variable input signal **76**'. Also, control unit **54** may provide modified input signal **76**' to place input signal **76** in a format that may be understood or processable by host computer **58**. Further, control unit **54** may receive input signal **78** from haptic interface device **26**, such as a signal from a button or trigger **79** on the haptic interface device. Input signal **78** may be a signal that requires a reflex-like response, such as the firing of a gun. Rather than burdening host computer **58** with processing these types of signals, which may be very frequent, control unit **54** provides the processing capability. Input signal **78** may be completely processed by control unit **54**, thereby advantageously reducing the processing burden on host computer **58**. Thus, the use of control unit **54** increases the efficiency of system **20** by performing force feedback computations in parallel with the force feedback computations being performed by host computer **58** in running the interactive program.

[**0062**] Similarly, control unit **54** may receive concise high-level commands, comprising all or a portion of output signal **66**, to be processed locally within the control unit **54**. These high-level commands may represent simple, semi-active, variable resistance force sensations that may be easily processed locally by control unit **54**. Thus, in effect, control unit **54** provides a parallel processing capability to host computer **58** to maximize the overall efficiency of system **20**.

[**0063**] Modified variable output signal **66**' provided by control unit **54** may require further processing before being received by magnetically-controllable device **24**. Modified output signal **66**' may be received by amplification device **56**, for example, to boost the level of modified output signal **66**' to provide amplified output signal **66**". Modified output signal **66**' may be a variable signal of low electrical current that is not sufficient to properly energize coil **48** to produce a magnetic field to the desired strength to provide the desired resistance forces. To solve this problem, amplification device **56** proportionally increases the strength or amperage of modified output signal **66**' to a level sufficient to properly energize coil **48**. Thus, amplification device **56** advantageously allows lower strength signals to be processed within system **20**, thereby saving cost by requiring less heavy duty components and less power, before boosting the signal to a level required to properly energize magnetically-controllable device **24**.

[**0064**] As mentioned above, control unit **54** and amplification device **56** may be a part of computer system **28** or the haptic interface unit or they may be separate components within system **20**. Those skilled in the art will realize that the various components described above may be combined in numerous manners without affecting the operability of the system. Similarly, some of the components, such as control unit **54** amplification device **56**, may not be required if their function can be adequately performed by other system components, such as host computer **58**. Thus, variation of the above-described configuration of system **20** is contemplated by the present invention.

[**0065**] Haptic interface system **20** comprises two closely coupled, interactive functions: a sensory input function and a force output function. The sensory input function tracks the operator's manual manipulation of the haptic interface device, feeding sensory data to the controller representative of those manipulations. The force output function provides physical tactile feedback to the operator in response to commands from the host computer. These two functions are intertwined in that the sensory input function generally varies in response to the force output function, and vice versa. In other words, the operator's manipulations of the haptic interface device are affected by the applied resistance forces, or force feedback, and the applied resistance forces are dependent upon the manipulations of the operator. Thus, haptic interface system **20** involves a very complex and continual interaction.

[**0066**] Returning again to the example of the computer system operator **22**, in operation, host computer **58** runs an interactive program, such as a game, using processor **62** to generate a video signal **80** received by display **30**. Video signal **80** is an electrical signal used to generate an image, corresponding to an event occurring within the game, on display **30**. Operator **22** responds to the event by moving haptic interface device **26**, such as a steering wheel or a joystick, in conjunction with the viewed event. Sensor **32** sends variable input signal **76** comprising tracking information representing the position of the wheel or joystick to control unit **54**. Control unit **54** may respond to the information by processing the information locally, and by forwarding the information, or a modified form of the information, as a modified variable input signal **76**' to host computer **58**. Even when processing information locally, control unit **54** may provide modified variable input signal **76**' to host computer **58** and/or display **30** to update the generated image of the event to correspond with the latest input.

[**0067**] Host computer **58** receives modified variable input signal **76**' from control unit **54** and inputs that information into processor **50** that is running the interactive game. Host computer **58**, based on the processing of modified input variable signal **76**', updates the image of the event generated on display **30** and provides a variable output signal **66** in proportion to a resistance force to be felt by operator **20** in moving the wheel or joystick. Variable output signal **66** may be modified by control unit **54** and amplified by amplification device **56** before reaching magnetically-controllable device **24** as amplified variable output signal **66**". The strength of amplified variable output signal **66**" varies in proportion to a desired magnetic field strength, and hence resistance force, as computed by host computer **58** to coordinate with the interactive program.

[**0068**] Again referring to **FIGS. 1B, 2A** and 2B, variable output signal **66**" thereby energizes coil **48** within magnetically-controllable device **24** to produce a magnetic field. The magnetic field is applied across working space **36**, affecting the shear strength of magnetically-controllable medium **34** contained within absorbent element **46**. The affect on the shear strength of medium **34** creates a semi-active, resistance force between first **38** and second **40** members, which is connected to haptic interface device **26**. As a result, operator **22** feels the changed resistance force through haptic interface device **26** during attempted movements of the haptic interface device. Thus, haptic interface system **20** provides opposing force feedback sensations, or resistance forces, to operator **22** maneuvering haptic interface device **26** to simulate a realistic feel. For example, the following feels may be simulated: jolting blasts, rigid surfaces, viscous liquids, increased gravity, compliant springs, jarring vibrations, grating textures, heavy masses, gusting winds, and any other physical phenomenon that can be represented mathematically and computed by controller **28**.