Unity 3D and Robot Operating System applied to the development of a multi-UAV strategy to identify oil spills around offshore platforms

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Environments - Unity Simulator and ROS

The environment simulates water movement and oil spills spread out in real-time, providing immersive visuals for testing monitoring strategies. Different spill types, like tank breaches, pipeline ruptures, and wellhead failures, can be simulated to develop prevention and monitoring strategies.
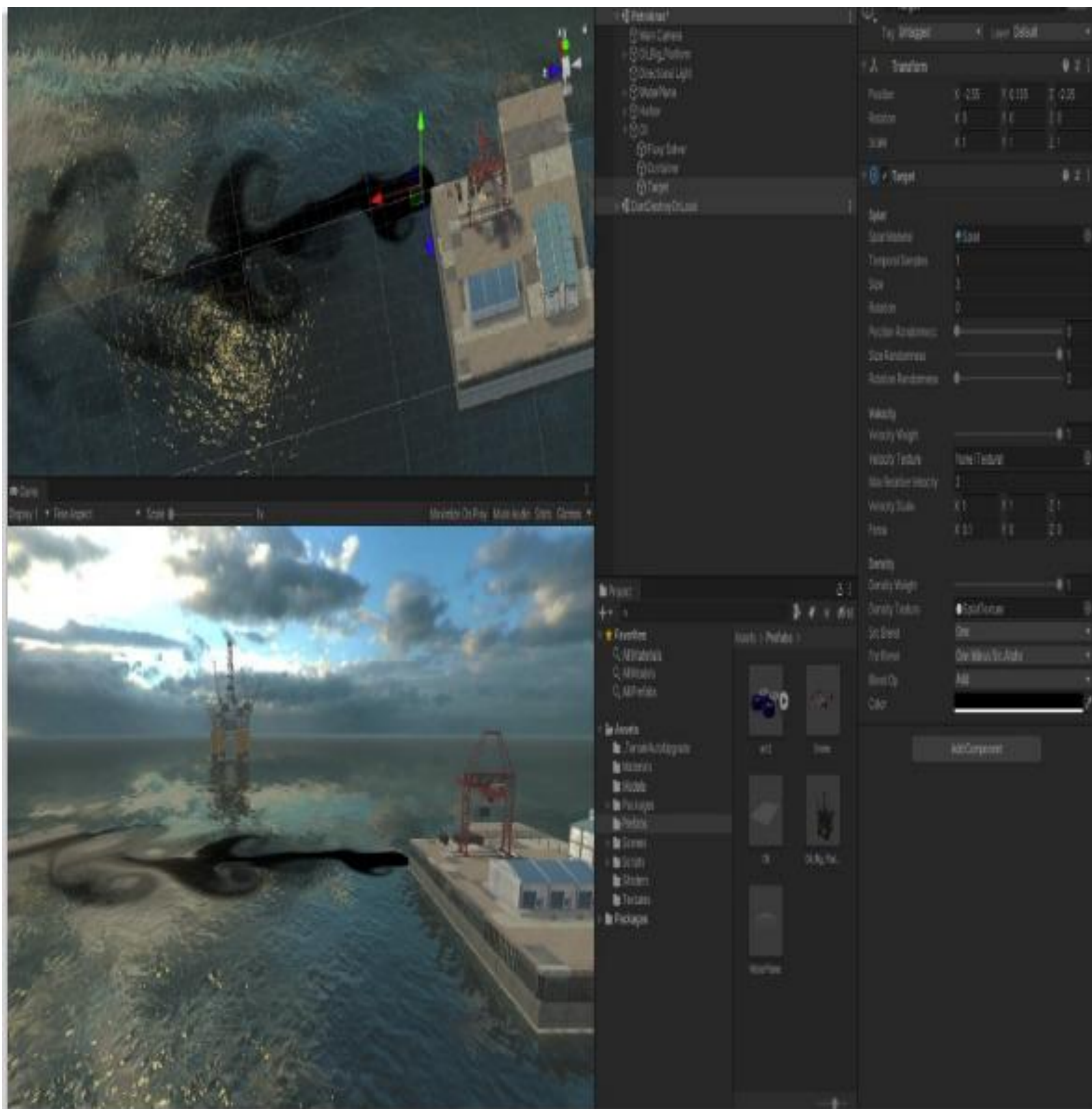

Figure 1: A simulated oil spill from a storage tank. An oil offshore platform, a base, and an oil slick spread out from it in all directions.

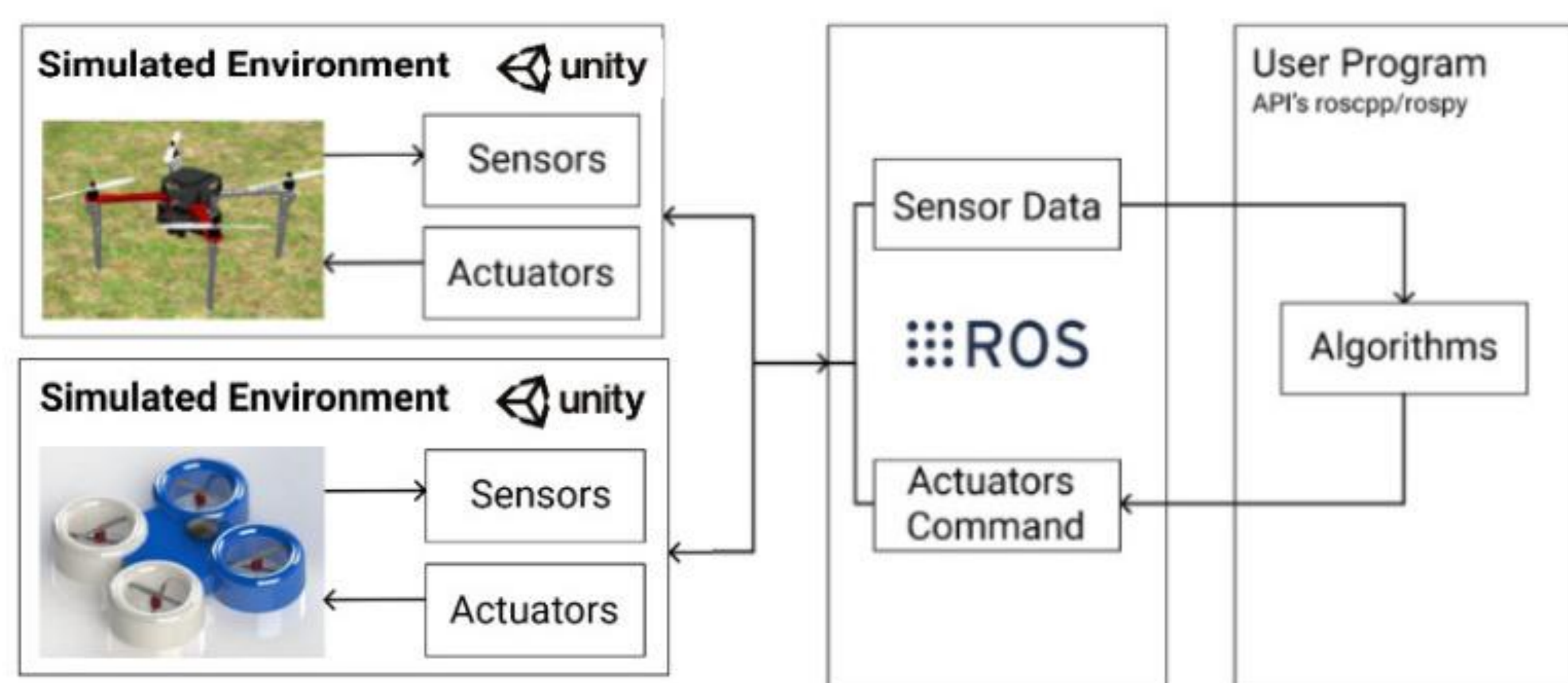Figure 2: Different perspectives of oil spills (a pipeline or a wellhead).

Figure 3: Software in the Loop Diagram - UAVs F450 and ART2

Detecting and Monitoring Oil Spills

The proposed Multi-UAV collaborative system includes a leader-follower architecture. The system incorporates deep learning-based active segmentation to identify regions of interest.
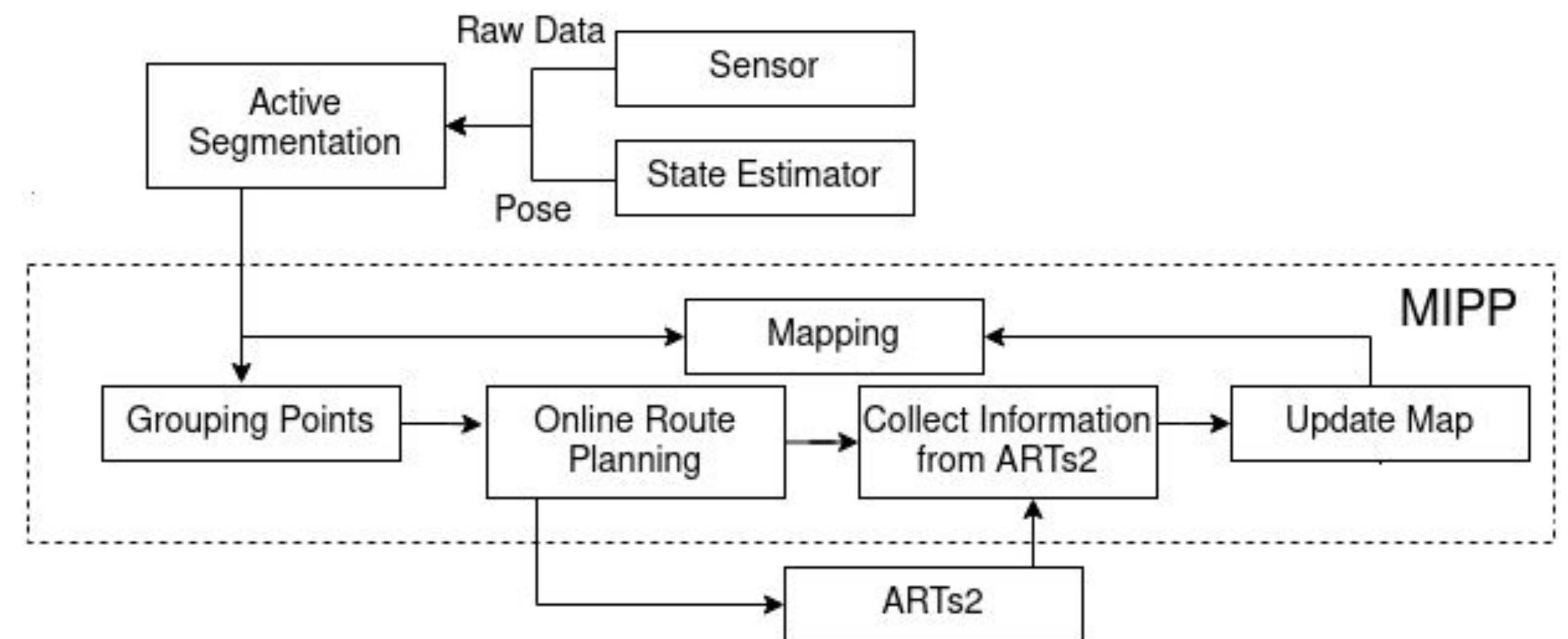

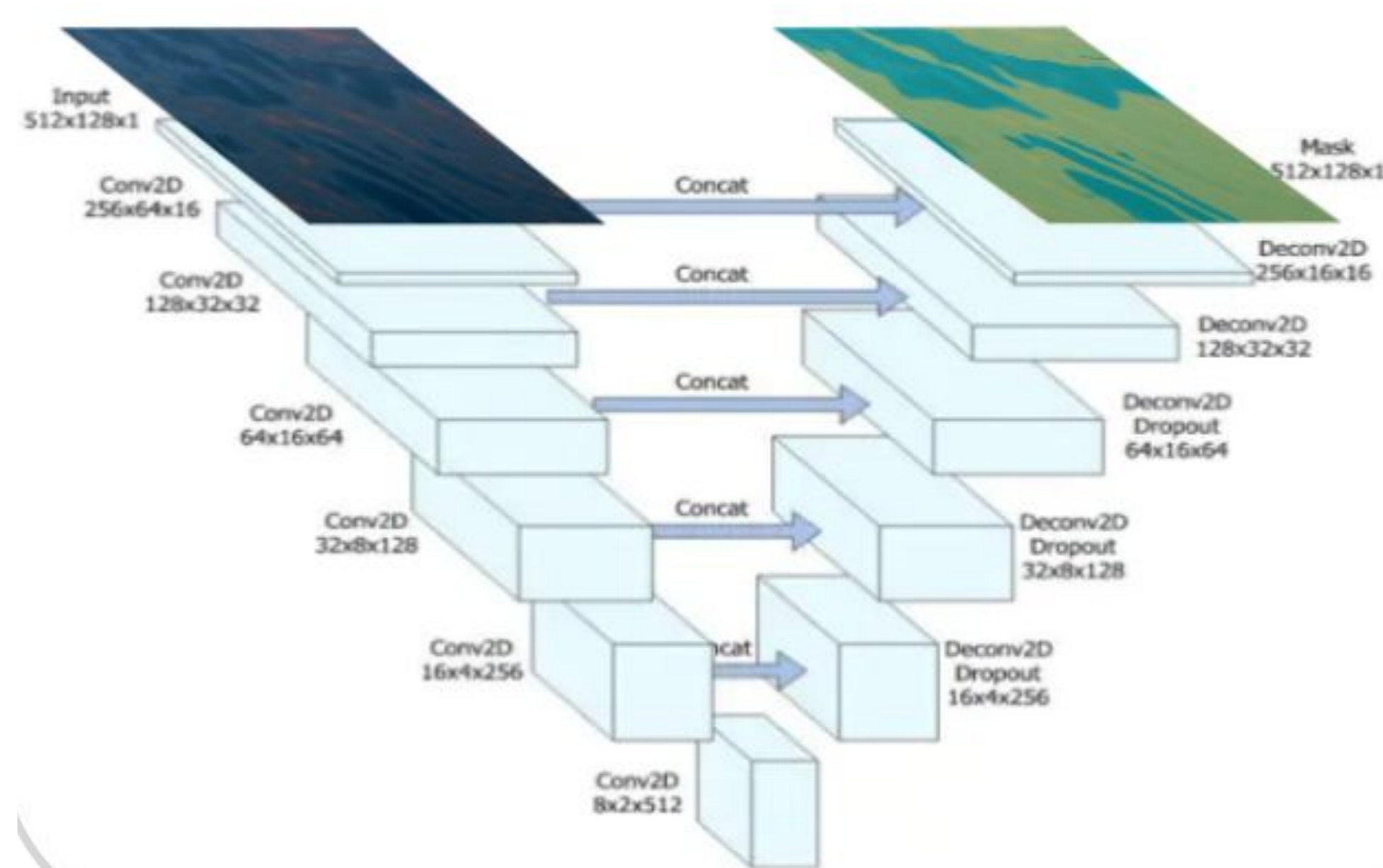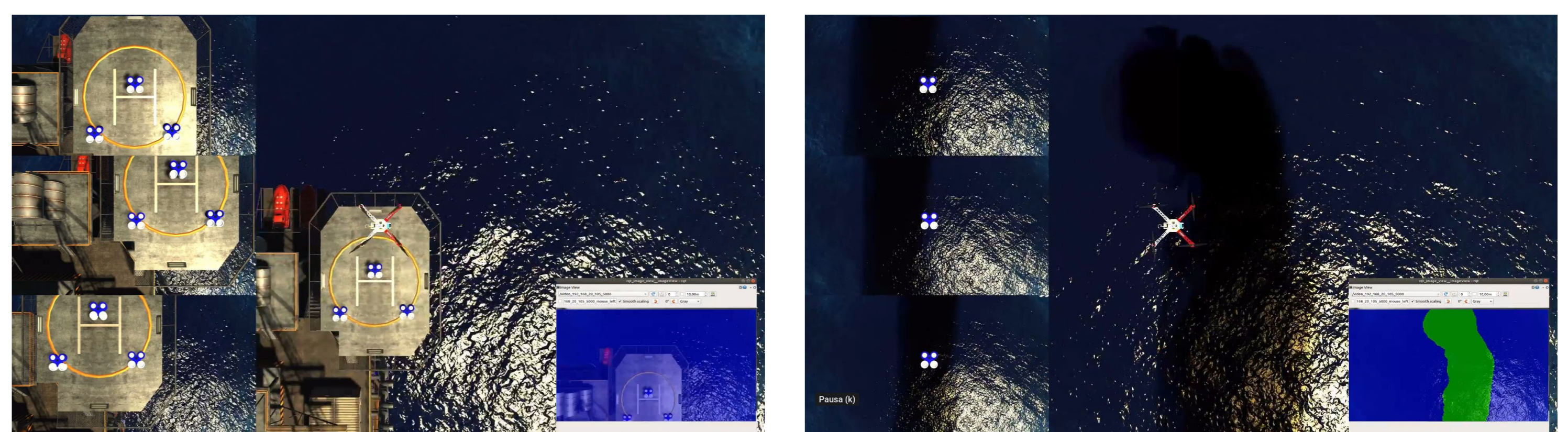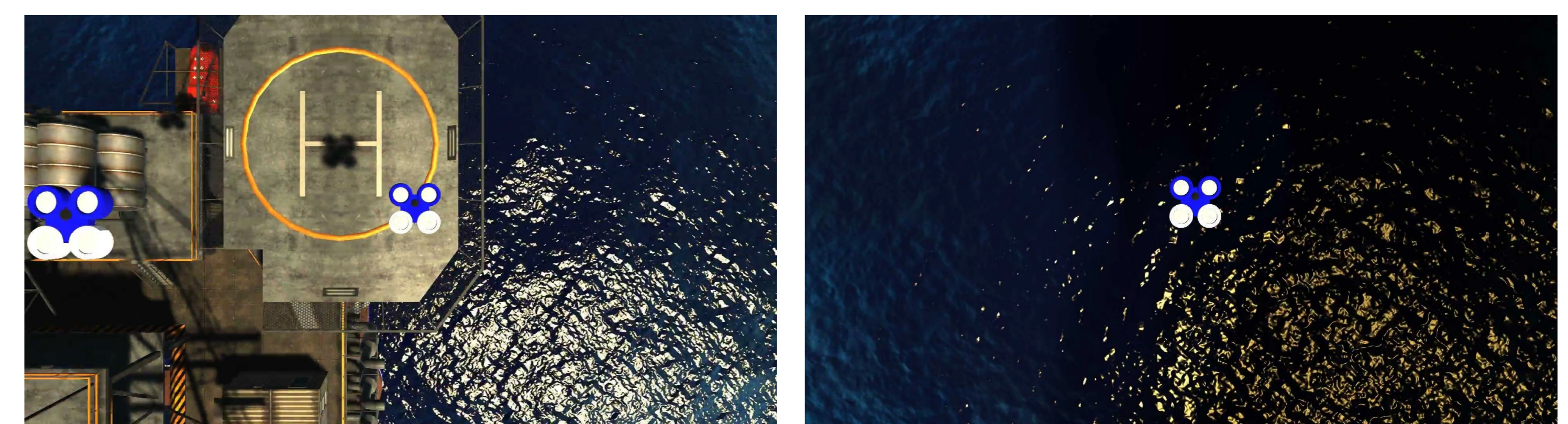Figure 4: Multi-UAV Informative Path Planning Architecture

Figure 5: Real image network - IoU of 75%, with 71 training images. Simulated image networks - IoU of 91%, from 223 images.

Results

Figures 6: Multi-UAV Platform - F450 (leader)

Figures 7: Multi-UAV Platform - ART2s - followers

Acknowledgement