

5. An interface device as recited in claim 4 wherein said interaction includes moving said user-controlled graphical object against a surface of said different graphical object.

6. An interface device as recited in claim 5 wherein said surface is an edge of a graphical window displayed on said display device.

7. An interface device as recited in claim 6 wherein said input force controls a document scrolling in said window.

8. An interface device as recited in claim 2 wherein said user manipulatable object is a puck graspable by a user and usable similarly to a mouse input device.

9. An interface device as recited in claim 1 wherein said actuator applies said output force to said user object in said isotonic mode.

10. An interface device as recited in claim 8 further comprising a safety switch for deactivating said output force from said actuator when said safety switch is opened.

11. An interface device as recited in claim 10 wherein a mapping between said user-controlled graphical object and said puck provided in said isotonic mode is disabled when said safety switch is opened.

12. An interface device as recited in claim 10 wherein said safety switch is a contact switch opened when said user removes weight of his or her fingers from said puck.

13. An interface device as recited in claim 2 wherein said actuator is a voice coil actuator.

14. An interface device as recited in claim 2 wherein said user object is coupled to said actuator by a linkage having a plurality of members.

15. An interface device as recited in claim 2 wherein said interface device and said host computer communicate using a Universal Serial Bus (USB).

16. An interface device as recited in claim 15 wherein said actuators receive power from said USB.

17. A method of providing an isometric control mode for an interface device coupled to a host computer, the method comprising:

receiving an indication to engage an isometric control mode of said interface device;

determining a deviation of a user manipulable physical object in a provided plurality of degrees of freedom, said deviation indicative of an input force from said user on said user manipulable object;

applying a resistive force using an computer-controlled actuator to said user manipulable object opposing said input force; and

using said determined deviation to control an isometric function of an application program implemented by said host computer.

18. A method as recited in claim 17 further comprising a step of defining a local origin with reference to a current position of said user manipulable object in said provided plurality of degrees of freedom, wherein said deviation of said user manipulable object is determined from said local origin.

19. A method as recited in claim 18 wherein said indication to engage said isometric mode includes receiving an indication from a input device.

20. A method as recited in claim 19 wherein said input device includes a button.

21. A method as recited in claim 18 wherein said host computer is displaying a graphical environment including a user-controlled graphical object, and wherein said indication to engage said isometric control mode includes an interaction of said user-controlled graphical object with a different graphical object displayed in said graphical environment.

22. A method as recited in claim 21 wherein said interaction includes a movement of said user-controlled graphical object into a surface of said different graphical object.

23. A method as recited in claim 22 wherein said different graphical object is a window, and wherein said surface is an edge of said window.

24. A method as recited in claim 22 wherein said user-controlled graphical object includes a cursor and said graphical environment includes a graphical user interface.

25. A method as recited in claim 18 wherein said resistive force applied to said user manipulable object is a restoring force, said restoring force having a magnitude proportional to a magnitude of said deviation of said user manipulable object from said local origin and a direction towards said local origin.

26. A method as recited in claim 18 wherein said isometric function includes scrolling of a document displayed in said graphical environment.

27. A method as recited in claim 18 wherein said isometric function includes panning a view of said graphical environment.

28. A method as recited in claim 18 wherein said isometric function includes zooming a view of said graphical environment.

29. A method as recited in claim 20 further comprising displaying magnitude indicators indicating a magnitude of said deviation on said display device.

30. A method as recited in claim 22 wherein said host computer displays a deviation of said user-controlled graphical object corresponding to said deviation of said user manipulable object.

31. A method as recited in claim 30 wherein said surface of said different graphical object compresses in response to said movement of said user-controlled graphical object into said surface.

32. A method as recited in claim 18 wherein a magnitude of said deviation is indicated by a pitch of audio feedback to said user.

33. A method as recited in claim 27 wherein a visual-physical dichotomy is provided such that said host computer does not display a deviation of said user-controlled graphical object corresponding to said deviation of said user manipulable object.

34. A method as recited in claim 18 wherein said interface device is in an isotonic control mode when said isometric control mode is not active, said isotonic control mode providing input to said host computer to display said user-controlled graphical object at a position corresponding to said position of said user manipulable object.

35. A method as recited in claim 25 further comprising adding an overlay force to said restoring force applied to said user manipulable object.

36. A method as recited in claim 35 wherein said overlay force is a jolt force sensation applied to said user manipulable object to indicate to said user an event in said graphical environment.

37. A method as recited in claim 36 wherein said event in said graphical environment is a page break of a scrolling document or an end of said scrolling document reached.

38. A method as recited in claim 35 wherein said overlay force is a vibration force sensation applied to said user manipulable object to indicate to said user an event in said graphical environment.

39. A method for enabling isotonic and isometric control from a user utilizing a single interface device coupled to a host computer system displaying a graphical environment, the method comprising:

receiving a selection of a control mode of said interface device, wherein said control mode is either an isotonic control mode or an isometric control mode;