CLAIMS

What is claimed is:

1. A virtual reality ride system comprising:

an electronic display configured to present virtual reality image content to a rider while the rider is being carried through a variable ride environment by a ride vehicle configured to traverse the variable ride environment;

one or more sensors configured to determine sensor data indicative of movement characteristics of the ride vehicle in the variable ride environment; and

virtual reality processing circuitry communicatively coupled to the electronic display and the one or more sensors, wherein the virtual reality processing circuitry is configured to:

determine a predicted movement profile of the ride vehicle within the variable ride environment based at least in part on the sensor data received from the one or more sensors, wherein the predicted movement profile indicates that the ride vehicle is expected to move a predicted movement magnitude during a predicted movement duration;

determine a target perceived movement magnitude greater than the predicted movement magnitude at least in part by applying a movement-exaggeration factor to the predicted movement magnitude; and

determine movement-exaggerated virtual reality image content to be presented on the electronic display during the predicted movement duration at least in part by adapting default virtual reality image content to incorporate the target perceived movement magnitude.

2. The virtual reality ride system of claim 1, wherein the virtual reality ride system is a roller coaster ride system, a lazy river ride system, a log flume ride system, a boat ride system, a drop tower ride system, a pendulum ride system, a swing ride system, a scrambler ride system, or a robotic arm ride system.

3. The virtual reality ride system of claim 1, wherein the virtual reality processing circuitry is configured to instruct the electronic display to display the movement-exaggerated virtual reality image content during the predicted movement duration corresponding with the predicted movement magnitude.

4. The virtual reality ride system of claim 1, wherein the virtual reality processing circuitry is configured to determine the movement-exaggerated virtual reality image content at least in part by translating the default virtual reality image content a distance corresponding with the target perceived movement magnitude.

5. The virtual reality ride system of claim 1, wherein:

the predicted movement profile indicates that the ride vehicle is expected to move within the variable ride environment an additional predicted movement magnitude during an additional predicted movement duration; and

the virtual reality processing circuitry is configured to:

determine an additional target perceived movement magnitude greater than the additional predicted movement magnitude at least in part by applying an additional movement-exaggeration factor to the additional predicted movement magnitude; and

determine additional movement-exaggerated virtual reality image content to be presented on the electronic display during the additional predicted movement duration at least in part by adapting additional default virtual reality image content to incorporate the additional target perceived movement magnitude.

6. The virtual reality ride system of claim 5, wherein a value of the movement-exaggeration factor applied to the predicted movement magnitude is different from a value of the additional movement-exaggeration factor applied to the additional predicted movement magnitude when:

image content of the movement-exaggerated virtual reality image content to be presented on the electronic display during the predicted movement duration differs from the additional movement-exaggerated virtual reality image content to be presented on the electronic display during the additional predicted movement duration;

the predicted movement magnitude of the ride vehicle expected to occur during the predicted movement duration differs from the additional predicted movement magnitude of the ride vehicle that is expected to occur during the additional predicted movement duration;

duration of the predicted movement duration differs from duration of the additional predicted movement duration, or

any combination thereof.

7. The virtual reality ride system of claim 1, wherein the movement-exaggeration factor comprises an offset value, a gain value, or both.

8. The virtual reality ride system of claim 1, wherein:

the predicted movement profile indicates that the ride vehicle is expected to move in a predicted movement direction within the variable ride environment during the predicted movement duration; and

the virtual reality processing circuitry is configured to determine the movement-exaggerated virtual reality image content to be presented on the electronic display during the predicted movement duration at least in part by adapting the default virtual reality image content to incorporate a perceived movement direction that matches the predicted movement direction of the ride vehicle.

9. The virtual reality ride system of claim 1, wherein the virtual reality processing circuitry is configured to determine the predicted movement profile of the ride vehicle by extrapolating a ride vehicle movement prediction model that at least in part describes one or more expected relationships between the sensor data and subsequent movement characteristics of the ride vehicle.

10. The virtual reality ride system of claim 1, wherein:

the variable ride environment comprises a water body and at least one buoy configured to float on the water body; and

the one or more sensors comprise an environment sensor implemented on the at least one buoy, wherein the environment sensor is configured to determine sensor data indicative of proximity of the ride vehicle to the at least one buoy, movement characteristics of the at least one buoy, movement characteristics of a wave in the water body, or any combination thereof.

11. The virtual reality ride system of claim 1, wherein:

the variable ride environment comprises a water body and a wall adjacent the water body; and

the one or more sensors comprise at least one environment sensor positioned on the wall, wherein the at least one environment sensor is configured to determine sensor data indicative of proximity of the ride vehicle to the wall, movement characteristics of a wave in the water body, or both.

12. A method of operating a virtual reality ride system, comprising:

receiving, using processing circuitry implemented in the virtual reality ride system, sensor data determined by one or more sensors while a ride vehicle is moving through a variable ride environment of the virtual reality ride system, wherein the variable ride environment defines a plurality of variable paths through which the ride vehicle is configured to traverse;

predicting, using the processing circuitry and a ride vehicle movement prediction model, a movement magnitude that the ride vehicle will experience within the variable ride environment at a time during a prediction horizon based at least in part on the sensor data received from the one or more sensors;

determining, using the processing circuitry, a target perceived movement magnitude corresponding with the time during the prediction horizon at least in part by applying one or more movement-exaggeration factors to the movement magnitude that the ride vehicle is predicted to experience within the variable ride environment at the time during the prediction horizon; and

determining, using the processing circuitry, movement-exaggerated virtual reality content to be presented to a rider of the ride vehicle at the time by adapting default virtual reality content corresponding with the time during the prediction horizon based at least in part on the target perceived movement magnitude.

13. The method of operating the virtual reality ride system of claim 12, comprising instructing, using the processing circuitry, an electronic display carried by the ride vehicle to display the movement-exaggerated virtual reality content at the time.

14. The method of operating the virtual reality ride system of claim 12, comprising:

predicting, using the processing circuitry, an additional movement magnitude that the ride vehicle will experience within the variable ride environment at an additional time during the prediction horizon based at least in part on the sensor data received from the one or more sensors;

determining, using the processing circuitry, an additional target perceived movement magnitude corresponding with the additional time during the prediction horizon at least in part by applying the one or more movement-exaggeration factors to the additional movement magnitude that the ride vehicle is predicted to experience within the variable ride environment at the additional time during the prediction horizon; and

determining, using the processing circuitry, additional movement-exaggerated virtual reality content to be presented to a rider of the ride vehicle at the additional time by adapting default virtual reality content corresponding with the additional time during the prediction horizon based at least in part on the additional target perceived movement magnitude.

15. The method of operating the virtual reality ride system of claim 12, comprising predicting, using the processing circuitry, a movement direction that the ride vehicle will experience within the variable ride environment at the time during the prediction horizon based at least in part on the sensor data received from the one or more sensors, wherein adapting the default virtual reality to determine the movement-exaggerated virtual reality content comprises:

shifting the default virtual reality content in a direction corresponding with the movement direction that the ride vehicle is predicted to within the variable ride environment experience at the time; and

shifting the first default virtual reality content a distance corresponding with the target perceived movement magnitude that differs from the movement magnitude that the ride vehicle is predicted to experience within the variable ride environment at the time.

16. A tangible, non-transitory, computer readable medium storing instructions executable by one or more processors of a virtual reality ride system, wherein the instructions comprise instructions to:

determine, using the one or more processors, sensor data measured by one or more sensors as a ride vehicle is carrying a rider through a changeable ride environment of the virtual reality ride system, wherein the ride vehicle in configured to a traverse a variable path of a plurality of variable paths defined by the changeable ride environment;

determine, using the one or more processors, a predicted movement magnitude of the ride vehicle within the changeable ride environment that is predicted to occur during a subsequent time period based at least in part on the sensor data measured by the one or more sensors; and

determine, using the one or more processors, movement-exaggerated virtual reality image content based at least in part on the predicted movement magnitude such that presentation of the movement-exaggerated virtual reality image content to the rider results in a perceived movement magnitude that differs from the predicted movement magnitude of the ride vehicle within the changeable ride environment.

17. The tangible, non-transitory, computer readable medium of claim 16, comprising instructions to instruct, using the one or more processors, an electronic display carried by the ride vehicle to display the movement-exaggerated virtual reality image content during the subsequent time period in which the predicted movement magnitude of the ride vehicle is predicted to occur.

18. The tangible, non-transitory, computer readable medium of claim 16, wherein the instructions to determine the movement-exaggerated virtual reality image content comprise instructions to:

determine a target magnitude of the perceived movement magnitude that differs from the predicted movement magnitude at least in part by applying one or more movement-exaggeration factors to the predicted movement magnitude of the ride vehicle; and

offsetting default virtual reality image content corresponding with the subsequent time period a distance corresponding with the target magnitude of the perceived movement magnitude that differs from the predicted movement magnitude of the ride vehicle.

19. The tangible, non-transitory, computer readable medium of claim 16, comprising instructions to determine, using the one or more processors, a predicted movement direction of the ride vehicle that is predicted to occur during the subsequent time period based at least in part on the sensor data measured by the one or more sensors, wherein the instructions to determine the movement-exaggerated virtual reality image content comprise instructions to:

offset default virtual reality image content corresponding with the subsequent time period in a direction corresponding with the predicted movement direction of the ride vehicle that is predicted to occur during the subsequent time period; and

offset the default virtual reality content corresponding with the subsequent time period a distance corresponding with a target magnitude of the perceived movement magnitude that differs from the predicted movement magnitude of the ride vehicle.

20. The virtual reality ride system of claim 1, wherein the ride vehicle is configured to traverse a variable path of plurality of variable paths defined by the variable ride environment during a first pass through the virtual reality ride system, and wherein the ride vehicle is configured to traverse and additional variable path of the plurality of variable paths, different than the variable path, during a second pass through the virtual reality ride system.

21. A virtual reality (VR) ride system comprising:

a ride vehicle configured to support a rider and traverse a variable ride environment;

an electronic display configured to present image content to the rider carried through the variable ride environment by the ride vehicle; and

one or more processors communicatively coupled to the electronic display and a sensor, wherein the sensor is configured to record sensor data indicative of a movement profile of the ride vehicle in the variable ride environment, and wherein the one or more processors are configured to:

determine a predicted ride vehicle trajectory of the ride vehicle within the variable ride environment based on the sensor data indicative of the movement profile of the ride vehicle and a ride vehicle movement prediction model, wherein the predicted ride vehicle trajectory corresponds to a predicted movement magnitude of the ride vehicle during a predicted movement duration;

determine a target perceived movement magnitude that is greater than the predicted movement magnitude; and

determine movement-exaggerated image content to be presented on the electronic display during the predicted movement duration by adjusting default image content to incorporate the target perceived movement magnitude.

22. The VR ride system of claim 21 wherein the ride vehicle movement prediction model describes at least one relationship between the sensor data and the predicted movement magnitude.

23. The VR ride system of claim 21, wherein the predicted ride vehicle trajectory indicates that the ride vehicle is expected to move the predicted movement magnitude in a predicted movement direction.

24. The VR ride system of claim 21, wherein the one or more processors are configured to determine the target perceived movement magnitude by applying a movement-exaggeration factor to the predicted movement magnitude.

25. The VR ride system of claim 24, wherein the movement-exaggeration factor comprises an offset value that biases the target perceived movement magnitude relative to the predicted movement magnitude, a gain value that scales the target perceived movement magnitude relative to the predicted movement magnitude, or both.

26. The VR ride system of claim 21, wherein the one or more processors are configured to instruct the electronic display to display the movement-exaggerated image content during the predicted movement duration corresponding with the predicted movement magnitude.

27. The VR ride system of claim 21, wherein the movement-exaggerated image content is translated relative to the default image content by a distance corresponding to the target perceived movement magnitude.

28. The VR ride system of claim 21, wherein the sensor data is indicative of orientation of the ride vehicle, location of the ride vehicle, previous movement characteristics of the ride vehicle, current movement characteristics of the ride vehicle in the variable ride environment, or a combination thereof.

29. The VR ride system of claim 21, wherein the electronic display comprises a headset display implemented in a headset.

30. The VR ride system of claim 21, wherein the electronic display comprises a vehicle display integrated with the ride vehicle.

31. The VR ride system of claim 21, wherein the variable ride environment comprises a water body ride environment.

32. A virtual reality (VR) ride system comprising:

an electronic display configured to present image content to a rider;

a ride vehicle configured to support the rider and traverse a variable ride environment; and

VR processing circuitry communicatively coupled to the electronic display and one or more sensors, wherein the one or more sensors are configured to capture sensor data indicative of a current movement profile of the ride vehicle, and wherein the VR processing circuitry is configured to:

receive the sensor data indicative of the current movement profile of the ride vehicle from the sensor;

generate a predicted movement profile of the ride vehicle by using the sensor data in a ride vehicle movement prediction model, wherein the predicted movement profile indicates that the ride vehicle is expected to move a predicted movement magnitude during a predicted movement duration;

determine a target perceived movement magnitude that is greater than the predicted movement magnitude; and

determine movement-exaggerated image content to be presented on the electronic display during the predicted movement duration, wherein the movement-exaggerated image content corresponds to the target perceived movement magnitude.

33. The VR ride system of claim 32, wherein the ride vehicle comprises an input device

configured to facilitate rider control of a movement direction of the ride vehicle, and wherein the input device comprises a steering wheel or a rudder.

34. The VR ride system of claim 32, wherein the variable ride environment comprises a water body ride environment, and wherein the ride vehicle comprises a boat ride vehicle.

35. The VR ride system of claim 32, comprising the one or more sensors, wherein the one or more sensors comprises an inertial motion sensor, a proximity sensor, or a location sensor.

36. The VR ride system of claim 32, wherein the VR processing circuitry is configured to determine the target perceived movement magnitude by applying a movement-exaggeration factor to the predicted movement magnitude, and wherein the movement-exaggeration factor comprises an offset value or a gain value.

37. A tangible, non-transitory, machine-readable medium, comprising machine-readable instructions that, when executed by one or more processors, cause the one or more processors to:

receive sensor data indicative of movement characteristics of a ride vehicle traversing a variable path of a variable ride environment, wherein the sensor data is received from one or more sensors associated with the ride vehicle and configured to capture data corresponding to a movement profile of the ride vehicle;

generate a predicted movement profile of the ride vehicle based on the sensor data, wherein the predicted movement profile indicates that the ride vehicle is expected to move a predicted movement magnitude during a predicted movement duration;

determine a target perceived movement magnitude that is greater than the predicted movement magnitude by applying a movement-exaggeration factor to the predicted movement magnitude; and

determine movement-exaggerated virtual reality (VR) image content that incorporates the target perceived movement magnitude, wherein the movement-exaggerated VR image content is configured to be presented to a rider via an electronic display during the predicted movement duration.

38. The tangible, non-transitory, machine-readable medium of claim 37, wherein the machine-readable instructions are configured to cause the one or more processors to generate the predicted movement profile by inputting the sensor data and a default movement profile of the ride vehicle to a ride vehicle movement prediction model.

39. The tangible, non-transitory, machine-readable medium of claim 37, wherein the electronic display comprises a headset display integrated with a head-mounted device, and wherein the one or more processors are configured to receive the sensor data from a sensor of the head-mounted display.

40. The tangible, non-transitory, machine-readable medium of claim 37, wherein the variable ride environment comprises a water body ride environment.