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Simulated real time controller using modified hill climbing algorithm on fixed wing airplane

ABSTRACT

In dynamic systems, it is very difficult to have models with good accuracy that are sufficient to predict the plant behavior in a way that an acceptably controlled performance can be produced. Sometimes even if mathematical models are sufficiently accurate in a way that a good controlled performance can be obtained, long term operation (or even short term in some cases) gradually increases the difference between the plant and its dynamical model. That, in turn, would lead to a degraded performance. It is a common task in industrial applications to recalibrate the control system periodically, as the plant parameters suffer various fluctuations from their original values that were used in designing the control system. The calibration procedure usually requires professional attendance, which adds up to more maintenance costs. Also, the experimental nature of the manual calibration often requires at least part of the plant operations to be halted. Adapted from MRAC framework using PID and fuzzy controller, a modified climbing algorithm was introduced in order to compensate the signal. This simulation was applied in fixed-wing airplane pitch angle in Simulink MATLAB. The result demonstrated that effectiveness of the proposed tuning algorithm and improvement over the initial non-tuned response of the process.

Keyword: PID controller; Fuzzy controller; Hill climbing algorithm; Fixed wing airplane