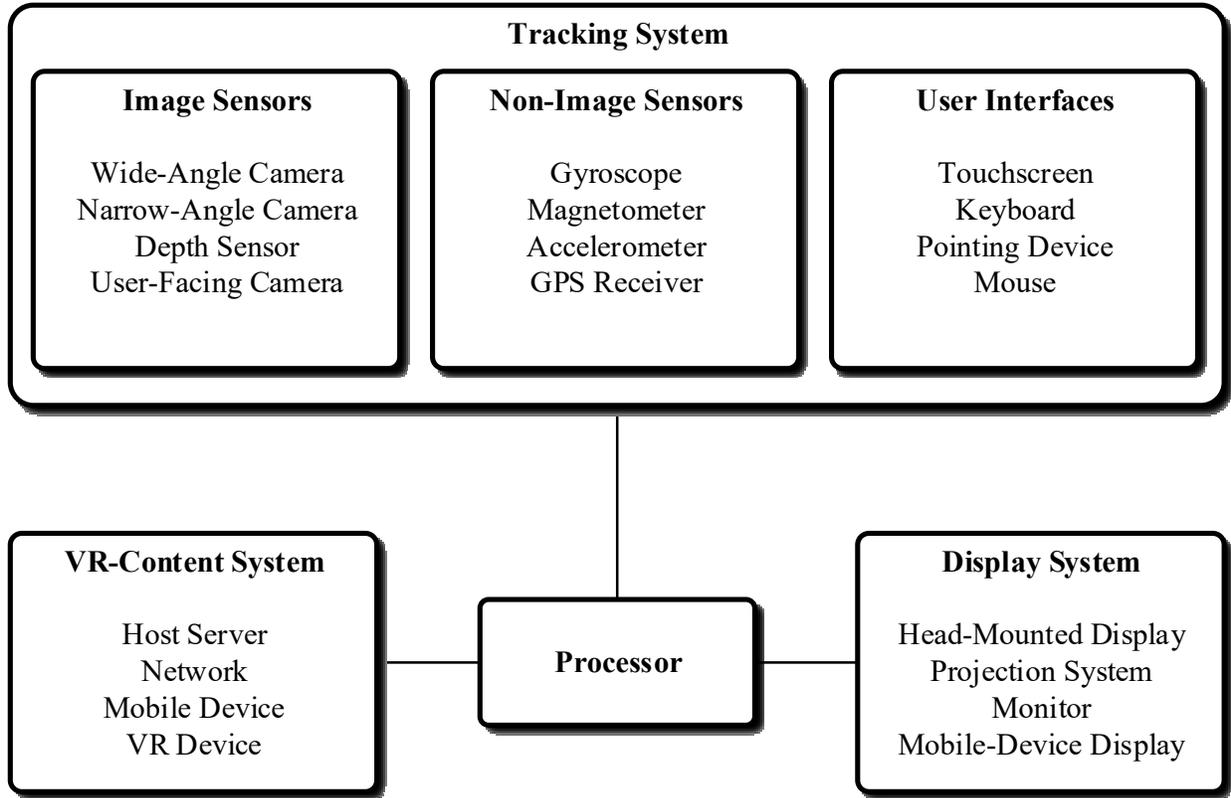


Fig. 1

The systems described in Fig. 1 may be implemented in one or more of various computing devices that can support VR applications, such as servers, desktop computers, VR goggles, computing spectacles, laptops, or mobile devices. These devices include a processor that can manage, control, and coordinate operations of the display, tracking, and VR-content systems. The devices also include memory and interfaces. These interfaces connect the memory with the systems using various buses and other connection methods as appropriate.

The display system enables a user to “look around” within the virtual world. The display system can include a head-mounted display, a projection system within a virtual-reality room, a monitor, or a mobile device’s display, either held by a user or placed in a head-mounted device.

The VR-content system provides content that defines the VR environment, such as images and sounds. The VR-content system provides the content using a host server, a network-based device, a mobile device, or a dedicated virtual reality device, to name a few.

The tracking system enables the user to interact with and navigate through the VR environment, using sensors and user interfaces. The sensors may include image sensors such as a wide-angle camera, a narrow-angle camera, a user-facing camera, and a depth sensor. Non-image sensors may also be used, including gyroscopes, magnetometers, accelerometers, GPS sensors, retina/pupil detectors, pressure sensors, biometric sensors, temperature sensors, humidity sensors, optical or radio-frequency sensors that track the user's location or movement (*e.g.*, user's fingers, arms, or body), and ambient light sensors. The sensors can be used to create and maintain virtual environments, integrate "real world" features into the virtual environment, properly orient virtual objects (including those that represent real objects, such as a mouse or pointing device) in the virtual environment, and account for the user's body position and motion.

The user interfaces may be integrated with or connected to the computing device and enable the user to interact with the VR environment. The user interfaces may include a touchscreen, a keyboard, a pointing device, a mouse or trackball device, a joystick or other game controller, a camera, a microphone, or an audio device with user controls. The user interfaces allow a user to interact with the virtual environment by performing an action, which causes a corresponding action in the VR environment (*e.g.*, raising an arm, walking, or speaking).

The tracking system may also include output devices that provide visual, audio, or tactile feedback to the user (*e.g.*, vibration motors or coils, piezoelectric devices, electrostatic devices, LEDs, strobes, and speakers). For example, output devices may provide feedback in the form of blinking and/or flashing lights or strobes, audible alarms or other sounds, songs or other audio

files, increased or decreased resistance of a control on a user interface device, or vibration of a physical component, such as a head-mounted display, a pointing device, or another user interface device.

Fig. 1 illustrates the display, tracking, and VR-content systems as disparate entities in part to show the communications between them, though they may be integrated, *e.g.*, a smartphone mounted in VR goggles, or operate separately in communication with other systems. These communications can be internal, wireless, or wired. Through these illustrated systems, a user can be immersed in a VR environment. While these illustrated systems are described in the VR context, they can be used, in whole or in part, to augment the physical world. This augmentation, called “augmented reality” or AR, includes audio, video, or images that overlay or are presented in combination with the real world or images of the real world. Examples include visual or audio overlays to computing spectacles (*e.g.*, some real world-VR world video games or information overlays to a real-time image on a mobile device) or an automobile’s windshield (*e.g.*, a heads-up display) to name just a few possibilities.

A particular configuration of the systems of Fig. 1 presents the user with a VR environment that includes a text field that allows the user to type in text, such as a search term, the name of an application or a game, or an internet address. As VR technology evolves, applications have become increasingly dependent on the internet and many websites have become more like an application. For instance, many applications and websites offer a single environment that is intended to be the only environment the user will experience while it is running.

To begin this immersive experience, the user types in a destination (*e.g.*, an internet address or the name of an application) or opens a menu and makes a selection from a two-dimensional list, as if the VR environment were a web-browser or an application interface. In contrast, VR

interactions are usually intended to involve items or icons that the user interacts with as if they were real objects. For example, the desired VR “metaphor” is that the environment around the user is itself the interface or control that is used to select a destination and be taken to the destination. If the user cannot launch applications and environments, or return to the user’s “home” environment, in a manner consistent with the other interactions in the VR environment, the quality of the VR experience may be reduced.

In VR parlance, an affordance is a situation in which an object’s functionality is implied or suggested by the object’s virtual characteristics. For example, a button implies being pushed by being highlighted by a border or being offset in height from the surrounding surface. Similarly, a text field implies entry of text by its position, shape, and in some cases, by features such as a magnifying glass (search) or an arrow (go) included at one or both ends of the text field. The text field with volumetric input is an affordance for opening a single application or website that is intended to be the only environment the user is experiencing.

Description:

To address these problems, techniques are described that utilize a text field with volumetric input that can accept text or a virtual reality (VR) object that represents text. To use the text field with volumetric input, the user selects a virtual object that represents the environment that the user wants to be immersed in and puts the virtual object in the text field. For example, the user may speak, gesture, or use a controller (*e.g.*, a VR controller such as a laser pointer) to select a virtual object that represents a game (for instance, a game called the Magic Crystal Game).

The text field with volumetric input is typically a rectangle with a shallow inset and rounded corners to suggest that it can accept input in the same way that conventional text fields

typically accept text. By having the shallow inset, which can be visualized as being a small amount of z-axis depth, the user can ascertain that the text field accept objects. An illustration of a text field with volumetric input is presented in Fig. 2 below:



Fig. 2

The text field with volumetric input can receive text like a conventional text field, such as by typing or dragging and dropping text, as shown in Fig. 3.

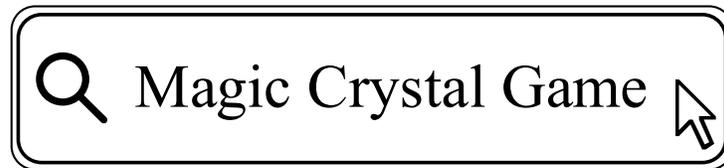
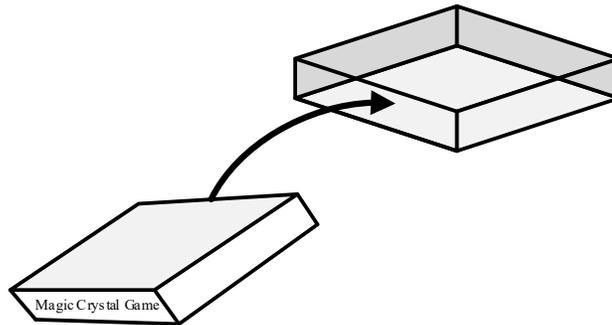


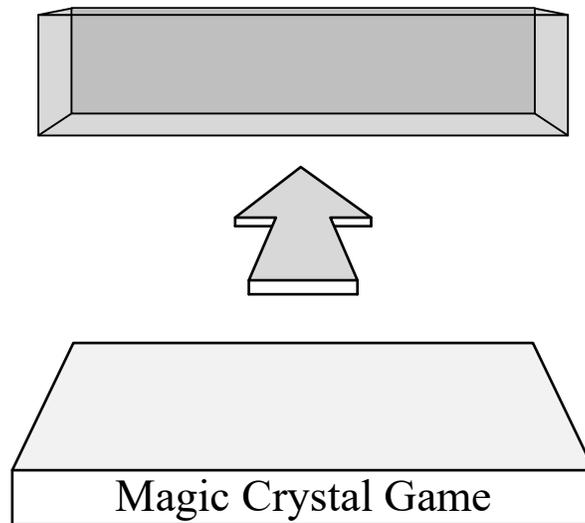
Fig. 3

When the text field receives the virtual object that represents text, an application or game, or an internet address, the text field extends and its perspective is altered. The extension is done using back-face rendering, in which only the interior edges are rendered. Back-face rendering is used so that no matter the angle the user is looking from, the user does not see one of the sides covering up the interior. For example, if the user looks at the text field from the bottom, then the top, the back, and the sides are visible. Similarly, if the user looks at the text field from the top, then the bottom, the back, and the sides are visible. Additionally, the front face is preserved in the

right shape to accept the shape of the virtual object. Fig. 4 shows two examples, 4A and 4B, of the extended text field receiving a virtual object that is a rectangular solid. Note that even though the view is from a position above the text field, the interior back and sides are still visible.



Example 4A



Example 4B

Fig. 4

The text field with volumetric input can also be used to create virtual objects that represent applications, games, or internet addresses, which can be used later to enter the environment that the object represents. Consider an example in which a user selects “Magic Crystal Game” from a dropdown menu by using a laser pointer and drags the game to the text field. The Magic Crystal

Game then starts, and the user can play. The user can end the game by bringing up the VR control panel and selecting a stop feature on the text field with volumetric input (e.g., an “X” or other symbol). The text field of Fig. 2 then extends itself to appear as the volumetric text field of Fig. 4 and a virtual object that represents the Magic Crystal Game is “ejected” from the text field. The virtual object can then be placed in the user’s home environment or in a library of virtual objects that can be used in the text field with volumetric input. This process is illustrated in Fig. 5.

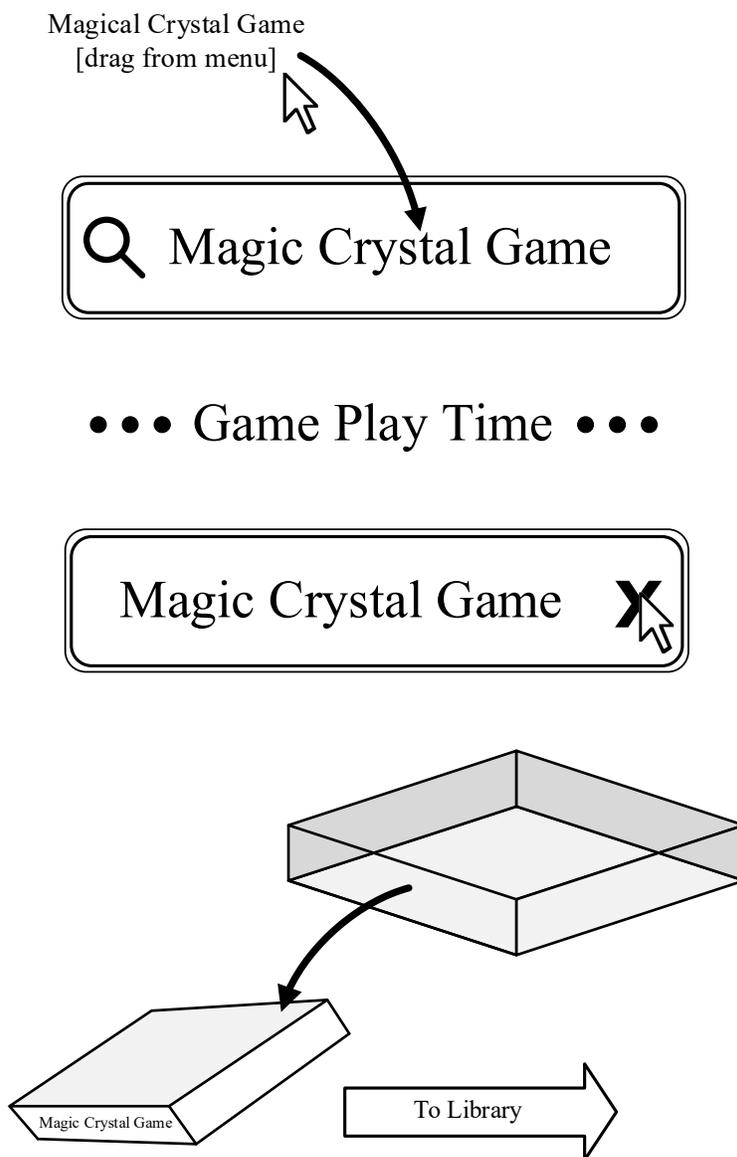


Fig. 5

A user may build a library of virtual objects through this described process or another process. The virtual objects may then be used, as described above, to initiate different VR environments, applications, games, and so forth. Although the virtual objects shown in Fig. 4 and Fig. 5 are rectangular solids, other shapes can be used, and may be configurable by the user.