CLAIMS

1. A water environment robotic system, comprising:

an underwater robotic vehicle, in which the underwater robotic vehicle is at least one vehicle of the water environment robotic system;

a tether;

a motor positioned on the underwater robotic vehicle and coupled to the tether operable to retract and extend the tether adding or reducing tension thereon;

a buoyancy module having a positive or negative buoyancy coupled to the tether; and

a state controller connected to the motor and operative to control an amount of tension on the tether connecting the buoyancy module with the underwater robotic vehicle so as to buoyantly engage or disengage the underwater robotic vehicle with the buoyancy module;

in which a depth position of the underwater vehicle in a water column is adjustable according to whether the buoyancy module is buoyantly engaged or disengaged from the underwater robotic vehicle.

2. A water environment robotic system according to Claim 1, in which the buoyancy module has a positive buoyancy, such that retraction of the tether by the motor buoyantly engages the buoyancy module with the underwater vehicle and causes the underwater robot to move higher in the water column.

3. A water environment robotic system according to Claim 1, further comprising:

a water surface vehicle having a winch connected to the tether;

in which the buoyancy module has a negative buoyancy, such that retraction of the tether by the winch of the water surface vehicle buoyantly engages the buoyancy module with the water surface vehicle and also disengages buoyant coupling between the underwater vehicle and the buoyancy module, causing the underwater robot to move higher in the water column.

4. A water environment robotic system according to Claim 1, in which the buoyancy module has a negative buoyancy, such that retraction of the tether by the motor engages the buoyancy module with the underwater robotic vehicle and causes the underwater robotic

vehicle to move lower in the water column, and sufficient expansion of the tether disengages the buoyant coupling between the buoyancy module and the underwater robotic vehicle, causing the underwater robotic vehicle to move higher in the water column.

5. A water environment robotic system according to Claim 1, in which the buoyancy module is incorporated in a surface boat.

6. A water environment robotic system according to Claim 1, in which the buoyancy module is a surface boat.

7. A water environment robotic system according to Claim 6, in which the surface boat is configured to perform functions on a surface of the water when the surface boat is in the disengaged condition.

8. A water environment robotic system according to Claim 1, in which the tether being in a slack condition causes the buoyancy module to be in the state of being buoyantly disengaged with the underwater robot.

9. A robotic system having selectively engageable buoyancy for use in a water environment, comprising:

an underwater robotic vehicle;

a tether;

a winch positioned on the underwater robotic vehicle and coupled to the tether and operable to retract and extend the tether adding or reducing tension thereon;

a buoyancy module having a positive or negative buoyancy coupled to the tether; and

a state controller connected to the winch and operative to transition the robotic system between at least two of the following buoyancy states:

(i) in a first state the tether and buoyancy module are in a retracted position and the underwater robotic vehicle has a first buoyancy, and

(ii) in a second state the tether and buoyancy module are in an extended position and the underwater robotic vehicle has a second buoyancy, and

in which a depth position of the underwater vehicle in a water column is adjustable according to whether the buoyancy module is buoyantly engaged or disengaged from the underwater robotic vehicle.

10. A method for operating a water environment robotic system, comprising the steps of:

deploying the water environment robotic system into a water environment, the water environment robotic system comprising:

an underwater robotic vehicle, in which the underwater robotic vehicle is at least one vehicle of the water environment robotic system;

a tether;

a motor positioned on the underwater robotic vehicle and coupled to a tether operable to retract and extend the tether adding or reducing tension thereon; and

a buoyancy module having a positive or negative buoyancy coupled to the tether;

controlling a buoyancy configuration of the water environment robotic system by:

operating the motor to adjust the tension on the tether between the buoyancy module and the underwater robotic vehicle so as to engage or disengage the buoyancy module from the underwater robotic vehicle;

in which a depth position of the underwater robotic vehicle is determined according to whether the buoyancy module is engaged to or disengaged from the underwater robotic vehicle.

11. A method according to Claim 10, in which the water environment robotic system is deployed with a buoyancy module which has a positive buoyancy, such that retraction of the tether by the motor buoyantly engages the buoyancy module with the underwater vehicle and causes the underwater robot to move higher in the water column.

12. A method according to Claim 10, in which the water environment robotic system is deployed with a buoyancy module which has a negative buoyancy, such that retraction of the tether by a winch of a water surface vehicle buoyantly engages the buoyancy module with the water surface vehicle and also disengages buoyant coupling between the underwater vehicle and the buoyancy module, causing the underwater robot to move higher in the water column.

13. A method according to Claim 10, in which the water environment robotic system is deployed with a buoyancy module which has a neutral buoyancy, such that retraction of the tether by the motor engages the buoyancy module with the underwater robotic vehicle and causes the underwater robotic vehicle to move lower in the water column, and sufficient expansion of the tether disengages the buoyant coupling between the buoyancy module and the underwater robotic vehicle, causing the underwater robotic vehicle to move higher in the water column.

14. A method according to Claim 10, further comprising the step of including the buoyancy module in a surface boat before the step of deploying the water environment robotic system.

16. A method according to Claim 6, in which the surface boat is configured to perform functions on a surface of the water when the surface boat is in the disengaged condition.

17. A method according to Claim 10, in which the tether being in a slack condition causes the buoyancy module to be in the state of being buoyantly disengaged with the underwater robot.