CLAIMS

What is claimed is:

1. A robotic device for traversing vertical or near vertical surfaces comprising:

three or more modular structures; and

an interconnecting frame structure comprising two or more longitudinal bars connected to each of the three or more modular structures, each of the three or more modular structures comprising:

means for adhering a pad structure of the modular structure to the vertical or near vertical surfaces;

means for translational motion of the modular structure across the vertical or near vertical surfaces; and

means for maneuvering the modular structure over obstacles, wherein the means for maneuvering the modular structure over obstacles comprises:

means for detecting the obstacles; and

means for raising the pad structure of the modular structure in relation to the interconnecting frame structure to a raised position so that, in response to detecting one of the obstacles, the means for raising the pad structure raises the pad structure of the modular structure to the raised position and maintains the pad structure in the raised position while the means for translational motion of other modular structures moves the interconnecting frame structure until the raised pad structure is moved over the detected obstacle,

wherein the interconnecting frame structure is maintained at a constant distance from and parallel to the vertical or near vertical surface and, when a pad structure of a modular structure is in its raised position, the interconnecting frame structure

maintains the pad surface of the pad structure substantially parallel to the vertical or near vertical surface.

2. The robotic device in accordance with Claim 1 wherein the means for raising the pad structure comprises an elevation system coupled to the interconnecting frame structure, the modular structure and the pad structure for raising the pad structure in relation to the interconnecting frame structure.

3. The robotic device in accordance with Claim 2 wherein the elevation system comprises:

a lead screw mechanism; and

a motor coupled between the lead screw mechanism and the pad structure.

4. The robotic device in accordance with Claim 3 wherein the elevation system further comprises sensing means for detecting movement of the pad structure during raising and lowering of the pad structure by the elevation system.

5. The robotic device in accordance with any of the preceding claims wherein the means for adhering the pad structure to the vertical or near vertical surfaces comprises:

a flexible suction cup mounted on the pad structure; and

variable vacuum means for creating a variable vacuum between the flexible suction cup and the vertical or near vertical surfaces.

6. The robotic device in accordance with Claim 5 wherein the flexible suction cup comprises a flexible thermoplastic polyurethane material.

7. The robotic device in accordance with Claim 5 or Claim 6 wherein the variable vacuum means creates a variable vacuum for variable suction control based on an orientation of the robotic device.

8. The robotic device in accordance with any of the preceding claims wherein the means for translational motion across the vertical or near vertical surfaces comprises one or both of caterpillar bands or wheels operating under the control of motors.

9. The robotic device in accordance with Claim 8 wherein the motors comprise one or more of DC motors or servo motors, and wherein the caterpillar bands are controlled by DC motors and the wheels are controlled by servo motors.

10. A robotic device for traversing vertical or near vertical surfaces comprising: three or more modular structures; and

an interconnecting frame structure comprising two or more longitudinal bars connected to each of the three or more modular structures, each of the three or more modular structures comprising:

means for adhering a pad structure of the modular structure to the vertical or near vertical surfaces;

means for translational motion of the modular structure across the vertical or near vertical surfaces; and

means for maneuvering the modular structure over obstacles, wherein the means for adhering the pad structure to the vertical or near vertical surfaces comprises:

a flexible suction cup mounted on the pad structure; and

variable vacuum means for creating a variable vacuum between the flexible suction cup and the vertical or near vertical surfaces, and

wherein the interconnecting frame structure is maintained at a constant distance from and parallel to the vertical or near vertical surface by the two or more longitudinal bars connected to each of the three or more modular structures.

11. The robotic device in accordance with Claim 10 wherein the variable vacuum means creates a variable vacuum for variable suction control based on an orientation of the robotic device.

12. The robotic device in accordance with Claim 10 or Claim 11 wherein the flexible suction cup comprises a flexible thermoplastic polyurethane material.

13. The robotic device in accordance with any of Claims 10 to 12 wherein the means for maneuvering the modular structure over obstacles comprises:

means for detecting the obstacles; and

an elevation system coupled to the interconnecting frame structure, the modular structure and the pad structure for raising the pad structure in relation to the interconnecting structure and the modular structure so that, in response to detecting one of the obstacles, the elevation system raises the pad structure of the modular structure while the means for translational motion of other modular structures moves the interconnecting frame structure until the raised pad structure is moved over the

detected obstacle.

14. The robotic device in accordance with Claim 13 wherein the elevation system further comprises sensing means for detecting movement of the pad structure during raising and lowering of the pad structure by the elevation system.

15. The robotic device in accordance with Claim 13 or Claim 14 wherein the elevation system comprises:

a lead screw mechanism; and

a motor coupled between the lead screw mechanism and the pad structure.

16. A method for navigating a robotic device over obstacles on vertical or near vertical surfaces, the robotic device comprising three or more modular structures and an interconnecting frame structure comprising two or more longitudinal bars connected to each of the three or more modular structures, each of the three or more modular structures comprising means for adhering a pad structure of the modular structure to the vertical or near vertical surfaces and means for translational motion of the modular structure across the vertical or near vertical surfaces, wherein the method comprises:

detecting the obstacles; and

raising a pad structure of one of the modular structures in relation to the interconnecting frame structure to a raised position so that, in response to detecting one of the obstacles, the pad structure of the one of the modular structures is raised to the raised position while the means for translational motion of other modular structures moves the

interconnecting frame structure until the raised pad structure is moved over the detected obstacle to an opposite side of the detected obstacle.

17. The method in accordance with Claim 16 further comprising lowering the raised pad to the vertical or near vertical surfaces at the opposite side of the detected obstacle.

18. The method in accordance with Claim 17 wherein the steps of raising and lowering the pad comprise activating a motor to move the pad along a lead screw mechanism.