TOWARDS NATURE INSPIRED NAVIGATION OF AUTONOMOUS MOBILE MULTI-SENSOR PLATFORMS

A. A. Heidari [a,] , Rahim A.Abaspour [a]

[a] GIS Division, Dept. of Geomatic Engineering, University of Tehran, Tehran
- (as_heidari, abaspour)@ut.ac.ir

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ABSTRACT:

An unmanned aerial vehicle (UAV) is a mobile multi-sensor platform that can fly with a remote input either from a ground-based station, or autonomously without operator interference based on pre-programmed flight plans. UAVs are applied to provide spatio-temporal information about an area of interest. Recent advances in technology are encouraging the use of unmanned aerial vehicles for intelligence, reconnaissance, and surveillance missions. These missions are usually in threatened situations, and then it is very significant for flying in the direction of a Trajectory, which keeps the UAV away from known threats. Long-range UAVs have an autopilot system for following predesigned waypoints and continue motion based on planned trajectory, when they are out of the control of station's communication range. Operational UAVs need human control, but operator tasks are based on UAV level of autonomy. However, developments of intelligent unmanned flight systems have become a growing trend in many research areas. Trajectory planning is a vital task in autonomous control processes of UAV navigation, which is responsible for producing optimal trajectories from the launching location to the landing station considering some known constraints in environment.

Many tasks should apply to UAV control systems for providing autonomous navigation. These steps maybe include scanning environment, DTM generation and path planning. Path planning is a complex requirement in the autonomous navigation. Its objective is to find an optimal flight path in proper time, to UAV be able to accomplish several mission tasks. Choosing efficient algorithms for solving path planning problem is an influential task. Optimal mission planning relies on optimization technics, so it has usually solved offline. Use of UAVs, which can fly autonomously in aerospace environments, is necessary in several innovative applications. Reliable safe navigation of UAV in Complex missions has technical challenges and UAV path planning is an essential task. Remote sensing applications of mobile multi sensor platforms require exact maneuvers, optimal decisions, and robust trajectory planning algorithms. Complex space around UAV flight trajectory makes the problem NP-hard.

This article addresses a novel approach to intelligent path planning of UAVs in constrained environments. Path planning for UAV is a complicated optimization problem, which basically includes optimizing the motion path considering the different kinds of constrains. To solve this NP-hard problem, an evolutionary method is improved. By modelling UAV properties, aerospace constraints and environment, proposed path planner based on improved optimization algorithm is proposed. Also it provides a comprehensive study for efficiency evaluation of nature inspired path planners based on ACO, ICA, ABC, CS, GSA, BA, DE, ES, GA, BH and PSO optimization algorithms. Then mission planning task of UAV is performed. Simulations show the advantage of proposed path planner.Then, decision maker can discover any optimal mission plan by considering several limitations include sources and fuel consumptions.