Specification of Multiple AUV Strategies for Search of Freshwater Oceanic Sources

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Abstract: The continued action of mankind upon the environment has produced problems in the freshwater quality and availability for human water supply systems. This problem is even more severe in particular regions of the globe where water resources are scarce.

The use of freshwater sources in the ocean (due to freatic leaks on the sea bottom) is currently limited by the difficulty in mapping these resources. Although geological studies can provide an estimate of possible sources, the location of them on the sea bottom is difficult to achieve. The use of automatic and economic efficient search methods can provide an effective solution to these problems.

The use of small Autonomous Underwater Vehicles (AUV) equipped with oceanographic sensors, allows the efficient search of various types of underwater phenomena. This is the case of finding and mapping of hydrothermal vents and also other oceanic freshwater sources.

In the current work, system and mission requirements for the use of AUV's in this type of problems are defined. A requirement analysis is done having in mind the definition of search methodologies involving multiple cooperating vehicles. Control and navigation issues are addressed.

Various search strategies are proposed and analysed in terms of control, navigation and overall system requirements. An efficient coordinated scheme is proposed, allowing distributed control and relative navigation with minimum communication between vehicles.

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