Risk-averse Planning for Marine Robots

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Autonomous Underwater Vehicles (AUVs) are unmanned underwater platforms for gathering data in scientific and commercial areas. The promise of autonomy makes them ideal for inspection tasks in harsh environments. Operating in these conditions poses a higher risk to humans to ensure reliable and safe autonomy [1]. We propose considering possible alternative plans before executing a mission to open the horizon in making better decisions taking safety and reliability into account. In other words, we argue for prospection: the ability to anticipate and assess future events and consequences of actions [2]. Crucially, the greater the expense or risks in executing the plan, the more important the role of their anticipation. Leveraging it can improve the safety of the deployment of AUVs.

The problem addressed by AI planning is to synthesize a plan to reach a state where the desired goals are achieved, given descriptions of possible initial states of the world and a set of possible actions. Symbolic AI planning is advantageous if problems can be described declaratively and non-trivial domain knowledge exists and is relevant. Pure learning techniques are difficult to use due to insufficient training data. Explaining a particular course of action the system takes is also important and supported by planning methods [3].

Although modeling of uncertainty in planning systems seems necessary in dynamic environments, there exists mainly research work on underwater mission planning focuses on re-planning [4, 5] or temporal planning [6]. They consider planning problems a minimization optimization against a single objective like limited time or energy [7]. Due to the risks and costs we mentioned above, it is necessary that Autonomous Underwater Vehicle (AUV) missions are not aborted unnecessarily and consider alternative plans. To this end, we propose a solution that enables marine robots to autonomously assess the risk in operational conditions by ranking potential acceptance plans and choosing the safe plan by Risk-averse Planning. The goal of this research work is that underwater robot fail less in dilemma situation.

References

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