

have said sufficient space, said particular force effect data is stored in a cache implemented in memory of said host computer instead of said local memory; and means for receiving a command by said driver from said application program to output said particular force effect to a user of said force feedback device, wherein if said particular force effect data is stored in said cache, said driver swaps said particular force effect data with loaded force effect data in said local memory and instructs said force feedback device to output said particular force effect.

**29.** An apparatus as recited in claim 28 wherein said driver creates a representation of said local memory in said memory of said host computer, wherein said means for determining whether said local memory has sufficient space includes means for examining said representation for sufficient space.

**30.** An apparatus as recited in claim 29 wherein said means for determining whether said local memory has sufficient space includes means for comparing a priority of said particular force effect with a priority of said loaded force effect.

**31.** A method as recited in claim 28 wherein said force effect create command designates that at least one of a plurality of force effects be grouped in a category, and wherein said command instructs that force effect data for said category of force effects be stored in memory local to said force feedback device in place of an existing category of loaded force effects.

**32.** A method for outputting force effects from a force feedback device coupled to a host computer, the method comprising:

receiving a force effect play command from said host computer, said play command instructing that a particular force effect be output by said force feedback device, said particular force effect being stored as data in a memory local to said force feedback device, said local memory also storing data for at least one other force effect;

designating in a playlist in said local memory an identification of said particular force effect;

examining said playlist to determine which of a plurality of stored force effects are designated to be output;

determining a force based on said force effects designated in said playlist and outputting said force to a user of said force feedback device.

**33.** A method as recited in claim 32 wherein said force determined based on said force effects designated in said playlist is a sum of said designated force effects.

**34.** A method as recited in claim 32 further comprising storing a number in said local memory indicating how many

of said force effects stored in said local memory are currently designated to be output.

**35.** A method as recited in claim 34 wherein said examining said playlist includes examining said number to determine how many force effects are in said playlist.

**36.** A method as recited in claim 35 wherein said force effects in said playlist are provided in successive slots in said playlist.

**37.** A method as recited in claim 32 further comprising:

receiving a force effect create command from said host computer before receiving said force effect play command, said create command including force effect data characterizing a force effect; and

storing said force effect data in said memory local to said force feedback device at a location indicated by said create command.

**38.** A method for providing force output to a user of a force feedback device, said force feedback device being coupled to a host computer, the method comprising:

determining a first force to be output by actuators of said force feedback device;

outputting said first force at a first point in time occurring when a predetermined time interval has passed;

determining a second force to be output by said actuators;

if said predetermined time interval has not passed when said second force has been determined, waiting for a second point in time occurring when said predetermined time interval has passed after said first point in time, and outputting said second force at said second point in time; and

if said predetermined time interval has passed when said second force has been determined, waiting for a successive point in time occurring when an integer number of said predetermined time intervals has passed after said first point in time, and outputting a third force at said successive point in time, said third force being appropriate to said successive point in time.

**39.** A method as recited in claim 38 wherein said predetermined time interval has passed when said second force has been determined due to a plurality of force effects contributing to said second force.

**40.** A method as recited in claim 38 wherein said first force and said second force are at least partially based on a periodic function that varies with time, and wherein said third force is made appropriate to said successive point in time by basing said third force at least partially on an appropriate time point of said periodic function.

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