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Forward looking techniques for environment modelling, obstacle detection and characterization

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Military underwater robots are designed to perform complex underwater missions in both known and unknown environments. To achieve these tasks, an Autonomous Underwater Vehicle (AUV) must be supplied with appropriate sensors to deal with unpredictable events that can put it in danger, and with a high degree of decisional autonomy. In this paper, we have studied the architecture of forward looking sensors to allow the creation of a 3D model of the environment presenting the seabed and the obstacles that are on the path of the AUV. Our approach is based on experimental trials using different and complementary ways (sonars with several configurations) to gather an information as complete as possible. This information will be processed by the vehicle during a survey mission. Practically, we create a reference model of a static environment using a multibeam system which produces bathymetric images at different grazing angles. In the same environment we then use a Forward Looking Sonar intended for the recognition of detected echoes in comparison with the reference model. If an echo cannot be related to a known object on the reference map, it is considered as an obstacle, and the map is updated.