MULTI-UAS MINIMUM TIME SEARCH IN DYNAMIC AND UNCERTAIN ENVIRONMENTS

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1. Abstract

In the **Minimum Time Search (MTS)** problem there are one or several targets, whose locations are unknown and need to be found as soon as possible. A **fleet of UAVs** carries out the search, equipped with sensors capable of detecting the targets. The main objective is to obtain the best possible UAV search trajectories, making the most of the available information (probability map, sensor model, etc).

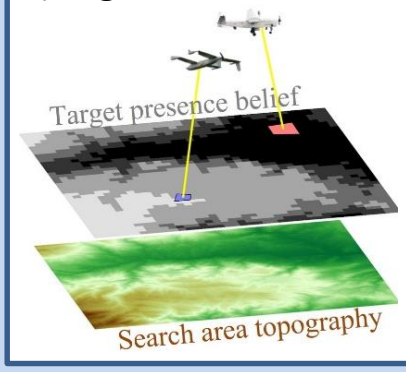
2. Motivation & Objectives

Propose new efficient **MTS algorithms** that considering the search scenario information obtain the UAV search trajectories that detect the target in minimum time.

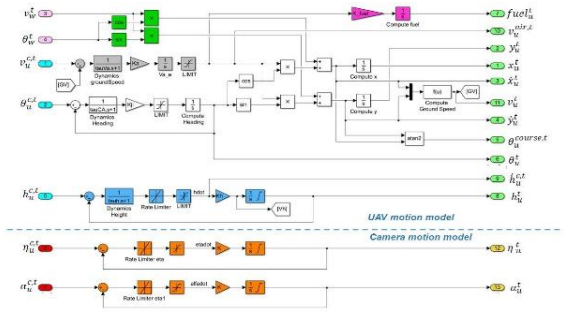
Develop **realistic models**: target presence and dynamic beliefs and UAV and sensor likelihood models.

3. Realistic Models

We build realistic models despite the uncertain information (target location and movements and sensor performance)



UAV Simulink motion model

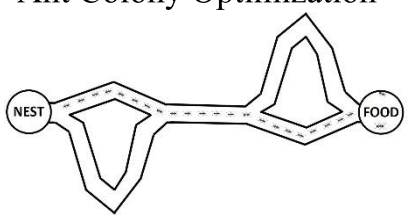


4. MTS Algorithms

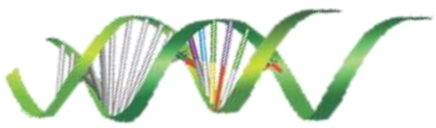
We propose several **bioinspired MTS algorithms** which include new MTS constructive and myopia reduction heuristics that allow them to obtain higher quality solutions in less computational time.

BIO-INSPIRED ALGORTIMS

Ant Colony Optimization

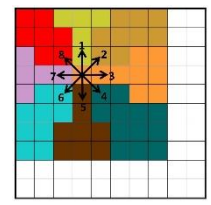


Genetic Algorithms



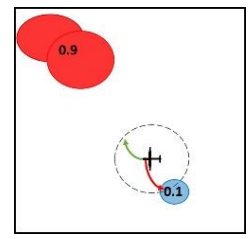
NEW MTS HEURISTICS

MTS constructive heuristics guide the UAVs towards the areas with higher target belief

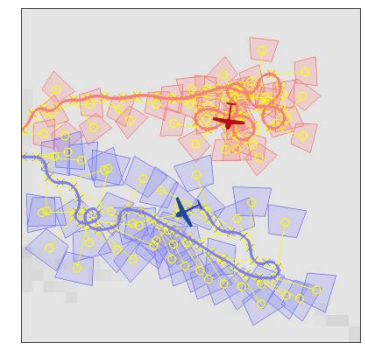


Myopia reduction heuristic decreases the myopia effects derived from solving consecutive subproblems

"divide and conquer"



OPTIMIZED UAV SEARCH TRAJECTORIES



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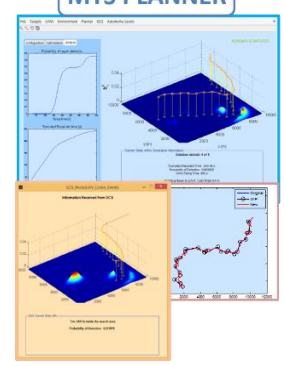
Sara Pérez-Carabaza et al., A real world multi-UAV evolutionary planner for minimum time target detection, GECCO, Denver 2016.

5.SAVIER Project & Integration

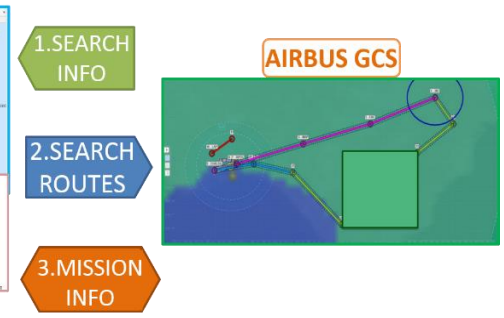
SAVIER Project funds 12 theses from different Spanish universities that research how to incorporate new technologies in future **Ground Control Stations (GCS)**

One of the main objectives of the project was to incorporate the thesis contributions in **ATLANTE GCS simulator** (Airbus, Getafe)

MTS PLANNER



MTS PLANNER INTEGRATION



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