An on-line compensation of input additive disturbances: an evolving Gaussian process models approach

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An on-line compensation of input additive disturbances: an evolving Gaussian process models approach
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Case study: compensation of input additive disturbances for servo positioning system

Figure 1: Servo positioning system with mechanical friction brake that can be manually engaged. The additional mass can be added for the gravity compensation experiment.

\[
M(\cdot)\dddot{q}(t) + F_0(\cdot, \ddot{q}(t)) + F_1(\cdot) = u(t)
\]

\[
\begin{align*}
M(\cdot)\dddot{q}(t) &\quad \text{known dynamics} \\
F_0(\cdot, \ddot{q}(t)) &\quad \text{known forces} \\
F_1(\cdot) &\quad \text{unknown disturbances} \\
u(t) &\quad \text{nominal control (PD)} \\
w(t) &\quad \text{disturbance compensation}
\end{align*}
\]

How to compensate for disturbance, i.e., to estimate \(w(t)\)?

Nonparametric regression, e.g., LLR or GPR + Efficient on-line learning

Efficient on-line learning of disturbances; Selection of input/output regressors.

Local GPR
Evolving GP models

References

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