Journal Report

The research paper "Cooperative Path Planning for Heterogeneous Unmanned Vehicles in a Search-and-Track Mission Aiming at an Underwater Target" presents a cooperative path planning algorithm for multiple unmanned underwater vehicles (UUVs) with different capabilities to search and track an underwater target. The paper addresses the challenges of searching for and tracking a mobile target in an underwater environment using multiple UUVs with different communication and sensing ranges.

The proposed algorithm integrates a search algorithm and a tracking algorithm to optimize the overall search time and track accuracy. The search algorithm is based on the Sweep Coverage Algorithm (SCA) and uses a search pattern to cover the search area efficiently. The tracking algorithm is based on the Unscented Kalman Filter (UKF) and estimates the target location and updates the vehicle trajectories accordingly.

The algorithm considers the communication and sensing constraints of the UUVs, as well as the heterogeneous capabilities of the vehicles. The algorithm can adapt to different scenarios and optimize the search and tracking performance of the UUVs.

The paper presents simulation results to evaluate the proposed algorithm. The results show that the proposed algorithm can effectively improve the search efficiency and track accuracy compared to the traditional methods. The algorithm is also shown to be robust to communication and sensing constraints and can be applied to a wide range of scenarios.

Overall, the paper proposes a cooperative path planning algorithm that can enhance the search and tracking capabilities of multiple UUVs in a heterogeneous environment. The algorithm provides a promising approach for future underwater search and tracking missions using multiple unmanned vehicles.

The algorithm

Here is a high-level algorithm for Cooperative Path Planning for Heterogeneous Unmanned Vehicles in a Search-and-Track Mission Aiming at an Underwater Target:

Input:

- Search area

- Number and types of unmanned underwater vehicles (UUVs)
- Communication range
- Sensing range
- Target location

Output:

- Optimal search pattern for the UUVs
- Estimated target location
- Updated UUV trajectories

1. Define the search area and target location.

2. Initialize the UUVs with their respective communication and sensing ranges, and assign search tasks based on their capabilities.

3. Develop the Sweep Coverage Algorithm (SCA) to determine the optimal search pattern for the UUVs to cover the search area efficiently. The SCA should consider the communication and sensing ranges of the UUVs and the target location.

4. Develop the Unscented Kalman Filter (UKF) to estimate the target location and update the vehicle trajectories accordingly. The UKF should consider the communication and sensing ranges of the UUVs and the measured target location.

5. Integrate the SCA and UKF to implement the cooperative path planning algorithm. The algorithm should dynamically adjust the search pattern and UUV trajectories based on the estimated target location and measured data.

6. Test the algorithm using simulations or experiments and evaluate its performance in terms of search time and track accuracy.

7. Refine the algorithm based on the evaluation results and repeat the testing until satisfactory results are achieved.

Note that the details of the SCA and UKF algorithms are not included in this high-level algorithm and would require further development and implementation.

Results:

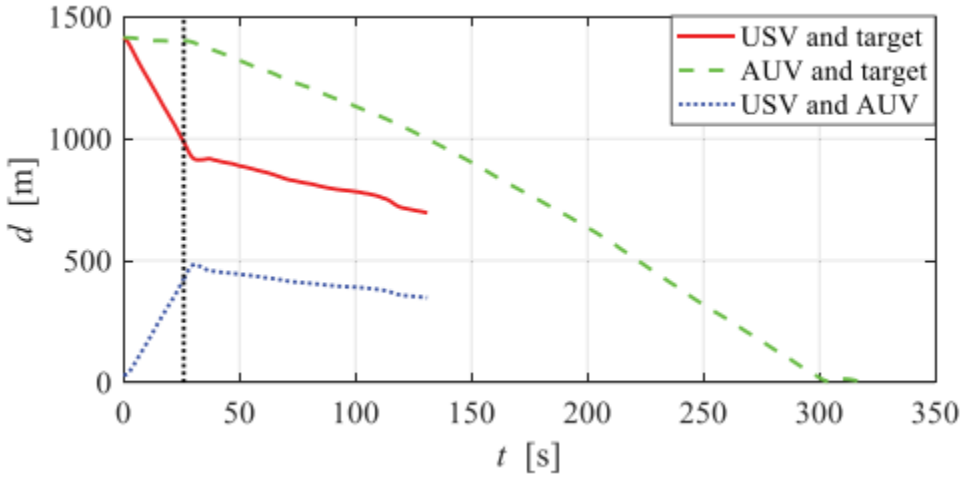
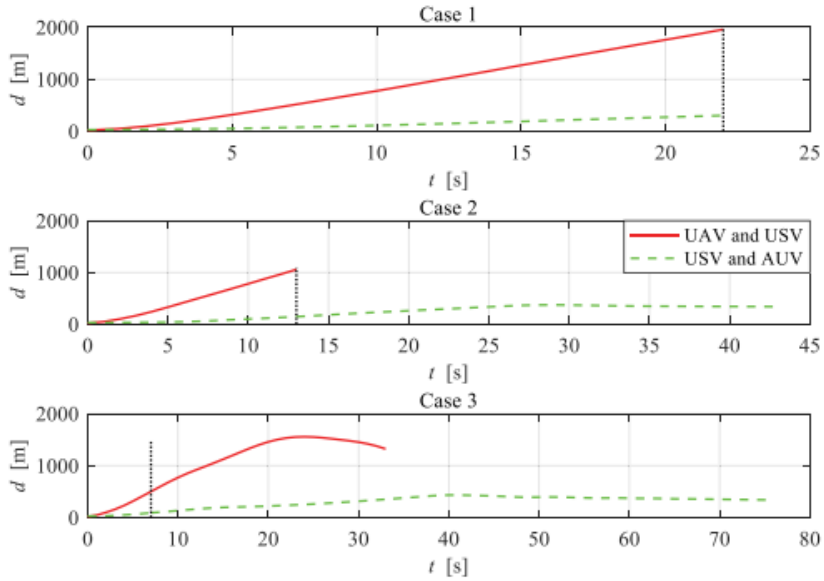


Fig. Comparison of different missions



. Distance between different vehicles in three cases.