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FLIGHT DYNAMICS PARAMETER ESTIMATION OF A ROTARY WING AIRCRAFT USING THE OUTPUT ERROR MINIMIZATION WITH NATURAL AND META HEURISTIC METHODS

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Abstract. Flight simulators are employed by civil and military pilots, as well by engineers, in order to increase the security in training of crew, and to find out the behavior of the aircraft under different operational conditions. However, it is necessary to calibrate the simulator software to have good adherence to real flight. In this process, parameters of the mathematical model of the flight simulation need to be identified, such that the simulation is as close as possible to the real flight dynamic. With appropriated values of these parameters, the simulator will be ready for training or assessing the aircraft dynamics. This can be described as an inverse problem or parameter identification, formulated as an optimization problem. The simulator is designed to represent the dynamics of the helicopter AS355-F2, for testing two types of maneuvers: a sinusoidal input and 3-2-1-1 pulse input. The estimation methodology is also known as quad-M scheme, since it involves Measurement, Maneuver, Model, and Methods of error minimization. The tested helicopter was equipped with the Aydin Vector Data Acquisition System (AVDAS) PCU-816-I, ATD-800 digital recorder The system measures a total of thirty-five different parameters. The calibration of a dynamic flight simulator is achieved by two meta-heuristics: a Genetic Algorithm and a new approach named Multiple Particle Collision Algorithm (MPCA). Preliminary results show a good performance of the employed optimization methods.