

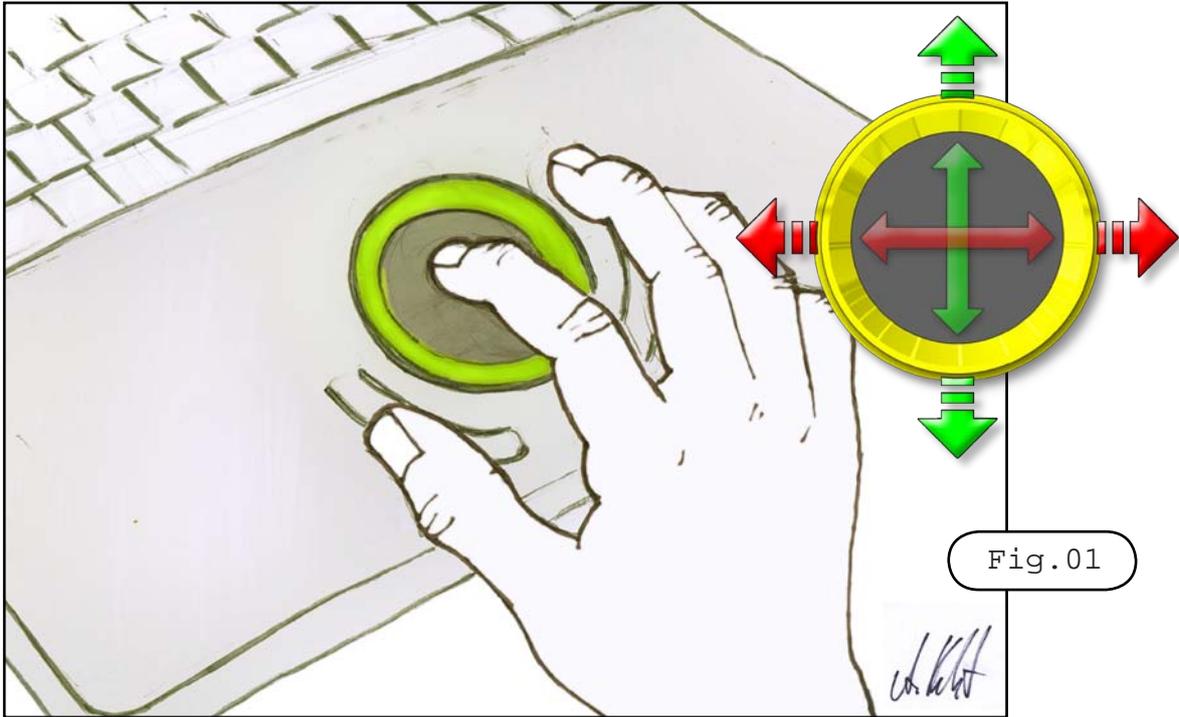
Continuous Cursor Control Within Reach of the Fingertip

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November 2006

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The Groovepad is a computer input device that facilitates touchpad-based interaction with graphical user interfaces on mobile devices. The novel design features up to five degrees of freedom which provide sufficient input channels to operate zoomable user interfaces with just one finger. The basic idea behind the new device is to augment touch sensitive input areas like touchpads and touchscreens with an elastically suspended frame to adjust motion velocity in two dimensions. The

Groovepad combines 2D rate- and position control in a very comfortable way. The users finds the rate controller just where the input area for position control ends and vice versa. Since the coordinate systems of both are assembled in congruency to each other, the motion direction remains the same, when the user switches between them in a fluent, continuous move. This may be particularly useful when the input area for position control is too small for covering the whole range of application graphics.

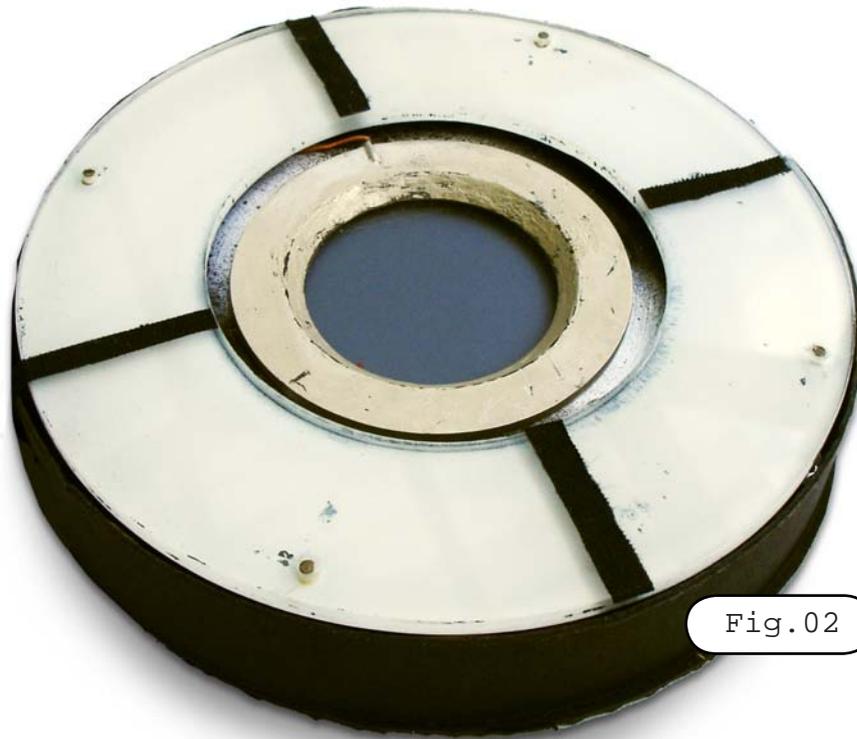


Fig.02

The elastic border offers rate control to cover distances comfortably instead of clutching incessantly. Circular motion on the Groovepad controls a fifth degree of freedom which we propose to use for scaling in zoomable user interfaces. The major advantage of such jog-dial like interaction is to enable continuous motion input even with position control. The circular shaped frame of the Groovepad guides the users finger and therefore facilitates this type

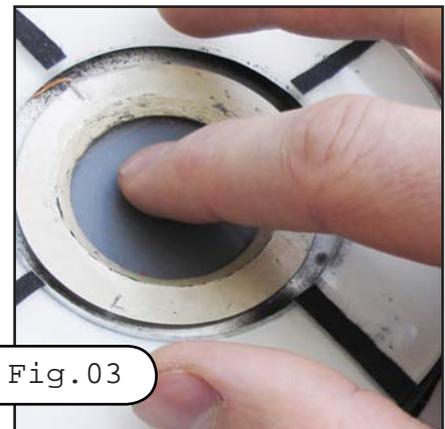


Fig.03

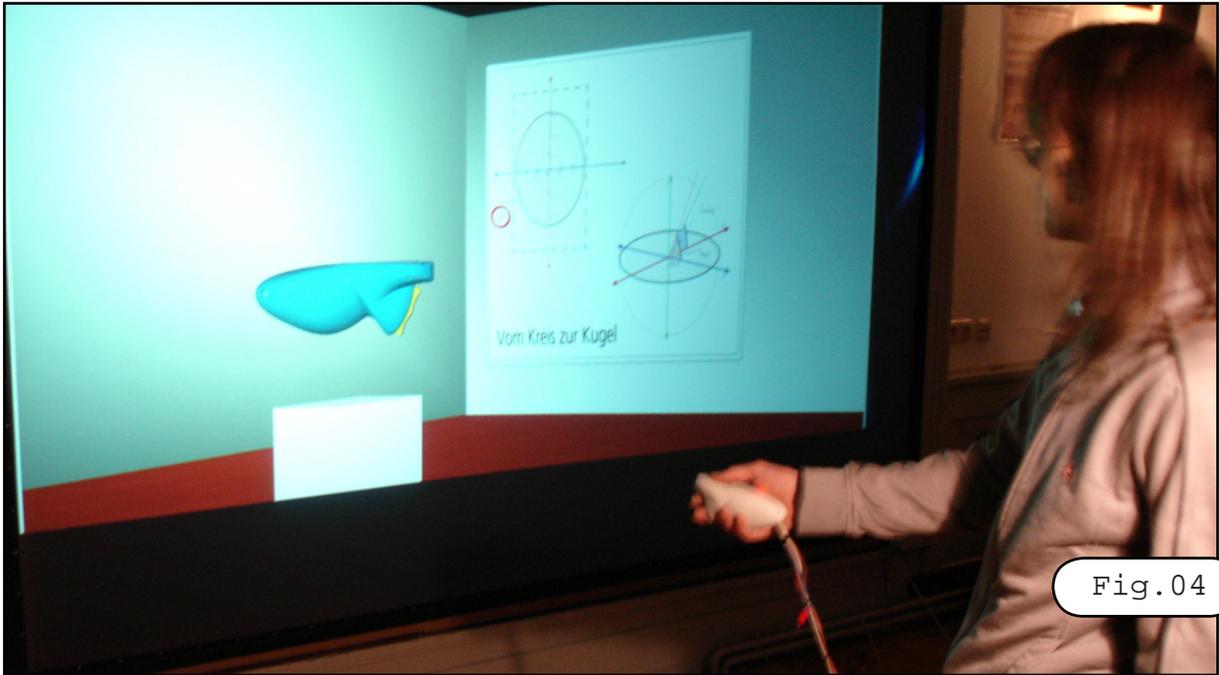


Fig.04

of input.
Also we employ the Groovepad for 3D interaction with a one-handed remote control for 3D-presentation applications



Fig.05

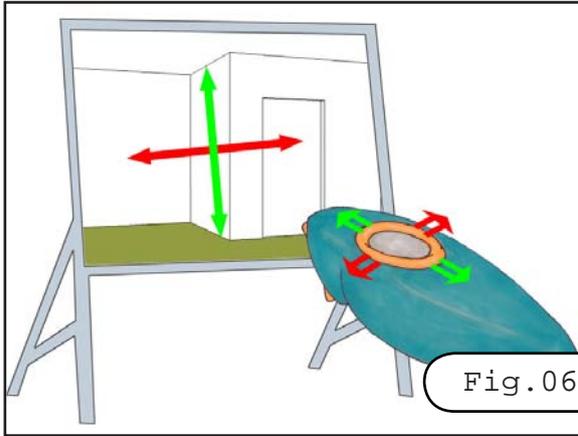


Fig.06

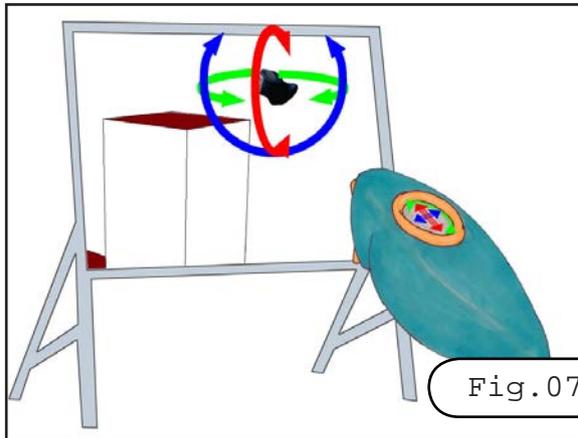


Fig.07

(Fig.04/05).

Standing in front of a projection wall the user controls 2D image plane motion with the elastically suspended ring through rate control (Fig.06), while the round shaped touchpad allows for 3D rotation through position control. Rotational input around the horizontal and the depth axis corresponds to 2D x/y-

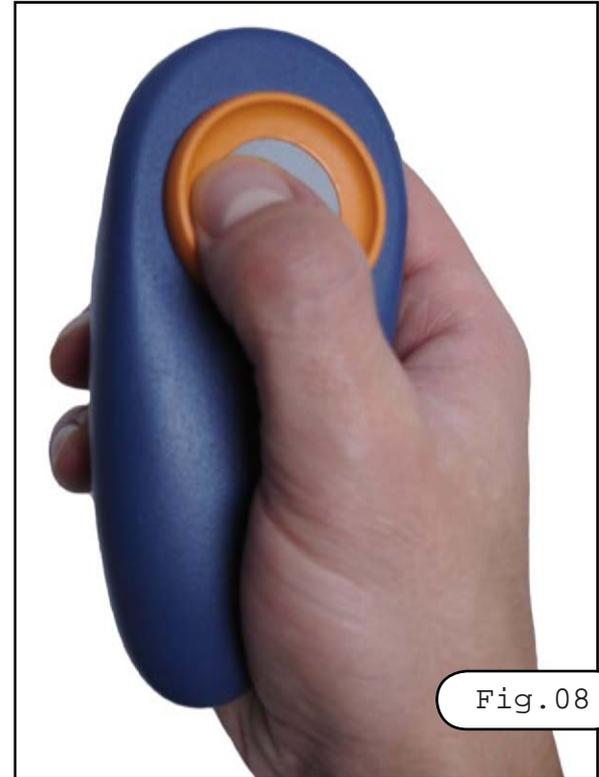


Fig.08

translation input used for desktop applications (Fig.07 - blue and red). The more frequently needed rotation around the vertical axis (e.g. presentation plate, look around in an architectural simulation) can be manipulated even more easily with continuous motion guided by the circle shaped frame of the employed version of the Groovepad (Fig.08, Fig.07 - green). We use absolute position information of the finger on the touchpad to compute this additional degree of free-

dom.

Circular input motion can continuously be induced, since no clutching is necessary. This is not only useful for 3D rotation or 2D scroll-wheel like functionality but may also facilitate system control with adapted circle menus (Fig.10). We implemented a series of such menus to confirm their usability. Fig.11 shows one possibility, where the surrounding ring is used to swap between several control parameters presented in a rectangular matrix, while rotation on the touchpad surface adjusts the value of the respec-

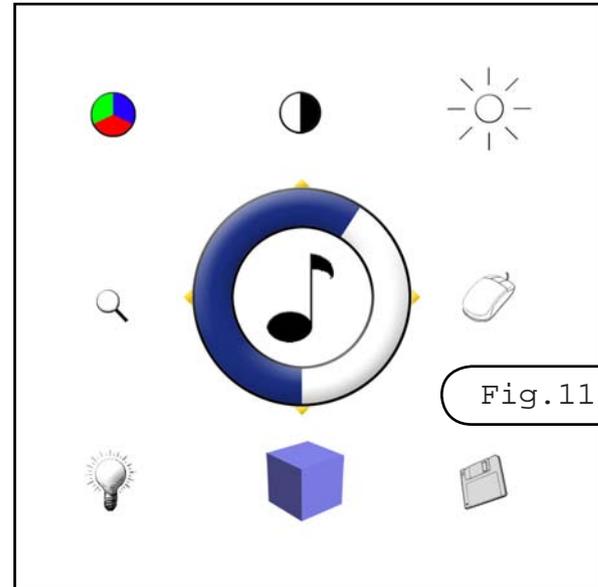




Fig.11

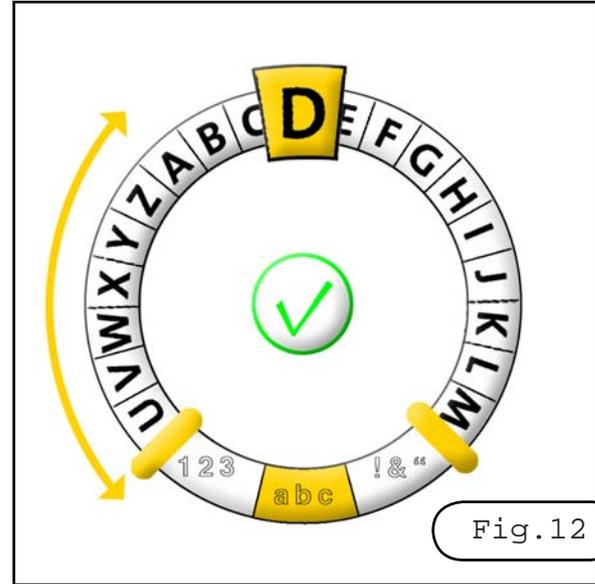


Fig.12

tive parameter. Fig.11 shows a kind of colour chooser menu for adjusting three different scalar values without resorting to explicit mode switching. The user simply starts the continuous circular motion in the respective area to adjust hue, saturation or brightness. Initial user tests showed the intuitiveness and effectiveness of this approach. Our Groovepad interface for symbolic input (Fig.12) works in a similar way. First experiments indicate that this type of interface has potential to compete with the well established 3x4 button matrix of most mobile phones (Fig.13).

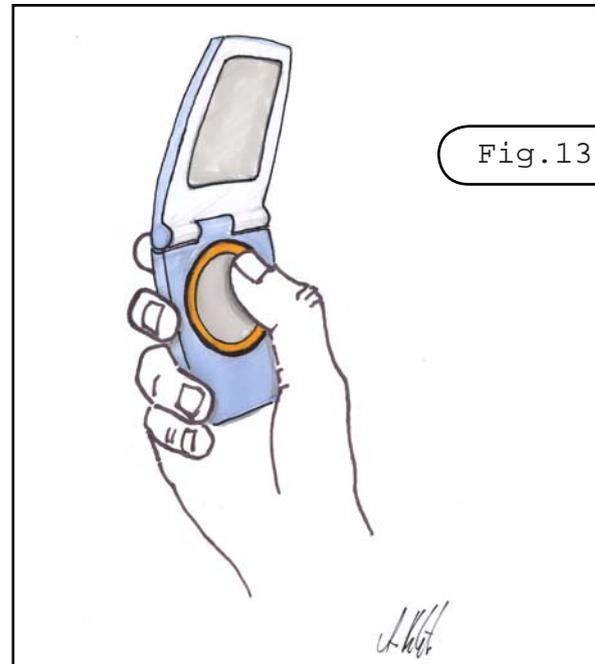


Fig.13

