

means for associating the location of the cursor in the display screen with a contact location on a touch screen; and

means for providing haptic feedback by way of the touch screen, said haptic feedback having an extent corresponding to the extent of the action.

34. A device for providing haptic feedback in response to a manipulation of a graphical object, comprising:

means for correlating a characteristic of the manipulation of the graphical object with a characteristic of a contact of a touch screen; and

means for imparting a force to the touch screen at an extent which varies in accordance with the characteristic of the manipulation.

35. A haptic feedback touch control for inputting signals to a computer and for outputting forces to a user of the touch control, the input signals manipulating a graphical object, the touch control comprising:

a touch input device including a touch surface operative to input a position signal to a processor of said computer based on a location on said touch surface which said user contacts; and

at least one actuator coupled to said touch input device, said actuator outputting a force on said touch input device to provide a haptic sensation to said user contacting said touch surface, said force being a function of a characteristic of the manipulation of a graphical object, which is a function of a characteristic of the contact by said user.

36. The haptic feedback touch control of claim 35, wherein the characteristic of the manipulation is one or more of speed, acceleration, or deceleration.

37. The haptic feedback touch control of claim 36, wherein the force is repetitive and increases in frequency and/or magnitude with said one or more of speed, acceleration or deceleration.

38. The haptic feedback touch control of claim 35, wherein the force is repetitive and increases in frequency and/or magnitude based on the characteristic of the manipulation.

39. The haptic feedback touch control of claim 35, wherein the graphical object assumes multiple forms, and the characteristic of said manipulation is the rate at which said forms are assumed.

40. The haptic feedback touch control of claim 39, wherein the force is repetitive and increases in frequency and/or magnitude based on said rate.

41. The haptic feedback touch control of claim 35, wherein said graphical object is a scroll bar.

42. The haptic feedback touch control of claim 35, wherein said characteristic of a contact is the location of the contact.

43. The haptic feedback touch control of claim 35, wherein said characteristic of a contact is pressure imparted by the contact.

44. The haptic feedback touch control of claim 35, wherein said characteristic of a contact is a rate of change of contact position.

45. The haptic feedback touch control of claim 35, wherein said characteristic of a contact is a rate of change of contact speed.

46. The haptic feedback touch control of claim 35, wherein said characteristic of a contact is a rate of change of contact location.

47. The haptic feedback touch control of claim 35, wherein the actuator comprises:

a first structural element having mounting structure mountable to a first component;

a second structural element having mounting structure mountable to a second component;

a first biasing element coupling the first structural element to the second structural element;

a first magnetic device carried by the first structural element, the first magnetic device including a first pole piece; and

a second magnetic device carried by the second structural element, the second magnetic device including a second pole piece;

a first coil disposed about at least one of said first pole piece and said second pole piece;

wherein the first biasing element is arranged to provide a biasing force opposing an attractive magnetic force urging the first and second pole pieces together when current is applied to the first coil and electric current applied to the first coil causes a haptic effect to be generated between the first component on the second component.

48. The haptic feedback touch control of claim 47, wherein the second magnetic device includes a second coil disposed about at least one of said first pole piece and said second pole piece.

49. The haptic feedback touch control of claim 47, further comprising a second biasing element, wherein the second biasing element is arranged to provide a biasing force opposing an attractive magnetic force urging the first and second pole pieces together when current is applied to the first coil.

50. The haptic feedback touch control of claim 47, wherein the first biasing element comprises a spring.

51. The haptic feedback touch control of claim 47, wherein the first biasing element comprises an elastomeric element.

52. The haptic feedback touch control of claim 47, wherein the first biasing element comprises a foam material.

53. The haptic feedback touch control of claim 47, wherein the first and second structural element and the first biasing element are all formed from the same material and the first biasing element is formed thinner than the first and second structural elements so that it is free to flex when perturbed.