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Optimization of Linear Quadratic Regulator with Tracking Applied to Autonomous Underwater Vehicle (AUV) Using Cuckoo Search

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Abstract: An Autonomous Underwater Vehicle (AUV) is used for exploring marine resources. The AUV has a control system for the surge, sway, or heave position and roll, pitch, or yaw angle. Tracking problems can be solved by using a controller designed using the LQR (Linear Quadratic Regulator). In optimal control for tracking problems using the LQR, the performance index is used as the objective function. The value of objective function depends on weighted matrices and, in general, the weighted matrices are determined by trial and error. In this research, the optimization of weighted matrices will be approached by heuristic methods such as Cuckoo Search (CS). CS simulates the reproduction strategy of cuckoo birds. The nests in CS represent weighted matrices in the LQR and the fitness function represents the performance index. Based on the simulation, the CS algorithm can find optimal weighted matrices in the LQR for the tracking problems. Furthermore, the solution of state and the optimal control can be obtained.

Keywords: *linear quadratic regulator; autonomous underwater vehicle; optimization; Cuckoo search.*

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