

Subsumption Architecture for Fluid-Advection Chemical Plume Tracing with *Soft* Obstacle Avoidance

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Abstract - A typical chemical plume tracing (CPT) is to navigate an autonomous vehicle to find a chemical plume that is transported in a turbulent fluid flow, to trace the plume to its source, and to declare the source location. CPT in the real world, however, is more complicated, for example, some test runs, conducted in August 2002 on Clemente Island, California, failed because of some “*soft obstacles*”, such as kelp forest or seaweed in near-shore ocean environments. This paper presents a subsumption architecture for CPT with *soft obstacle* avoidance by integrating a Follow-Obstacle behavior. The behaviors used herein can be grouped into two categories: *soft obstacle* avoidance and plume searching and tracing. The simulation studies of CPT with *soft obstacle* avoidance are performed using a simulated turbulent fluid environment.

Index Terms — Subsumption architecture, behavior-based control, autonomous underwater vehicles, chemical plume tracing, potential fields.