

Automatic container model crane

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Gruppe 633

Daniel Böhner Andersen

Nicolaj Vinkel Christensen

Ralf Victor Lømand Ravgård Christiansen

Simon Bjerre Krogh

Thomas Holm Pilgaard

Institut for elektroniske systemer

Aalborg Universitet

Danmark



AALBORG UNIVERSITY
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Agenda

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Force estimation

Improvements

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Force estimation

Improvements

Force estimation model

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Improvements

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- ▶ Model approach
- ▶ Nonlinearities in the EndoWrist dynamics
 - ▶ Hammerstein Wiener Models



Figure : Hammerstein-Wiener model.

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Force estimation model

Linear model

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Improvements

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- ▶ Linear model
 - ▶ Choice of inputs affects model quality
 - ▶ Inputs: effort, velocity
 - ▶ Outputs: force
- ▶ Black-box identification
 - ▶ Subspace identification
 - ▶ Hankel singular value analysis

Include picture with effort force fit here!!



Force estimation model

Hammerstein Wiener Models

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- ▶ Input and output nonlinearities

- ▶ Effort
- ▶ Force

Include picture with effort force fit here!!



Force estimation model

Hammerstein Wiener Models

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► Nonlinearities

- Deadzone nonlinearities
- Input/Output -saturation



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State estimation

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- ▶ Modeling for additional outputs allows correction of the model using an estimator
- ▶ A multiple output model that adequately captures the dynamics of the system could be used in a Kalman filter to create a state estimate
- ▶ The state estimates can be used in a state feedback loop to change system dynamics
- ▶ Reference following capabilities can be added to the system, despite the nonlinear characteristics of the dynamics

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State estimation

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- ▶ The hypothesis was tested in simulation
- ▶ Simulation results show that full reference following is possible despite the input nonlinearities in the system
- ▶ While the transient behaviour of the reference value is replicated, offsets and parasitic gains need to be compensated
- ▶ Could be implemented with improved model, doesn't improve estimate of current one.