Claims

The claims defining the invention are as follows:

1. An underwater probe, usable in a network of underwater probes, the underwater probe comprising:

a. a submersible body having:

i. an elongated body with a substantially hydrodynamic effective shape for travel in at least one longitudinal direction;

b. a power system for allowing the controllable driving of the submersible body in the at least one longitudinal direction;

c. a visual image capture system including a plurality of optical cameras located on or at the surface of the elongated body to allow for usage in one or more of:

i. navigation;

ii. a visual capture;

iii. a visual mapping;

iv. knitting of a composite visual image.

wherein the elongated body is substantially in the range of 1 to 5 metres long allowing for easy manoueverability in small spaces and

wherein the probe is remotely controlled by wireless connection in real time to the power system and to the visual image capture system for navigational control of the probe for easy manoueverability in small spaces.

2 An underwater probe according to claim 3 including an active ballast system with a ballast controller wherein the underwater probe has a buoyancy value related to the internal volume of the probe and the payload and the active ballast system is remotely controllable through a wireless connection to the ballast controller to allow controlled changing of the depth of the probe.

3 An underwater probe according to claim 2 wherein the elongated body with the hydrodynamic effective shape is substantially symmetrical for travel in at least two opposing longitudinal directionsand includes a first and a second opposing substantially conical head and a main central part therebetween and aligned along a common elongated axis to allow the hydrodynamic effective shape for travel in at least two opposing directions

wherein the first and/or the second opposing substantially conical heads are detachable and replaceable and

having one or more intermediate parts connectable between the main central part and the first and/or the second opposing substantially conical heads to form a larger internal volume of the probe wherein the payload can be increased.

4 An underwater probe according to any one of claims 3 wherein at least the first and second opposing substantially conical heads have parts of the visual image capture system to allow navigation and the main cylindrical part and/or the one or more intermediate parts have parts of the power system wherein the probe is modular and has readily connectable and disconnectable modules that can be reconfigured to readily form differing volume and different payload ballast remotely controllable adjustable buoyant probes and

the main cylindrical central part or the differing length main cylindrical central part or the one or more intermediate parts can include one or more of:

a. Batteries;

b. Ballast;

c. Motors;

d. Electronics

e. Data and power connections;

f. Other Payloads.

5 An underwater probe according to claim 1 wherein the power system for allowing the controllable driving of the submersible body is a 3 degree of freedom maneuvering system, where it can move in the at least two opposing directions along the axis of the elongated shape, up and down, left and right and includes two side thrusters on either side of the elongated body and a top thruster on a top surface

wherein the top thrusters of the power system on the top side of the elongated body include 2 motors spinning in opposite directions to counter the angular momentum of each single motor and wherein the two side thrusters of the power system on either side of the elongated body are under the centre of gravity plane, wherein the probe is maintained stable during maneuvering.

6 An underwater probe according to claim 1 wherein the plurality of optical cameras of the visual image capture system includes one or more of:

a. A monoscopic camera

b. A stereoscopic camera.

wherein the optical cameras include stereoscopic cameras for steering the underwater probe and are located at either end of the elongated body and form part of the hydrodynamic effective shape and

wherein the optical cameras include monoscopic cameras for visual mapping and are wide angled cameras substantially in the range of 90º to 180º scope

and are mounted on the nose part of the submersible.

7 An underwater probe according to claim 6 wherein a plurality of the monoscopic cameras are mounted in a ring on the surface of a nose part on a plane rectilinear to the longitudinal axis of the submersible.

8 An underwater probe according to claim 7 wherein a plurality of opposing nose parts each have a ring of a plurality of the monoscopic cameras on a plane rectilinear to the longitudinal axis of the submersible wherein the planes of each of the rings is parallel and spaced to each other to provide relativistic scanning at separate timing as the submersible moves in one or other of the opposing directions along the longitudinal axis.

9 An underwater probe according to claim 8 wherein the plurality of the monoscopic cameras are determined by the relationship is defined as:

$$x = \frac{r \sin(180 - \frac{1}{2}\theta)}{\sin(\frac{1}{2}\theta - \frac{1}{2}\beta)} - r$$

where θ = the camera view angle

x = distance between the camera lens and the first overlap with adjacent camera

r = radius of the submersible at the axis of the cameras

β = angular spacing of cameras = 360º / N

N = number of cameras

10. An underwater probe for use in a network of underwater probes each obtaining a localised panorama, the underwater probe comprising:

a. a submersible body having:

i. an elongated body with a hydrodynamic effective shape for travel in at least one direction;

b. a power system for allowing the controllable driving of the submersible body in the at least one direction;

c. a visual image capture system including a plurality of optical cameras locatable on or at the surface of the elongated body to allow for usage in multiple image capture for use in

i. providing a localised panorama formed by the optical cameras locating an object or the lack of an object in a predefined focused distance from the elongated body and allowing the localised panorama for use in creating an interlinked panorama by the network of underwater probes; and

ii. a navigation system providing a relativised panorama formed by the optical cameras locating an object or the lack of an object in a predefined focused distance from the elongated body and within a calculated time and or distance locating an object or the lack of an object in a predefined focused distance from the elongated body allowing the localised panorama.

11. An underwater probe according to claim 10 wherein a plurality of opposing nose parts each have a ring of a plurality of monoscopic cameras being wide angled cameras substantially in the range of 90º to 180º scope wherein each ring is on a

plane rectilinear to the longitudinal axis of the submersible wherein the planes of each of the rings is parallel and spaced to each other to provide relativistic scanning at separate timing as the submersible moves in one or other of the opposing directions along the longitudinal axis.

12. An underwater probe according to claim 32 wherein the at least one input device provides for use in creating an interlinked relativised panorama by digital knitting of each relativised panorama of a network of underwater probes.

13. An underwater probe according to claim 12 wherein the panorama is a digitally mapped panaroma determined from the interlinked panorama or interlinked relativised panorama.

14 An underwater probe according to claim 10 wherein the elongated body with a hydrodynamic effective shape includes a main substantially cylindrical part and a leading substantially conical head aligned along a common elongated axis to allow hydrodynamic effective shape for travel in at least one direction.

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wherein the power system for allowing the controllable driving of the submersible body is a 3 degree of freedom maneuvering system, where it can move in the at least two opposing directions along the axis of the elongated shape, up and down, left and right and includes two side thrusters on either side of the elongated body and a top thruster on a top surface

wherein the top thrusters of the power system on the top side of the elongated body include 2 motors spinning in opposite directions to counter the angular momentum of each single motor And

wherein the two side thrusters of the power system on either side of the elongated body are under the centre of gravity plane, wherein the probe is maintained stable during maneuvering.

15. An underwater probe according to claim 10 wherein the plurality of optical cameras of the visual image capture system includes one or more of:

a. A monoscopic camera

b. A stereoscopic camera.

wherein the optical cameras include stereoscopic cameras for steering the underwater probe

and are located at either end of the elongated body and form part of the hydrodynamic effective shape and

the monoscopic cameras are wide angled cameras or panoramic cameras substantially in the range of 90º to 180º scope and

cameras are mounted on the elongated body.

16 An underwater probe according to claim 15 wherein panoramic cameras are mounted on the elongated body to protrude to allow panoramic views while minimising effect to the hydrodynamic effective shape and

17 An underwater probe according to claim 15 wherein panoramic cameras are mounted in curved domes with protruding elevation in the range of 4 to 8 % of the maximum diameter of the underwater probe around the elongated axis and

18 An underwater probe according to claim 15 wherein the elongated body with a hydrodynamic effective shape includes a main substantially cylindrical part and a leading substantially conical head aligned along a common elongated axis to allow hydrodynamic effective shape for travel in at least one direction and wherein 5 to 9 but preferably 7 panoramic cameras are equally spaced from the leading point of and equally spaced around the 360º of the leading substantially conical head aligned along a common elongated axis.

19 An underwater probe according to claim 18 wherein the leading substantially conical head aligned along a common elongated axis has converging opposed tangential lines that extend to about the required predefined focused distance from the elongated body in front of the hydrodynamic effective shape such that the panoramic cameras are mounted on the tangential line on the hydrodynamic effective shape and thereby can locate an object or the lack of an object in a predefined focused distance in a hemispherical position from the elongated body allowing the localised panorama.

20 A method of using an underwater probe for use in a network of underwater probes each obtaining a localised panorama including the steps of:

a. Providing a submersible body having an elongated body with a hydrodynamic effective shape for travel in at least one direction;

b. Driving the submersible body at a fixed spacing to a predetermined extended surface;

c. Undertaking visual capture to undertake:

i. locating an object or the lack of an object in a predefined focused distance from the elongated body and allowing the localised panorama for use in creating an interlinked panorama by the network of underwater probes;

ii. locating an object or the lack of an object in a predefined focused distance from the elongated body and within a calculated time and or distance locating an object or the lack of an object in a predefined focused distance from the elongated body allowing the localised panorama

wherein the undertaking of visual capture includes the steps of:

a. Provide a location fixed relative location of a plurality of cameras

b. Providing control signal operation to each of the location fixed relative location of a plurality of cameras

c. Each camera separately upon receipt of control signal checking with global clock

d. Undertake the control action at the next predetermined particular time control point

e. Wherein images are provided that are with a fixed relative location and with a fixed relative synchronised time

f. Allowing knitting of images with a fixed relative location and with a substantially relative synchronised time

wherein the fixed spacing to a predetermined extended surface is about 2 metres.