

## ABSTRACT

### COOPERATIVE AUTONOMOUS THERMAL SOARING FOR SMALL UNINHABITED AERIAL VEHICLES

Through observations of bird flocks and experiences in human soaring flight, it is apparent that cooperative behaviors can improve the efficiency of locating and utilizing atmospheric thermals. This paper applies the concepts of cooperative soaring derived from theories of bird flight to flocks of small UAVs. A multi-vehicle simulation with atmospheric thermal models is written to evaluate the utility of these cooperative behaviors. It is shown that a novel behavior rule based upon mutual attraction and repulsion between flock members will produce a stable, uniformly-spaced flock to aid in cooperative thermal detection. Furthermore, a cooperative attraction rule based upon relative rates of climb is shown to produce both aggregations at a thermal, and improved thermal centering characteristics.

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May 2008