



Colóquio Interinstitucional

Modelos Estocásticos e Aplicações

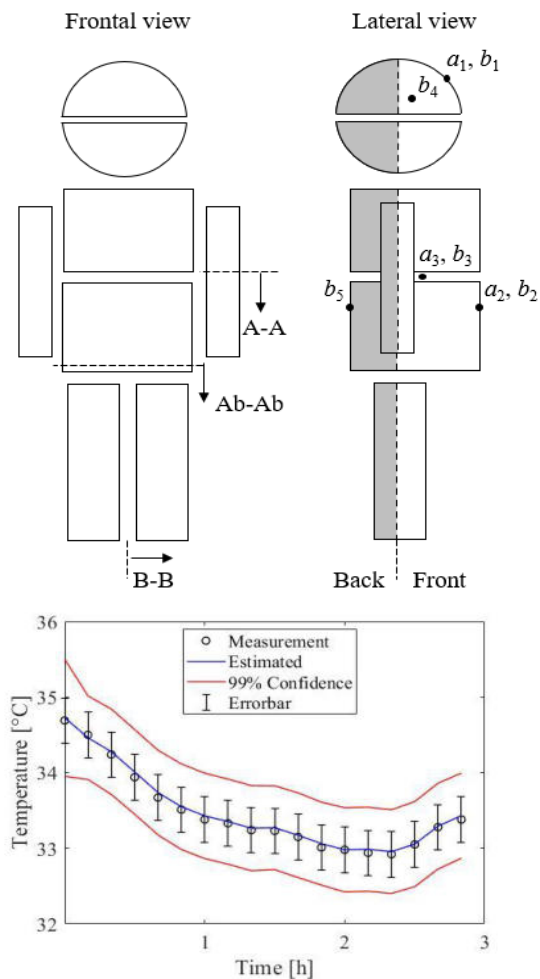
Quarta-feira, 31 de janeiro de 2024

Programa

14:00 - 15:20 – **Helcio Orlande (Programa de Engenharia Mecânica - COPPE/UFRJ)**

State estimation and predictive control applied to the treatment of the hypoxic-ischemic encephalopathy in neonates

The hypoxic-ischemic encephalopathy in neonates is a neurological disorder characterized by the lack of oxygen (hypoxia) and low blood flow (ischemia), often related to perinatal asphyxia due to complications during birth. The main treatment for hypoxic-ischemic encephalopathy in neonates is the cooling of affected regions. Systemic cooling can be achieved by wrapping the body of the neonate with a blanket containing channels through which cold water is circulated. Alternatively, local cooling can be performed by surrounding the head of the neonate with a cap, in which cold water flows through channels, while the remaining body can be warmed by a radiator in the incubator. This seminar summarizes the works recently performed by the authors on the solution of inverse problems and predictive control related to the hypothermia treatment of the hypoxic-ischemic encephalopathy in neonates. The inverse problem involved the estimation of the brain temperature from the information provided by other temperature measurements available during the treatment. The inverse problem was solved as a state estimation problem with the Sampling Importance Resampling (SIR) algorithm of the particle filter method. The solution of the inverse problem was verified with simulated measurements, and ultimately validated with actual experimental data obtained during the local cooling treatment of a neonate in a pediatric intensive care unit. The combined application of the particle filter method and stochastic model predictive control was also numerically examined.



15:40 - 17:00 – **Béla Bollobás (University of Cambridge and University of Memphis)**

Sum-set problems and results: Old and new

Sums of subsets of \mathbb{R}^n , \mathbb{Z}^n and \mathbb{Z}_p^n have been studied for well over a century, although at the beginning progress was very slow. The subject took off in the 1960s, when Erdős and Heilbronn, and Freimann published their celebrated papers, and has been going from strength to strength with the results of Gowers, Green, Károlyi, Ruzsa, Tao, Vu and others. The talk, which should be understandable to a wide audience, not only to pure mathematicians, will contain some of the results I have obtained with Imre Leader and Marius Tiba, together with a recent breakthrough achieved by Gowers, Green, Manners and Tao.



17:00 - 18:00 – Discussão e lanche

Local

Instituto de Matemática – UFRJ
Sala C-116 - Bloco C
Centro de Tecnologia
Ilha do Fundão

Contatos

Americo Cunha (UERJ) americo@ime.uerj.br
Evaldo M. F. Curado (CBPF) evaldo@cbpf.br
João Batista M. Pereira (UFRJ) joao@dme.ufrj.br
Leandro P. R. Pimentel (UFRJ) leandro@im.ufrj.br
Maria Eulália Vares (UFF) eulalia@im.ufrj.br
Nuno Crokidakis (UFF) nuno@mail.if.uff.br
Roberto I. Oliveira (IMPA) rimfo@impa.br
Simon Griffiths (PUC-Rio) simon@mat.puc-rio.br
Yuri F. Saporito (FGV-EMAp) yuri.saporito@fgv.br

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