METHODS AND APPARATUSES FOR HAPTIC SYSTEMS

This application is a continuation-in-part of U.S. Patent Application Serial No. 14/808,247, filed July 24, 2015, which application is a continuation of U.S. Patent Application Serial No. 13/804,429, filed March 14, 2013, now U.S. Patent No. 9,146,069, which claims the benefit of U.S. Provisional Application No. 61/650,006, filed May 22, 2012, the entire contents of which are incorporated herein by reference. This application also claims benefit of U.S. Provisional Application No. 62/085,443, filed November 28, 2014, and U.S. Provisional Application No. 62/170,572, filed June 3, 2015, which are incorporated herein by reference.

U.S. Patent Application No. 14/551,526 is also incorporated by reference herein.

SUMMARY OF INVENTION

An aspect of the present invention provides a simulation system, comprising:

a body;

a linear motor attached to the body, the linear motor having at least two independent magnetic coils and a sliding mass having at least one magnet that magnetically interacts with at least one of the at least two independent magnetic coils when an electrical current is passed through at least one of the at least two independent magnetic coils;

a controller that controls movement of the sliding mass by controlling the electrical current going to at least one of the at least two independent magnetic coils such that the sliding mass produces a force on the body that simulates a haptic effect.

An another aspect of the present invention provides a simulation system, comprising:

a body;

a linear motor attached to the body, the linear motor controlling a sliding mass;

a controller that controls movement of the sliding mass such that the sliding mass produces a force on the body that simulates a haptic effect.

A further aspect of the present invention provides a simulation system, comprising:

a visual display in communication with a user;

a peripheral device including a body and a linear motor having a sliding mass;

a tracking system monitoring at least one of the user's movement and a movement of the peripheral device;

a computer system running a simulation and providing an output image from the simulation to the visual display and updating the image using a set of location data from the tracking system, the location data corresponding to at least one of the user's movement and the movement of the peripheral device,

wherein the computer system is in communication with a control system that controls the sliding mass which produces a force on the body simulating a haptic effect that correlates with the simulation.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a side view of a firearm training system, according to an exemplary embodiment of the present disclosure.

Figure 2 is a side view of a simulated firearm body of the system shown in Figure 1.

Figure 3 is a perspective view of an upper assembly of the simulated firearm body shown in Figure 2.

Figure 4 is an exploded view of the simulated firearm body shown in Figure 2.

Figure 5 is a perspective view of a linear motor and sliding mass, according to an exemplary embodiment of the present disclosure.

Figure 6 is an exploded side view of the linear motor and sliding mass shown in Figure 5.

Figure 7 is an assembled side view of the linear motor and sliding mass shown in Figure 6.

Figure 8 is a perspective view of a support bracket for a linear motor and sliding mass, according to an exemplary embodiment of the present disclosure.

Figure 9 is a side view of a simulated firearm body, according to an exemplary embodiment of the present disclosure.

Figure 10 is a schematic flow diagram of the simulated firearm system shown in Figure 1.