



ECOLE DOCTORALE
« Mécanique, Energétique, Génie Civil, Procédés »
ED 468



Vous êtes cordialement invités à la soutenance de la thèse de

Jian, FU

Le 06 Juillet 2016 à 10h30
Salle Clément Ader, Institut Clément Ader

**Incremental Virtual Prototyping of Electromechanical Actuators
for Position Synchronization**

Résumé

In the aerospace field, the concepts based on extended use of electricity in “More Electric Aircraft” (MEA) and even “All Electric Aircraft” (AEA), electromechanical actuators (EMAs) are increasingly being implemented in place of conventional hydraulic servo actuators (HSAs). When EMAs are used for safety-critical actuation applications like flight controls, some specific issues related to thermal balance, reflected inertia, parasitic motion due to compliance, response to failure (jamming and free-run) and synchronization of EMAs driving independent loads cannot be ignored. The simulation-aided design process can efficiently support the assessment and validation of the concepts fixing these issues. For that, virtual prototypes of EMAs at system-level have to be developed in a structured way that meets the engineers’ needs. Unfortunately, the physical effects governing the EMAs behavior are multidisciplinary, coupled and highly nonlinear. Although numerous multi-domain and system-level simulation packages are now available in the market of simulation software, the modelling process and the engineers’ needs are rarely addressed as a whole because of lack of scientific approaches for model-based architecting, multi-purpose incremental modelling and model implementation for efficient numerical simulation. In this thesis, the virtual prototyping of EMAs is addressed using the Bond-Graph formalism. New approaches are proposed to enable incremental modelling of EMAs that provides models supporting control design, energy consumption and thermal analysis, calculation of reaction forces, power network pollution simulation, prediction of response to faults and influence of temperature. The case of preliminary design of EMAs position synchronization is used to highlight the interests and advantages of the proposed process and models of EMAs.

Mots-Clés:

Bond-graph, More Electric Aircraft, EMA, Energy Losses, Power-by-Wire, Response to Faults, Synchronization

Etablissement d’inscription:

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