

## CLAIMS:

1. A ride attraction system comprising:
  - a ride vehicle configured to transport passengers along a path;
  - a screen having a resting position in which the screen occupies the path, wherein the screen comprises a display surface configured to display an image to the ride vehicle along a portion of the path;
  - an actuation system physically coupled to the screen and configured to move the screen from its resting position and along a compound trajectory comprising at least one translation and at least one rotation; and
  - a control system in communication with the actuation system and comprising one or more processing devices configured to cause the actuation system to move the screen from its resting position along the compound trajectory and out of a clearance envelope of the ride vehicle as the ride vehicle approaches the screen and passes the resting position vacated by the screen.
2. The system of claim 1, comprising a projection system having one or more projection devices and configured to project the image onto the display surface.
3. The system of claim 2, wherein the compound trajectory is such that the display surface of the screen remains facing toward the ride vehicle until the vehicle is past the screen, and the projection system is configured to continue projecting the image onto the screen through at least portions of the compound trajectory such that the image can be observed from within the ride vehicle on the display surface.
4. The system of claim 3, wherein the projection system or the control system is configured to apply a distortion or perspective correction function to data corresponding to the projected image to enable the image to be reproduced in a substantially undistorted manner on the screen along at least portions of the compound trajectory.

5. The system of claim 2, wherein the screen comprises a curved geometry.
6. The system of claim 5, comprising a curved wall configured to at least partially surround a section of the path, the curved wall enabling substantial optical isolation of the section of the path resulting in no view or only a limited view of the path past the curved wall, wherein the screen forms a region of the curved wall in its resting position and comprises a mating geometry configured to mate with the remaining regions of the curved wall and thereby enable the substantial optical isolation of the section of the path when in the resting position.
7. The system of claim 6, wherein the curved wall comprises an additional display surface onto which the projection system is configured to project one or more images.
8. The system of claim 7, wherein the one or more images projected onto the additional display surface change over time.
9. The system of claim 7, wherein the image projected onto the display surface of the screen is pre-processed to account for movement of the screen based on a motion path determined by at least a portion of the compound trajectory, and the pre-processing enables blending between respective edges of the screen and the wall so as to mask movement of the screen away from the wall.
10. The system of claim 7, wherein the control system is communicatively coupled to the projection system and the ride vehicle, and the one or more processing devices are configured to execute instructions to coordinate the operation of the ride vehicle, the actuation system, and the projection system to cause the ride vehicle to progress toward the curved wall, cause one or more images to be projected onto the

display surface and the additional display surface, and cause the actuation system to move the screen out of the path along the compound trajectory as the ride vehicle travels along the path and through the curved wall.

11. The system of claim 1, wherein the actuation system comprises a robotic arm having at least two controllable degrees of freedom, and the robotic arm is attached to the screen on an opposite side of the display surface.

12. The system of claim 11, wherein the robotic arm comprises between three and six controllable degrees of freedom.

13. The system of claim 11, wherein the robotic arm comprises a collection of rigid members connected via movable couplings, a first rigid member of the rigid members is indirectly secured to a floor via a first movable coupling, the path is defined by first tracks secured to the floor, wherein the ride vehicle is configured to travel on the tracks to move along the path, and wherein the first rigid member is positioned proximate the first tracks.

14. The system of claim 13, wherein the first movable coupling only allows rotation of the first rigid member such that the first rigid member is unable to move along the floor.

15. The system of claim 13, wherein the first movable coupling comprises a track or slide mechanism enabling translational movement of the entire robotic arm along the floor and beside at least a portion of the path.

16. A method of operating a ride attraction system, comprising:  
moving a ride vehicle along a path;  
displaying an image in a display direction toward the ride vehicle using a screen;  
occupying a forward section of the path with the screen during a first portion of the movement of the ride vehicle along the path, wherein the screen is in a resting position during the first portion of the movement of the ride vehicle such that the ride vehicle approaches the screen;

moving the screen along a first compound trajectory using a robotic actuation system coupled to the screen, the movement of the screen along the first compound trajectory occurring during or before a second portion of the movement of the ride vehicle along the path such that the ride vehicle passes the screen without touching the screen, and wherein the first compound trajectory comprises at least one translation and at least one rotation; and

moving the screen along a second compound trajectory once the ride vehicle has passed the screen, wherein the second compound trajectory moves the screen to the resting position.

17. The method of claim 16, comprising moving the screen along the first and second trajectories using only rotational movement of the robotic actuation system.

18. The method of claim 16, comprising translating the robotic actuation system along an additional path positioned proximate the path on which the ride vehicle is positioned, and the additional path extends for only a portion of the path such that the screen displays the image in the display direction for only a portion of the movement of the ride vehicle along the path.

19. The method of claim 16, wherein displaying the image in the display direction toward the ride vehicle using the screen comprises projecting the image onto the screen during the first portion of the movement of the ride vehicle along the path using a

projection system comprising one or more projection devices, and the projection system is configured to project the image onto the screen through at least a portion of the first compound trajectory.

20. The method of claim 19, comprising:

moving the ride vehicle into at least a partial enclosure that is curved, the movement occurring during the first portion of the movement of the ride vehicle, wherein the screen forms a part of the at least partial enclosure when occupying the path in its resting position;

projecting one or more images onto a surface of the at least partial enclosure using the projection system such that the one or more images seemingly create an environment at least partially surrounding the ride vehicle; and

moving the screen along the first compound trajectory to create an opening in the at least partial enclosure through which the ride vehicle travels during the second portion of the movement of the ride vehicle.

21. The method of claim 20, comprising continuing to project the image onto the screen as the screen moves along the first trajectory and above the ride vehicle, the image having an applied correction when the screen is above the ride vehicle such that the image continues to be displayed by the screen in a substantially undistorted manner.

22. The method of claim 16, wherein the second compound trajectory re-traces the first compound trajectory.

23. A ride attraction system, comprising:  
a path of travel;  
a curved wall including an opening through which the path extends;  
a ride vehicle positioned on the path and configured to move along the path into an enclosure including the curved wall;  
a screen having a curved geometry corresponding to the opening in the curved wall, the screen being coupled to a robotic actuation system having a robotic actuator comprising between four and six degrees of freedom, the robotic actuation system being configured to move the screen between a first position and a second position, wherein in the first position the screen fills the opening to form a portion of the curved wall and occupies the path of travel with respect to the ride vehicle, and in the second position the screen is removed from the opening such that the screen does not occupy the path of travel with respect to the ride vehicle; and  
a projection system having one or more projection devices and configured to project an image onto a surface of the curved wall and a surface of the screen.

24. The system of claim 23, comprising a control system in communication with at least the robotic actuation system and the projection system, the control system comprising one or more processing devices configured to cause the robotic actuation system to move the screen along a compound trajectory between the first and second positions in synchrony with the projection of images onto the screen and the curved wall using the projection system.

The invention claimed is:

1. A ride attraction system comprising:

a ride vehicle configured to transport passengers along a path;

a screen having a resting position in which the screen occupies the path, wherein the screen comprises a display surface configured to display an image to the ride vehicle along a portion of the path;

an actuation system physically coupled to the screen and configured to move the screen from its resting position and along a compound trajectory comprising at least one translation and at least one rotation; and

a control system in communication with the actuation system and comprising one or more processing devices configured to cause the actuation system to move the screen from its resting position along the compound trajectory and out of a clearance envelope of the ride vehicle as the ride vehicle approaches the screen and passes the resting position vacated by the screen, wherein the actuation system comprises a robotic arm having at least two controllable degrees of freedom, and the robotic arm is attached to the screen on a side of the screen opposite the display surface, and wherein the robotic arm comprises a base that is coupled to a floor at a position adjacent to the path of the ride vehicle, the base being coupled to the floor in a manner that resists movement of the base relative to the path.

2. The system of claim **1**, comprising a projection system having one or more projection devices and configured to project the image onto the display surface.

3. The system of claim **2**, wherein the compound trajectory is such that the display surface of the screen remains facing toward the ride vehicle until the vehicle is past the screen, and the projection system is configured to continue projecting the image onto the screen through at least portions of the compound trajectory such that the image can be observed from within the ride vehicle on the display surface.

4. The system of claim **3**, wherein the projection system or the control system is configured to apply a distortion or perspective correction function to data corresponding to the projected image to enable the image to be reproduced in a substantially undistorted manner on the screen along at least portions of the compound trajectory.

5. The system of claim **2**, wherein the screen comprises a curved geometry.

6. The system of claim **5**, comprising a curved wall configured to at least partially surround a

section of the path, the curved wall enabling substantial optical isolation of the section of the path resulting in no view or only a limited view of the path past the curved wall, wherein the screen forms a region of the curved wall in its resting position and comprises a mating geometry configured to mate with the remaining regions of the curved wall and thereby enable the substantial optical isolation of the section of the path when in the resting position.

7. The system of claim 6, wherein the curved wall comprises an additional display surface onto which the projection system is configured to project one or more images.

8. The system of claim 7, wherein the one or more images projected onto the additional display surface change over time.

9. The system of claim 7, wherein the image projected onto the display surface of the screen is pre-processed to account for movement of the screen based on a motion path determined by at least a portion of the compound trajectory, and the pre-processing enables blending between respective edges of the screen and the wall so as to mask movement of the screen away from the wall.

10. The system of claim 7, wherein the control system is communicatively coupled to the projection system and the ride vehicle, and the one or more processing devices are configured to execute instructions to coordinate the operation of the ride vehicle, the actuation system, and the projection system to cause the ride vehicle to progress toward the curved wall, cause one or more images to be projected onto the display surface and the additional display surface, and cause the actuation system to move the screen out of the path along the compound trajectory as the ride vehicle travels along the path and through the curved wall.

11. The system of claim 1, wherein the robotic arm comprises between three and six controllable degrees of freedom.

12. The system of claim 1, wherein the robotic arm comprises a collection of rigid members connected via movable couplings, a first rigid member of the rigid members is indirectly secured to a floor via a first movable coupling, the path is defined by first tracks secured to the floor, wherein the ride vehicle is configured to travel on the tracks to move along the path, and wherein the first rigid member is positioned proximate the first tracks.

13. The system of claim 12, wherein the first movable coupling only allows rotation of the first rigid member such that the first rigid member is unable to move along the floor.

14. A method of operating a ride attraction system, comprising:  
moving a ride vehicle along a path;

displaying an image in a display direction toward the ride vehicle using a screen;

occupying a forward section of the path with the screen during a first portion of the movement of the ride vehicle along the path, wherein the screen is in a resting position during the first portion of the movement of the ride vehicle such that the ride vehicle approaches the screen;

moving the screen along a first compound trajectory using a robotic actuation system comprising a robotic arm having at least two controllable degrees of freedom coupled to the screen, the movement of the screen along the first compound trajectory occurring during or before a second portion of the movement of the ride vehicle along the path such that the ride vehicle passes the screen without touching the screen, wherein the first compound trajectory comprises at least one translation and at least one rotation, and wherein a base of the robotic arm does not move relative to the path while the screen is moved along the first compound trajectory; and

moving the screen along a second compound trajectory once the ride vehicle has passed the screen, wherein the second compound trajectory moves the screen to the resting position, and wherein the base of the robotic arm does not move relative to the path while the screen is moved along the second compound trajectory.

15. The method of claim **14**, comprising moving the screen along the first and second trajectories using only rotational movement of the robotic actuation system.

16. The method of claim **14**, wherein displaying the image in the display direction toward the ride vehicle using the screen comprises projecting the image onto the screen during the first portion of the movement of the ride vehicle along the path using a projection system comprising one or more projection devices, and the projection system is configured to project the image onto the screen through at least a portion of the first compound trajectory.

17. The method of claim **16**, comprising:

moving the ride vehicle into at least a partial enclosure that is curved, the movement occurring during the first portion of the movement of the ride vehicle, wherein the screen forms a part of the at least partial enclosure when occupying the path in its resting position;

projecting one or more images onto a surface of the at least partial enclosure using the projection system such that the one or more images seemingly create an environment at least partially surrounding the ride vehicle; and

moving the screen along the first compound trajectory to create an opening in the at least partial enclosure through which the ride vehicle travels during the second portion of the movement of the ride vehicle.

18. The method of claim **17**, comprising continuing to project the image onto the screen as the screen moves along the first trajectory and above the ride vehicle, the image having an applied correction when the screen is above the ride vehicle such that the image continues to be displayed by the screen in a substantially undistorted manner.

19. The method of claim **14**, wherein the second compound trajectory re-traces the first compound trajectory.

20. A ride attraction system, comprising:

a path of travel;

a curved wall including an opening through which the path extends;

a ride vehicle positioned on the path and configured to move along the path into an enclosure including the curved wall;

a screen having a curved geometry corresponding to the opening in the curved wall, the screen being coupled to a robotic actuation system having a robotic actuator comprising between four and six degrees of freedom, the robotic actuation system being configured to move the screen between a first position and a second position, wherein in the first position the screen fills the opening to form a portion of the curved wall and occupies the path of travel with respect to the ride vehicle, and in the second position the screen is removed from the opening such that the screen does not occupy the path of travel with respect to the ride vehicle; and

a projection system having one or more projection devices and configured to project an image onto a surface of the curved wall and a surface of the screen.

21. The system of claim **20**, comprising a control system in communication with at least the robotic actuation system and the projection system, the control system comprising one or more processing devices configured to cause the robotic actuation system to move the screen along a compound trajectory between the first and second positions in synchrony with the projection of images onto the screen and the curved wall using the projection system.

22. A ride attraction system comprising:

a ride vehicle configured to transport passengers along a path;

a screen having a resting position in which the screen occupies the path, wherein the screen comprises a display surface configured to display an image to the ride vehicle along a portion of the path;

an actuation system physically coupled to the screen and configured to move the screen from its resting position and along a compound trajectory comprising at least one translation and at least one rotation, wherein the screen has a curved geometry;

a control system in communication with the actuation system and comprising one or more processing devices configured to cause the actuation system to move the screen from its resting position along the compound trajectory and out of a clearance envelope of the ride vehicle as the ride vehicle approaches the screen and passes the resting position vacated by the screen; and

a curved wall configured to at least partially surround a section of the path, the curved wall enabling substantial optical isolation of the section of the path resulting in no view or only a limited view of the path past the curved wall, wherein the screen forms a region of the curved wall in its resting position and comprises a mating geometry configured to mate with the remaining regions of the curved wall and thereby enable the substantial optical isolation of the section of the path when in the resting position.

23. The system of claim **22**, comprising a projection system having one or more projection devices and configured to project images onto the display surface and the curved wall.