CLAIMS

1. A water environment robotic system, comprising:

a control station;

an underwater robotic vehicle adapted for shallow water maneuver and inspection having a body, a plurality of legs coupled to the body, thrusters for swimming movement of the body through water, a water navigation module for controlling the thrusters and a crawling module for controlling the legs along an underwater seabed and a plurality of inspection devices having different sensing modes;

a water-surface robotic vehicle;

first and second communication modules associated with the underwater robotic vehicle and the water-surface robotic vehicle, respectively, in which the first and second communication modules provide communication between the vehicles through the water;

third and fourth communication modules associated with the water-surface robotic vehicle and the control station, respectively, in which the third and fourth communication modules provide communication between the water-surface robotic vehicle and the control station over air; and

an alignment control system, comprising:

a position signal emitter associated with the underwater robot;

a position signal detector associated with the water-surface robot, in which the position signal emitter emits signals that are capable of being detected by the position signal detector;

a surface propulsion system; and

an alignment control processor associated with the water-surface robot that receives signal data from the position signal detector and determines the relative positions of the underwater robot and the water-surface robot, the alignment control processor controlling operation of the surface propulsion system to move the water-surface robot along the surface of the water in such a way as to maintain an alignment in a range of zero degrees to 45

degrees of vertical between the water-surface robot and the underwater robot,

in which the control station is configured to control operation of the underwater robotic vehicle using control signals that are communicated between the control station and the water-surface robotic vehicle via the third and fourth communication modules and are relayed by the water-surface robotic vehicle to the underwater robotic vehicle via the first and second communication modules; and

in which the underwater robotic vehicle is configured to transmit multi-mode inspection data collected by underwater robotic vehicle using data signals that are communicated between the underwater robotic vehicle and the water-surface robotic vehicle via the first and second communication modules and are relayed by the water-surface robotic vehicle to the control station via the third and fourth communication modules, and

in which the water navigation module controls the thrusters to provide the swimming movement and in which the crawling module controls the legs for mobility along the seabed without requiring thruster activation by the water navigation module.

2. A water environment robotic system according to Claim 1, in which the position signal emitter and the position signal detector is selected from the group comprising emitters and detectors of light, acoustic energy, laser radiation, and various combinations thereof.

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

a tether extending between the water-surface robotic vehicle and the underwater robotic vehicle;

in which the alignment control system associated with the water-surface robotic vehicle includes:

sensors that provide tether force signal data related to forces on the tether; and

an alignment control processor that receives the tether force signal data and determines the relative positions of the underwater robotic vehicle and the water-surface robotic vehicle.

4. A water environment robotic system according to Claim 1, in which the first and second communication modules are configured to communicate using at least one of visible light, radio frequencies, laser light, acoustic communications, and a tether.

5. A water environment robotic system according to Claim 1, in which the water-surface robotic vehicle and the underwater robotic vehicle are configured to dock together.

6. A water environment robotic system according to Claim 5, in which the water-surface robotic vehicle and the underwater robotic vehicle are configured to electrically couple to provide electrical power from the water-surface robotic vehicle to the underwater robotic vehicle.

7. A water environment robotic system according to Claim 5, in which the water-surface robotic vehicle and the underwater robotic vehicle are configured to mechanically couple.

8. A water environment robotic system according to Claim 1, in which the water-surface robotic vehicle is configured to provide at least one of pressurized water, compressed air, or sandblasting material and various combination thereof to the underwater robotic vehicle via at least one of a mechanical couple or a tether and various combinations thereof.

9. A water environment robotic system according to Claim 1, in which the least one underwater motion module includes at least one of a vertical thruster, a horizontal thruster, or a buoyancy control device and various combinations thereof.

10. The water environment robotic system according to Claim 1, in which the least one underwater crawling module further controls at least one of a crawling skid, a track or a wheel.

11. A water environment robotic system according to Claim 1, in which the underwater robotic vehicle includes at least one environmental sensor.

12. A water environment robotic system according to Claim 11, in which the at least one environmental sensor includes at least one of a camera, imaging sonar, altimeter, pressure sensor, depth sensor, or temperature sensor and various combinations thereof.

13. A water environment robotic system according to Claim 1, in which the plurality of inspection devices includes at least two of a ultrasonic testing probe, cathodic protection probe, eddy current probe, infrared camera, 3D scanning system, and various combinations thereof.

14. A water environment robotic system according to Claim 1, in which the underwater robotic vehicle includes at least one marine life cleaning system.

15. A water environment robotic system according to Claim 1, further including at least one additional water-surface robotic vehicle in which the multiple water-surface robotic vehicles are in wireless communication to provide communication relay between the multiple water-surface robotic vehicles and the control unit.